APPENDIX 9-1

FLOOD RISK ASSESSMENT

256398-06/11/2025-EIAR Volume 3B Appdx. 9-1 Flood Risk Assessment

REG. No. _____

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CURRAGLASS WIND FARM, CO. CORK

SITE SPECFIC FLOOD RISK ASSESSMENT

FINAL REPORT

Prepared for:

MKO

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

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DOCUMENT INFORMATION

Document Title:	**Curraglass Wind Farm, Co. Cork** **Site Specific Flood Risk Assessment**
Issue Date:	**4th September 2025**
Project Number:	**P1483-3**
Project Reporting History:	**P1483-0 - P1483-2**
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Author(s):	**Michael Gill** **David Broderick** **Nitesh Dalal**
Signed:	Michael Gill **Michael Gill B.A., B.A.I., M.Sc., MIEI** **Managing Director – Hydro-Environmental Services**

Disclaimer:
This report has been prepared by HES with all reasonable skill, care and diligence within the terms of the contract with the client, incorporating our terms and conditions and taking account of the resources devoted to it by agreement with the client. We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above. The flood risk assessment undertaken as part of this study is site specific and the report findings cannot be applied to other sites outside of the survey area which is defined by the site boundary. This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by MKO to complete a Site-Specific Flood Risk Assessment (FRA) for the Proposed Development.

As detailed in Section 1.1.1 in Chapter 1 (Introduction), for the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Development', 'proposed turbines', the 'Site', the ' 2020 Application' and the 'Kealkill Wind Farm'. Please see Section 1.1.1 of this EIAR for further details. A detailed description of the Proposed Development is provided in Chapter 4 (Description of the Proposed Development) of this EIAR.

A site location map is presented below in Figure A.

The following Stage 2 assessment is carried out in accordance with '*The Planning System and Flood Risk Management Guidelines for Planning Authorities*' (DoEHLG, 2009).

1.2 STATEMENT OF QUALIFICATIONS

Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford.

Our core area of expertise and experience is hydrology and hydrogeology, including flooding assessment and surface water modelling. We routinely work on surface water monitoring and modelling and prepare flood risk assessment reports.

The report was prepared by Michael Gill, David Broderick and Nitesh Dalal.

Michael Gill P.Geo (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 24 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of quarries and renewable projects in Ireland, as well as accompanying Flood Risk Assessments. He has substantial experience in surface water drainage design and SUDs design and surface water/groundwater interactions.

David Broderick P.Geo (BSc, H. Dip Env Eng, MSc) is a Hydrogeologist with 19 years environmental consultancy experience in Ireland. David has completed numerous hydrological and hydrogeological assessments for various developments across Ireland. David has significant experience in surface water drainage issues, SUDs design, flood risk assessment and modelling.

Nitesh Dalal (B.Tech, PG Dip., MSc) is an Environmental Scientist with over 7 years' experience in environmental consultancy and environmental management in India. Nitesh holds a M.Sc. in Environmental Science from University College Dublin (2024), a PG Diploma in Health, Safety and Environment from Annamalai University, India (2021) and B.Tech. in Environmental Engineering (2016) from Guru Gobind Singh Indraprastha University, India (2016).

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1.3 REPORT LAYOUT

This FRA report has the following format:

- Section 2 describes the Site setting and details of the Site;
- Section 3 outlines the hydrological and geological characteristics of the surface water catchment and existing site drainage;
- Section 4 presents a site-specific flood risk assessment (FRA) undertaken for the Site which was carried out in accordance with the above-mentioned Guidelines;
- Section 5 presents Planning policy and responses to that policy outlined in this FRA; and,
- Section 6 presents the Stage 2 FRA report conclusions.

As stated above, this FRA is carried out in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' (DoEHLG, 2009). The assessment methodology involves researching and collating flood related information from the following data sources:

- OPW Flood Studies Update (FSU) Web Portal;
- Geological Survey of Ireland (GSI) maps on superficial deposits;
- EPA/WFD hydrology maps;
- OPW CFRAM & National Indicative Fluvial Mapping (NIFM);
- Cork County Development Plan 2022 – 2028; and,
- Site walkovers and surveys conducted by HES on 15th November 2024 and 26th February & 9th April 2025.

2. BACKGROUND INFORMATION

2.1 INTRODUCTION

This section provides details on the topographical setting of the Site along with a description of the Proposed Development.

2.2 SITE DESCRIPTION AND TOPOGRAPHY

The Site is in an upland forested setting and also a former wind farm development site with a total area of approximately 270ha. Access to the Site is from the Pass of Keimaneigh which runs along the northeastern boundary.

There is a network of existing forestry roads as well as access roads associated the Kealkill Wind Farm.

The topography is mountainous in setting with various peaks of the Shehy Mountains located to the east and west. The Site topography is characterised by a central north/south trending ridge line which slopes to the east and west. The Site ranges in elevation from 111 metres above ordnance datum (m OD), in the turbine component turbine area of the Site, to 347m OD in the north of the Site.

The majority of the Proposed Development infrastructure is located on the western slopes of the central trending ridge line. The Site is largely under forestry cover except on the eastern slopes of the central ridge which is dominated by shallow pockets of blanket bog and rocky outcrops.

The section of Site that covers the turbine component turning area, is located in low lying lands along the R584 at the bottom of the northern slopes of the Doughill Mountain. This pocket of the Site contains an existing private gravel track, with a mix of agricultural grasslands on either side of the track, and the boundary with the R548 Regional Road includes gorse willow hedgerow.

A site location map is shown as Figure A.

2.3 PROPOSED DEVELOPMENT DETAILS

A detailed description of the Proposed Development is provided in Chapter 4 (Description of the Proposed Devlopment) of this EIAR.

Works will typically involve removal of shallow soil, peat and subsoils for upgrade of existing and construction of new access roads, internal access road networks, internal cable network, hardstanding emplacement, turbine foundations, crane hardstands, construction compound, borrow pit and met mast installation. The construction grade granular fill and the higher quality surfacing granular fill will be sourced from 1 no. proposed on-site borrow pit.

