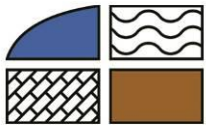


Borrisbeg Grid Connection

Appendix 8-1 Flood Risk Assessment

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Borrisbeg Grid
Connection
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30.09.2025



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Appendix 8-1: FLOOD RISK ASSESSMENT

FINAL REPORT

Prepared for:

Tetra Tech RPS

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

DOCUMENT INFORMATION

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Disclaimer: <i>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.</i>	

TABLE OF CONTENTS

1. INTRODUCTION	4
1.1 BACKGROUND	4
1.2 STATEMENT OF AUTHORITY	4
1.3 REPORT LAYOUT	5
2. BACKGROUND INFORMATION	6
2.1 INTRODUCTION	6
2.2 SITE LOCATION AND TOPOGRAPHY	6
2.3 PROPOSED GRID CONNECTION DETAILS	6
3. EXISTING ENVIRONMENT AND CATCHMENT CHARACTERISTICS	8
3.1 INTRODUCTION	8
3.2 HYDROLOGY	8
3.2.1 Regional and Local Hydrology	8
3.2.2 Rainfall and Evaporation	9
3.3 GEOLOGY	10
3.4 DESIGNATED SITES & HABITATS	10
4. SITE SPECIFIC FLOOD RISK ASSESSMENT	12
4.1 INTRODUCTION	12
4.2 FLOOD RISK ASSESSMENT PROCEDURE	12
4.3 FLOOD RISK IDENTIFICATION	14
4.3.1 Historical Mapping	14
4.3.2 Soils Maps - Fluvial Maps	14
4.3.3 OPW Past Flood Events Map	14
4.3.4 GSI Winter 2015/2016 Surface Water Flood Mapping	16
4.3.5 CFRAM Flood Extent Mapping	16
4.3.6 National Indicative Fluvial Flood Mapping	17
4.3.7 Groundwater Flooding	18
4.3.8 Coastal Flooding	