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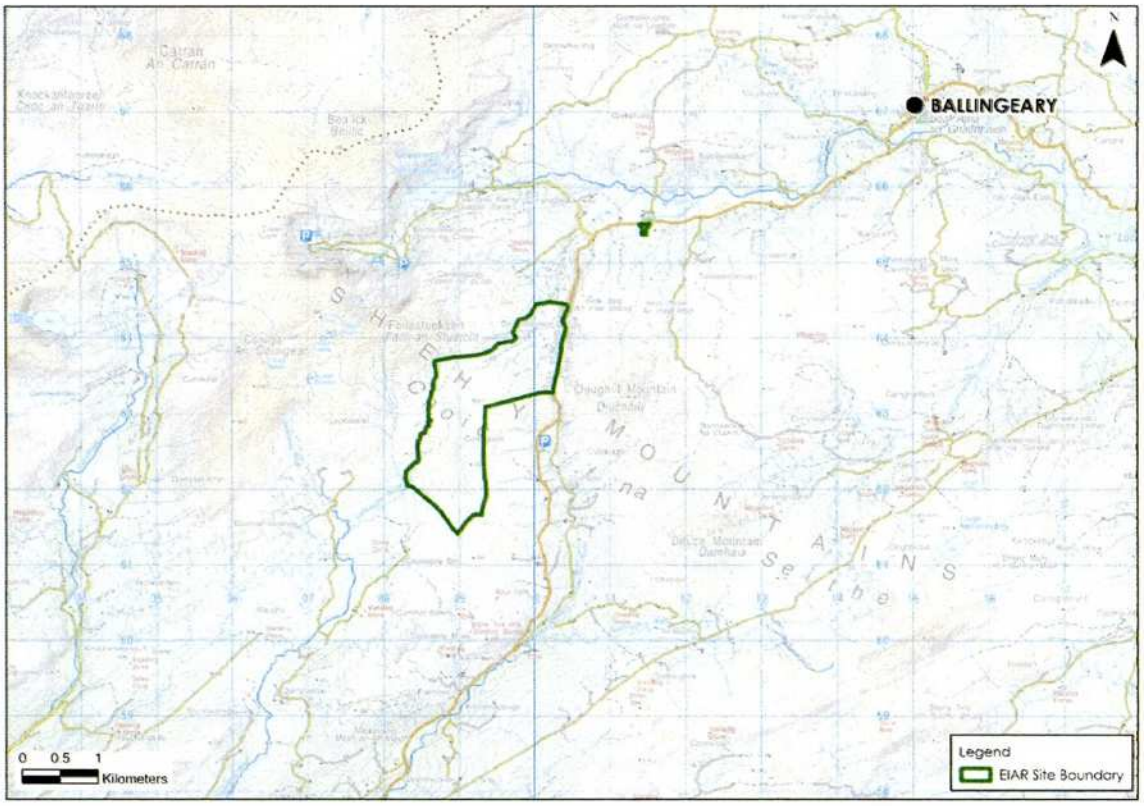

Figure A: Site Location Map

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3. EXISTING ENVIRONMENT AND CATCHMENT CHARACTERISTICS

3.1 INTRODUCTION

This section gives an overview of the hydrological and geological characteristics of the Site and the surrounding region.

3.2 HYDROLOGY

3.2.1 Regional and Local Hydrology

Regionally the southern section of the Site (including all proposed infrastructure apart from the site entrance road and turbine component turning area) is located in the Owvane River surface water catchment within the Coomhola_SC_010 sub-catchment.

The northern section of the Site (limited to the site entrance road and turbine component turning area) is located in the River Lee surface water catchment (Lee(Cork)_SC_010). All sub-catchments are located within Hydrometric Area 21 of the South Western River Basin District.

The Owvane River flows to the southeast of the Site and discharges into Bantry Bay approximately 11km to the southwest. The River Lee flows south-easterly towards Lough Allua approximately 0.4km to the north of the Site (at the proposed turbine component turning area location) and then on towards Cork Harbour. The part of the Site with the 3 no. turbines is located 1.5km to the south of the River Lee.

On a more local scale, the eastern half of the Site within the Owvane River surface water catchment drains directly into the Owvane River itself (Owvane(Cork)_010 sub-basin) which flows in a southerly direction immediately to the southeast of the Site (there is no Proposed Development infrastructure in the south-eastern section of the Site).

The western half of the Site within the Owvane River surface water catchment drains towards the Ownbeg River (Owvane_020) via several headwater streams that emerge within the Site itself. The Ownbeg (Owvane_010) is also referred to as the Lackavane River on Discovery Series OSI mapping.

The northern section of the Site (which is located in the River Lee surface water catchment) drains directly via a localised stream network into the River Lee upstream of Lough Allua (Lee(Cork_)010 sub-basin).

A local hydrology map is attached as **Figure** B.

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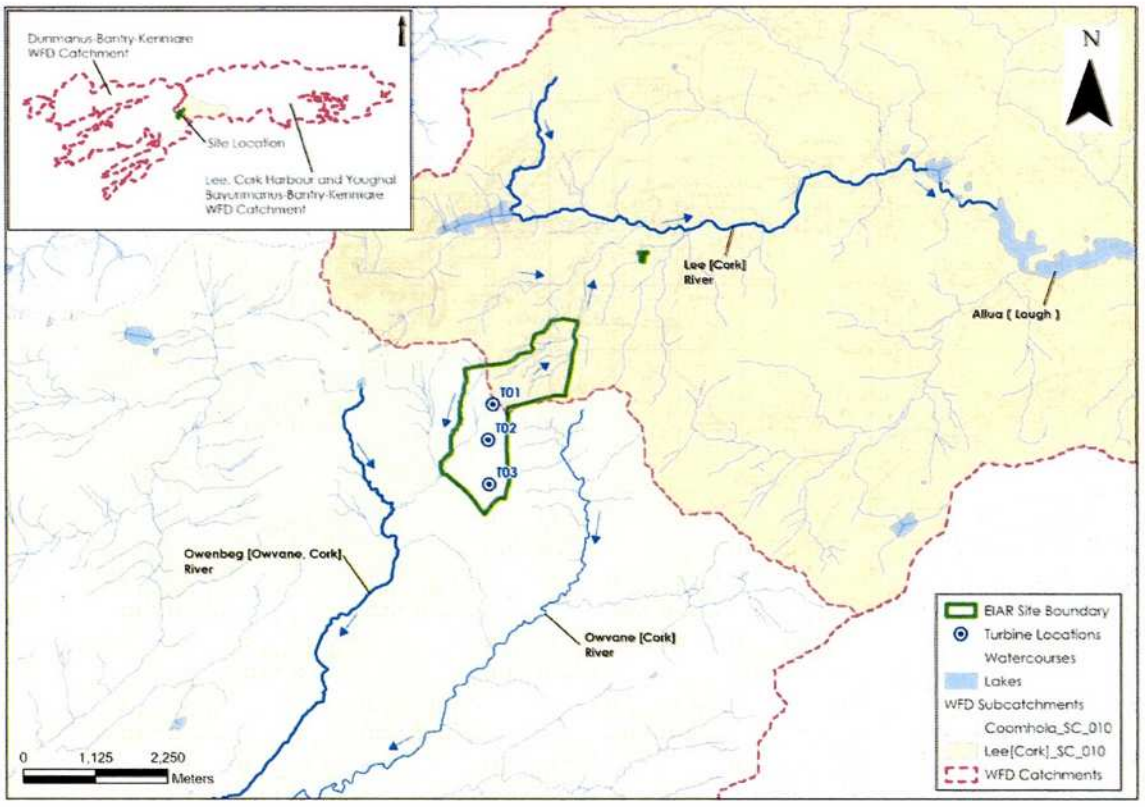

Figure B: Local Hydrology Map

3.2.2 Rainfall and Evaporation

Long term rainfall and evaporation data was sourced from Met Éireann. The 30-year annual average rainfall recorded at the Ballingeary (Tooreenaneen) rainfall station, located ~2.8km east of any permanent infrastructure are presented in **Table A**. This is the nearest and most appropriate station with respect topography and elevation.

Met Éireann also provide a grid of average annual rainfall for the entire country for the period of 1991 to 2020. Based on this more site-specific modelled rainfall values, the Average Annual Rainfall (AAR) at the Site ranges from 2,468 to 2,539mm/year with an overall average of 2,503mm/year. This is considered to be the most accurate estimate of average annual rainfall from the available sources.

Table A. Local Average long-term Rainfall Data (mm)

Station: Ballingeary			X Coord: 200,400		Y Coord: 216,000		Ht (mAOD): 37		Opened: 1928		Closed: NA	
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total
267	189	187	128	126	114	117	148	163	256	228	244	2,167

The closest synoptic[1] station where the average potential evapotranspiration (PE) is recorded is at Cork Airport, approximately 58km east of the Site. The long-term average PE for this station is 512mm/yr. This value is used as a best estimate of the site PE. Actual Evaporation (AE) at the site is estimated as 486mm/yr (which is 0.95 × PE).

[1] Meteorological station at which observations are made for synoptic meteorology and at the standard synoptic hours of 00:00, 06:00, 12:00, and 18:00.

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The effective rainfall (ER) represents the water available for runoff and groundwater recharge. The ER for the site is calculated as follows:

$$\text{Effective rainfall (ER)} = \text{AAR} - \text{AE}$$

$$= 2{,}503\text{mm/yr} - 486\text{mm/yr}$$

$$\text{ER} = 2{,}017\text{mm/yr}$$

In addition to average rainfall data, extreme value rainfall depths are available from Met Éireann. A summary of various return periods and duration of rainfall depths for the area of the Site are presented in **Table B**.

Table B. Curraglass – Return Period Rainfall Depths (mm)

	Return Period (Years)			
Storm Duration	**5**	**10**	**30**	**100**
5 mins	6.2	7.1	8.7	10.8
15 mins	8.7	11.7	14.3	17.6
30 mins	13.7	15.8	19.3	23.8
1 hour	18.5	21.3	26.0	32.0
6 hours	40.1	46.0	56.2	69.3
12 hours	54.0	62.0	75.7	93.4
24 hours	72.8	83.6	102.0	128.8
2 days	88.9*	100.8	120.7	145.9

3.3 GEOLOGY

The published soil maps (**www.gsi.ie**) for the local area shows that the majority of the Site is overlain by shallow, rocky, peaty/non-peatymineral complexes (Mainly acidic) (AminSRPT) and Blanket peat (BktPt) with small areas of Peaty poorly drained mineral (Mainly acidic) (AminPDPT), Deep well drained mineral (Mainly acidic) (AminDW) and Mineral poorly drained (Mainly acidic) (AminPD). The section of Site that covers the turbine component turning area for turbine delivery has soils mapped as alluvium and AminDW.

The published subsoil map (**www.gsi.ie**) for the local area shows that the majority of the Site is underlain by Bedrock outcrop or subcrop (Rck) with small areas of Blanket Peat (BktPt) and Till derived from Devonian sandstones (TDSs). The proposed turbine component turning area is mapped to be underlain by alluvium and sandstone tills.

A local subsoil map is shown as **Figure C.**

Based on the GSI Bedrock Geology 110k mapping (www.gsi.ie), the northern part of the Site is underlain by the Caha Mountain Formation described as Purple & green sandstone & siltstone.

The southern part is underlain by Gun Point Formation described as Green-grey sandstone & purple siltstone.

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The turbine component turning area is mapped to be underlain by the Slaheny Sandstone Formation which is described as Cross-bedded sandstone & siltstone.

The Caha Mountain Formation bedrock aquifer is described as a Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones (Pl) while the Gun Point Formation and Slaheny Sandstone Formation are described as Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones (Ll).

There are 2 no. faults mapped in the southern part of the Site that run from east to west and one fault mapped running from northeast to southwest. This GSI map the occurrence of several areas of bedrock outcrop in the Site. local bedrock geology map is shown as **Figure D**.

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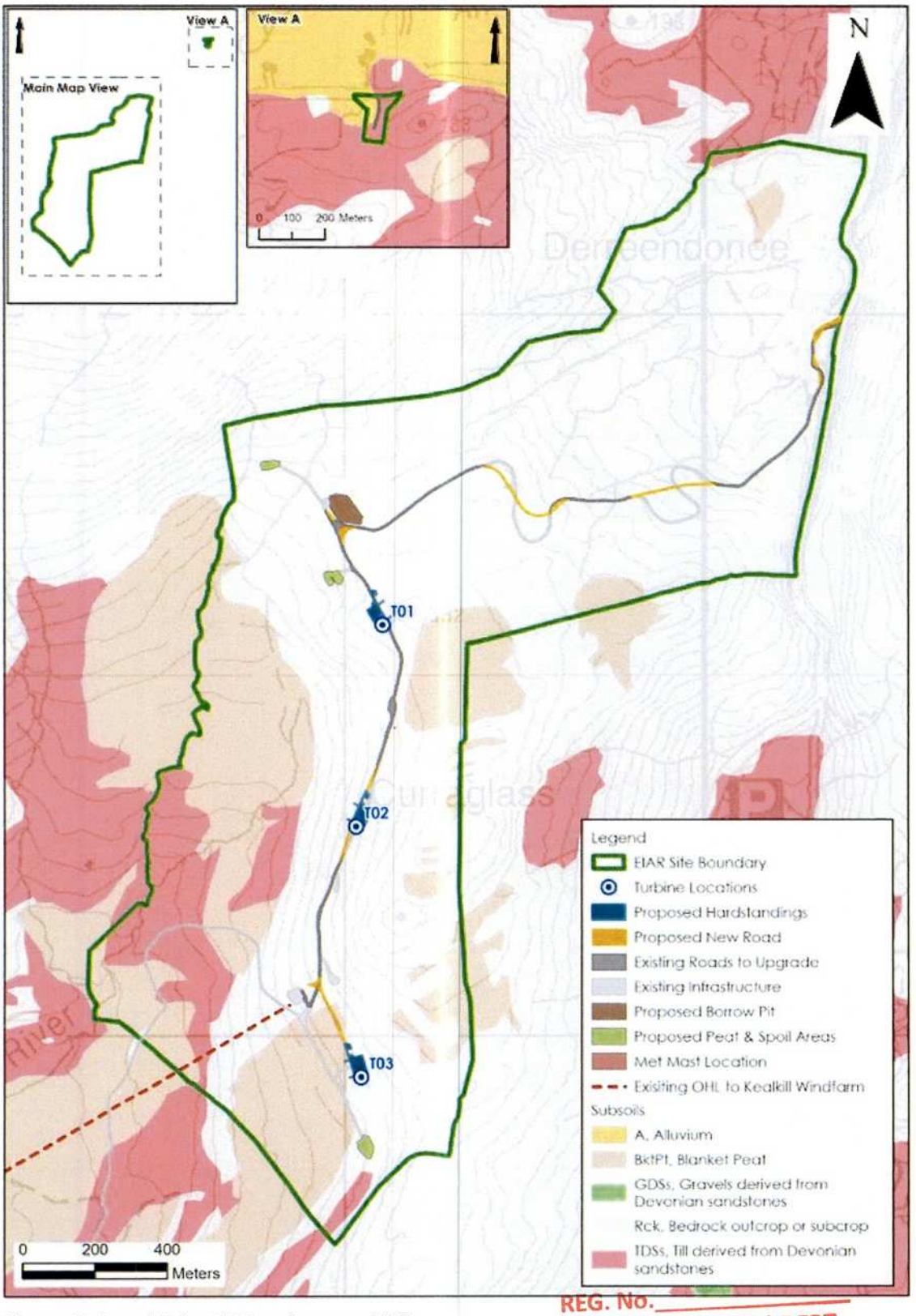

Figure C: Local Subsoil Map (www.gsi.ie)

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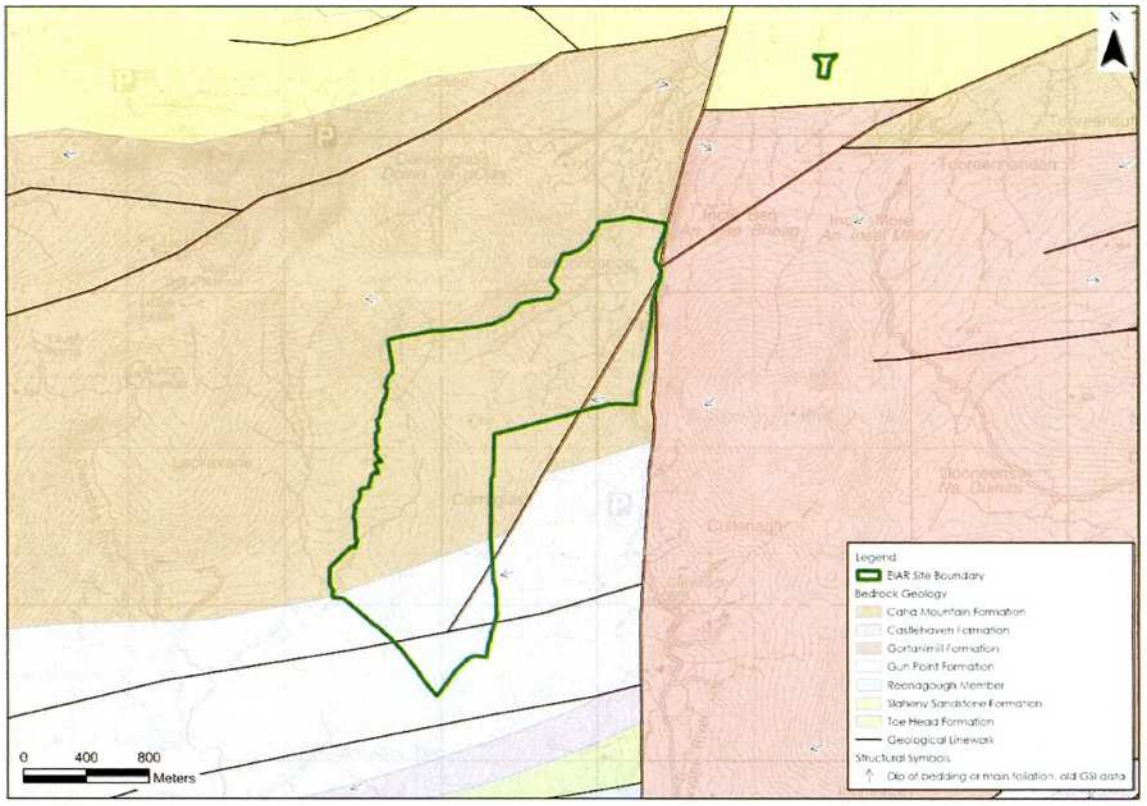

Figure D: Local Bedrock Geology Map (www.gsi.ie)

3.4 SITE DRAINAGE

3.4.1 Existing Site Drainage

The majority of the Site drains westerly to the Lackavane River (Ownbeg(Owvane_010) (including the majority of the Proposed Development infrastructure) which flows along the western boundary of the Site.

Several headwater streams rise along the western facing slopes of the Site and these streams flow south westerly towards the Lackavane River/Owvane_010. These streams intercept some of the existing forestry roads and Proposed Development access roads.

Several headwater streams of the Owvane River (Owvane_010) flow off the steep rocky eastern facing slopes of the Site. There is no Proposed Development infrastructure in the south-eastern section of the Site. A similar hydrology exists on the northern section of the Site, where several small headwater streams of the River Lee emerge (Lee(Cork)_010).

Within the Site there are also numerous manmade drains that are in place predominately to drain the forestry plantations. The current internal forestry drainage pattern is influenced by the topography, peat subsoils, layout of the forest plantation and by the existing road network.

The existing forest plantations are generally drained by a network of mound drains which typically run perpendicular to the topographic contours of the Site and feed into collector drains, which discharge to interceptor drains down-gradient of the plantation.

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3.5 DESIGNATED SITES & HABITATS

Within the Republic of Ireland designated sites include Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs), candidate Special Areas of Conservation (SAC) and Special Protection Areas (SPAs).

Designated sites within the same surface water catchments as the Site are listed below:

- Conigar Bog NHA (Site Code: 002386), is located approximately 0.8m to the west of the Site;
- Lough Allua pNHA (Site Code: 001065), is located approximately 4.2km to the northeast of the Site;
- Gouganebarra Lake pNHA (Site Code: 001057), is located approximately 2.2km to the north of the Site;
- Derryclogher (Knockboy) Bog SAC (Site Code: 001873), is located approximately 3.8km to the west of the; and,
- The Gearagh SAC (Site Code: 000108), is located approximately 19.5km to the northeast of the Site.

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4. SITE SPECIFIC FLOOD RISK ASSESSMENT

4.1 INTRODUCTION

The following flood risk assessment is carried out in accordance with '*The Planning System and Flood Risk Management Guidelines for Planning Authorities*' (DoEHLG, 2009). The basic objectives of these Guidelines are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface water run-off;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and,
- Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

4.2 FLOOD RISK ASSESSMENT PROCEDURE

This section of the report details the site-specific flood risk assessment carried out for the Site and surrounding area. The primary aim of the assessment is to consider all types of flood risks and the potential impact on the development. As per the relevant guidance (DOEHLG, 2009), the stages of a flood risk assessment are:

- *Flood risk identification* – identify whether there are surface water flooding issues at a site;
- *Initial flood risk assessment* - confirm sources of flooding that may affect a proposed development; and,
- *Detailed flood risk assessment – quantitative appraisal of potential risk to a proposed development*.

As per the Guidelines, there are essentially two major causes of flooding:

Coastal flooding which is caused by higher sea levels than normal, largely as a result of storm surges, resulting in the sea overflowing onto the land. Coastal flooding is influenced by the following three factors, which often work in combination:

- High tide level;
- Storm surges caused by low barometric pressure exacerbated by high winds (the highest surges can develop from hurricanes); and,
- Wave action, which is dependent on wind speed and direction, local topography and exposure.

Due to its inland location, coastal flooding is not applicable to the Site.

Inland flooding which is caused by prolonged and/or intense rainfall. Inland flooding can include a number of different types:

- Overland flow occurs when the amount of rainfall exceeds the infiltration capacity of the ground to absorb it. This excess water flows overland, ponding in natural hollows and low-lying areas or behind obstructions. This occurs as a rapid response to intense rainfall and eventually enters a piped or natural drainage system.

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- River flooding occurs when the capacity of a watercourse is exceeded or the channel is blocked or restricted, and excess water spills out from the channel onto adjacent low-lying areas (the floodplain). This can occur rapidly in short steep rivers or after some time and some distance from where the rain fell in rivers with a gentler gradient.

- Flooding from artificial drainage systems results when flow entering a system, such as an urban storm water drainage system, exceeds its discharge capacity and the system becomes blocked, and / or cannot discharge due to a high water level in the receiving watercourse. This mostly occurs as a rapid response to intense rainfall. Together with overland flow, it is often known as pluvial flooding. Flooding arising from a lack of capacity in the urban drainage network has become an important source of flood risk, as evidenced during recent summers.

- Groundwater flooding occurs when the level of water stored in the ground rises as a result of prolonged rainfall to meet the ground surface and flows out over it, i.e. when the capacity of this underground reservoir is exceeded. Groundwater flooding tends to be very local and results from interactions of site-specific factors such as tidal variations. While water level may rise slowly, it may be in place for extended periods of time. Hence, such flooding may often result in significant damage to property rather than be a potential risk to life.

- Estuarial flooding may occur due to a combination of tidal and fluvial flows, i.e. interaction between rivers and the sea, with tidal levels being dominant in most cases. A combination of high flow in rivers and a high tide will prevent water flowing out to sea tending to increase water levels inland, which may flood over river banks.

The Flood Risk Management Guidelines provide direction on flood risk and development. The Guidelines recommend a precautionary approach when considering flood risk management and the core principle of the Guidelines is to adopt a risk based sequential approach to managing flood risk and to avoid development in areas that are at risk. The sequential approach is based on the identification of flood zones for inland and coastal flooding.

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning.

There are three types or levels of flood zones defined within the Guidelines:

Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);

Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and,

Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

Once a flood zone has been identified for a site, the Guidelines set out the different types of development appropriate to each identified zone (pg. 25, Table 3.1 of the Guidelines). Exceptions to the restriction of development due to potential flood risks are provided for through the application of a Justification Test, where the planning need and the sustainable management of flood risk to an acceptable level must be demonstrated by the applicant.

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The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of particular developments that, for the reasons outlined above, are being considered in areas of moderate or high flood risk. The test is comprised of two processes.

- The first is the **Plan-making Justification Test** described in chapter 4 of the Guidelines and used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding. Plan making Justification Tests are made at Plan/Policy development stage such as County Development Plans, or Local Area Plans.

- The second is the **Development Management Justification Test** described in chapter 5 of the Guidelines and used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land. For example, application of Development Management Justification Test would be required at a site specific level, such as for this FRA assessment, if a Justification Test is required.

4.3 FLOOD RISK IDENTIFICATION

4.3.1 Historical Mapping

To identify any areas as being at risk of flooding, historical mapping (*i.e.* 6" and 25" base maps) were consulted. There is no identifiable map text within the Site that are mapped as 'liable to flood'.

4.3.2 Soils Maps - Fluvial Maps

A review of the soil types in the vicinity of the Site was undertaken as soils can be a good indicator of past flooding in an area. Due to past flooding of rivers, deposits of transported silts/clays referred to as alluvium build up within the flood plain and hence the presence of these soils is a good indicator of potentially flood prone areas.

Based on the EPA/GSI soil map for the local area, no fluvial or lacustrine deposits are mapped within the Site.

4.3.3 OPW Past Flood Event Mapping

To identify those areas as being at risk of flooding, OPW's Past Flood Event mapping (www.floodinfo.ie) were consulted.

No past flood incidents are recorded within the Site. The closest past flood event downstream of the Site is mapped ~3.8km northeast at Upper Lee Flood – Ballingeary (Flood ID: 11540) on 3rd November 2011.

There are past flood events mapped further downstream of the Site along the Lee (Cork) river in Ballingeary dated 07th January 2005 (Flood ID: 11543), 19th November 2009 (Flood ID: 10760), 15th January 2011 (Flood ID: 11301), 11th September 2015 (Flood ID: 11177), 04th December 2015 (Flood ID: 13330) and 29th December 2015 (Flood ID: 13472).

Past events and recurring flood events in the vicinity and downstream of the Site are shown on Figure E below.

No areas within the Site are mapped as an OPW Drainage District (i.e. an area where drainage schemes to improve land for agricultural purpose) or as Benefiting Lands (i.e. land identified by the OPW as potentially benefitting from the implementation of Arterial (Major) Drainage Schemes and an indicator of land subject to flooding and poor drainage).

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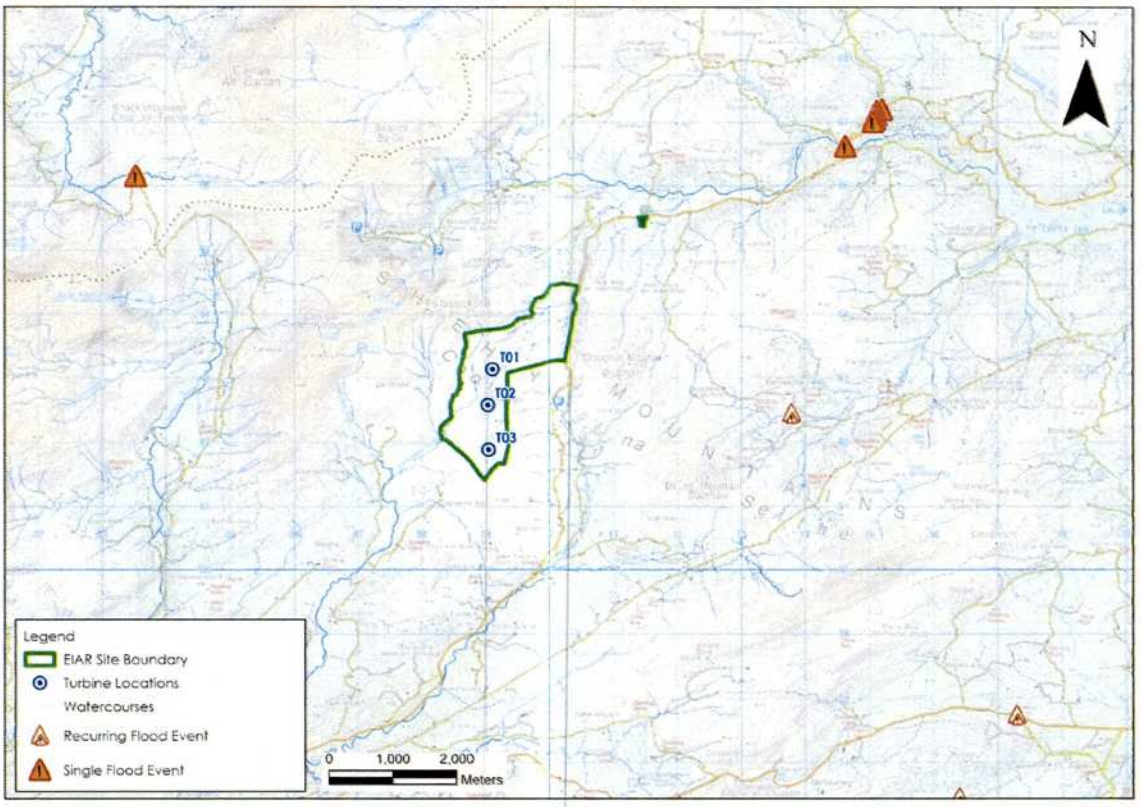

Figure E: OPW Past Flood Event Map

4.3.4 GSI Winter (2015/2016) Surface Water Flood Mapping

The GSI Winter (2015/2016) Surface Water Flooding Map[2] shows areas of fluvial and pluvial flood extents during the Winter 2015/2016 flood event, which was the largest recorded flood event in many areas.

The GSI Winter (2015/2016) Surface Water Flooding Maps do not shown any flood zones within the Site.

4.3.5 CFRAM Mapping – Fluvial and Pluvial Flooding

Catchment Flood Risk Assessment and Management (CFRAM)[3] OPW Flood Risk Assessment Maps are now the primary reference for flood risk planning in Ireland.

CFRAM mapping has not been completed for the area of the Site. The closest CFRAM mapping to the Site has been completed along the Lee(cork) River), which is located ~4.8km northeast of the Site.

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[2] GSI *Historical flood mapping principally developed using Sentinel-1 Satellite Imagery from the European Space Agency Copernicus Programme as well as any available historic records (from winter 2015/2016 or otherwise)*

[3] *CFRAM is Catchment Flood Risk Assessment and Management. The national CFRAM programme commenced in Ireland in 2011 and is managed by the OPW. The CFRAM Programme is central to the medium to long-term strategy for the reduction and management of flood risk in Ireland.*

4.3.6 National Indicative Fluvial Flood Mapping

National Indicative Fluvial Mapping (www.floodinfo.ie) shows probabilistic fluvial flood zones for catchments greater than 5km² for which flood maps were not produced under the CFRAM Programme.

The Present-Day Scenario has been generated using modelling methodologies based on historic flood data and does not consider the potential changes due to climate change. The potential effects of climate change on flooding have been separately modelled (see **Section 4.3.9** below.)

For the Present-Day Scenario, no medium (1 in 100) or low probability (1 in 1,000) fluvial flood zones have been mapped to encroach upon the Site. The Site is located entirely within Fluvial Flood Zone C as a consequence.

The closest NIFM Fluvial flood zone is mapped ~350m southwest and downstream of the Site along the River Owenbeg (Owvane)_010.

A map showing the National Indicative Fluvial Mapping for the present-day scenario is included as **Figure F** below.

Based on the combined CFRAM and NIFM fluvial flood zones, the Site is located in Fluvial Flood Zone C, where the probability of fluvial flooding is low (less than 0.1%).

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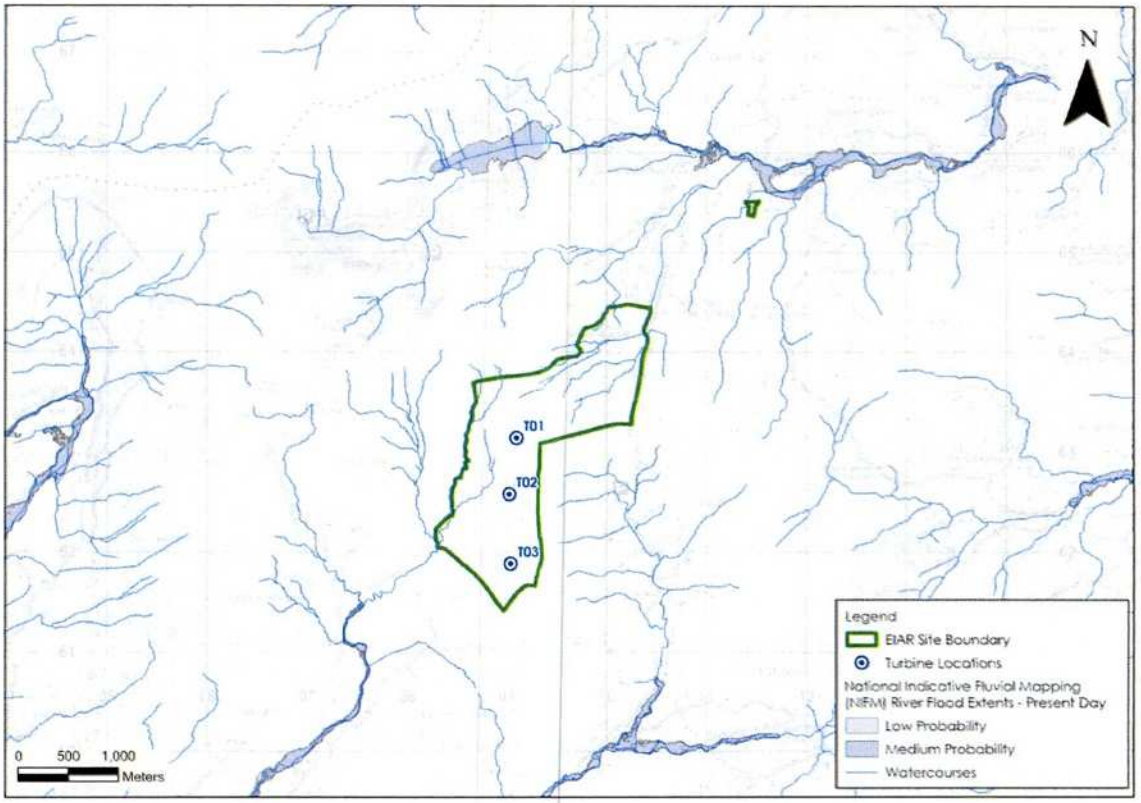

Figure F: OPW National Indicative Flood Mapping

4.3.7 Groundwater Flooding

The GSI Historical Groundwater flood map and the modelled groundwater flood extents map (www.floodinfo.ie) do not show the occurrence of any groundwater flooding within the Site or in its close vicinity.

4.3.8 Coastal Flooding

The Site is located at elevations of ~111-347m OD and is ~11km from the coast. Therefore, the Site is not at risk of coastal (tidal) flooding.

4.3.9 Climate Change

Fluvial flood modelling has also been completed to consider future climate scenarios where the potential effects of climate change can increase rainfall.

The National Indicative Fluvial Flood Mapping Mid-Range Future Scenario models flood extents based on a 20% increase in rainfall. Similarly, the National Indicative Fluvial Flood Mapping High-End Future Scenario models flood extends based on a 30% increase in rainfall. Both of these modelled flood extents show similar flood zones to the Present Day Scenario discussed above in **Section 4.3.6.**

Therefore, flood zones nearest to the Site are unlikely to be significantly impacted by future climate change.

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The CFRAM flood mapping has also been completed for the Mid-Range and High-End Future Scenarios. Both of these modelled flood extents show similar flood zones to the Present Day Scenario discussed above in **Section 4.3.5**.

Therefore, flood zones nearest to the Site are unlikely to be significantly impacted by future climate change.

4.3.10 Summary – Flood Risk Identification

Based on the information gained through the flood identification process it is apparent that the Site is located in Fluvial Flood Zone C, where the probability of flooding is low.

4.4 SUMMARY – INITIAL FLOOD RISK ASSESSMENT

Based on the information gained through the flood identification process and Initial Flood Risk Assessment process it would appear that flooding is unlikely to be a high risk at the Site or downstream. The potential sources of flood risk for the Site are outlined and assessed in **Table C**.

Table C. S-P-R Assessment of Flood Sources for the Site.

Source	Pathway	Receptor	Comment
Fluvial	Overbank flooding of the rivers and streams that are close to some of the wind farm infrastructures and the rivers and streams that flow throughout the Site	Land & infrastructure	The Site is located in Fluvial Flood Zone C.
Pluvial	Ponding of rainwater on Site	Land & infrastructure	There is very little risk of pluvial flooding within the Site as drainage moves relatively freely due to the sloping topography of the Site. CFRAM have no pluvial flood areas mapped at the Site.
Surface water	Surface ponding/ Overflow	Land & infrastructure	Same as above (pluvial).
Groundwater	Rising groundwater levels	Land & infrastructure	Based on local hydrogeological regime and GSI mapping, there is no risk of groundwater flooding at the Site.
Coastal/tidal	Overbank flooding	Land, People, property	The Site is located ~11km inland from the sea. So, no coastal flooding will be possible.

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4.5 REQUIREMENT FOR A JUSTIFICATION TEST

The matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test[4] is shown in **Table D** below.

It may be considered that the Proposed Development can be categorised as "Highly Vulnerable Development". However, as stated above, the Site is located in Flood Zone C (Low Risk) where the probability of flooding is low.

Table D: Matric of Vulnerability versus Flood Zone

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification test	Justification test	**Appropriate**
Less vulnerable development	Justification test	Appropriate	Appropriate
Water Compatible development	Appropriate	Appropriate	Appropriate

Note: *Taken from Table 3.2 (DoEHLG, 2009)*
Bold: *Applies to this project.*

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[4] *A 'Justification Test' is an assessment process designed to rigorously assess the appropriateness, or otherwise, of particular developments that are being considered in areas of moderate or high flood risk, (DoEHLG, 2009).*

5. PLANNING POLICY

5.1 PLANNING POLICY & COUNTY DEVELOPMENT PLAN

The following policies (**Table E**) are defined in the Cork County Council CDP 2022-2028 in respect of flooding, and we have outlined in the column to the right how these policies are provided for within the Proposed Development design.

Table E: Cork County Council Planning Policy/Objective and Responses

No.	Policy	Development Design Response
WM 11-13 (a)	Protect the County's floodplains, wetlands and coastal areas subject to flooding as vital green infrastructure which provides space for storage and conveyance of floodwater, enabling flood risk to be more effectively managed and reducing the need to provide flood defences in the future.	No such areas identified at the Site.
WM 11-14 (a)	Support the implementation of: • the EU Flood Risk Directive (20010/60/EC) on the assessment and management of flood risks, • the Flood Risk Regulations (SI No 122 of 2010) • the Guidelines on 'The Planning System and Flood Risk Management' (2009) and the recommendations of the South Western CFRAM study.	As Outlined in this FRA
WM 11-15	To require flood risk assessments to be undertaken for all new developments within the County in accordance with The Planning System and Flood Risk Management – Guidelines for Planning Authorities (2009) and the requirements of DECLG Circular P12/2014 and the EU Floods Directive.	As Outlined in this FRA
WM 11-16	Take the following approach in order to reduce the risk of new development being affected by possible future flooding: • Avoid development in areas at risk of flooding; and • Apply the sequential approach to flood risk management based on avoidance, substitution, justification and mitigation of risk. • Where development in floodplains cannot be avoided, applications for development must meet the definition of Minor Development or have passed the Justification Test for Development Plans in the updated SFRA and can pass the Justification Test for Development Management to the satisfaction of the planning authority. • Consider the impacts of climate change on the development. In areas where the Justification Test for Development Plans has not been applied, or has been failed, the sequential approach should be applied as follows: • In areas where there is a high probability of flooding - 'Flood Zone A' - avoid highly and less vulnerable development as described in Section 3 of 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities' issued in November 2009 by DoEHLG. • In areas where there is a moderate probability of flooding - 'Flood Zone B' - avoid 'highly	As Outlined in this FRA

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	vulnerable development' described in section 3 of 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities' issued in November 2009 by DoEHLG. In areas where there is low probability of flooding – 'Flood Zone C' all uses may be considered subject to a full consideration of all flood risks.	
WM 11-17 (2)	The proposal has been subject to an appropriate flood risk assessment that demonstrates: a) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk; b) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible; c) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.	As Outlined in this FRA

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6. REPORT CONCLUSIONS

- A flood risk identification study was undertaken to identify existing potential flood risk associated with the Proposed Development. From this study:
  - No instances of past flooding were identified in historic OS maps for the Site;
  - No instances of past flood events were identified on OPW maps within the Site;
  - The GSI Winter 2015/2016 Surface Water Flood mapping does not record any surface water flooding within the Site;
  - The GSI Groundwater flood mapping does not record any historic or modelled groundwater flood zones within the Site.
  - No CFRAM or NIFM Fluvial Flood Zones are mapped within the Site.
  - No surface water ponding or pluvial flooding issues have been identified.
- The Site is therefore located in Fluvial Flood Zone C with no areas mapped in fluvial flood zones (Flood Zones A and B); and,
- The Proposed Development is therefore appropriate and in accordance with DoEHLG (2009) guidance.

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7. REFERENCES

DOEHLG	2009	The Planning System and Flood Risk Management.
Natural Environment Research Council	1975	Flood Studies Report (& maps).
Cunnane & Lynn	1975	Flood Estimated Following the Flood Studies Report
CIRIA	2004	Development and Flood Risk – Guidance for the Construction Industry.
OPW	Not Dated	Construction, Replacement or Alteration of Bridges and Culverts. A Guide to Applying for Consent under Section 50 of the Arterial Act, 1945.
Institute of Hydrology	1994	Flood Estimation in Small Catchments (IH 124).
Fitzgerald & Forrestal	1996	Month and Annual Averages of Rainfall for Ireland 1961 – 1990.
Met Eireann	1996	Monthly and Annual Averages of Rainfall for Ireland 1961-1990.
Cork County Council	2022	County Cork Development Plan 2022-2028

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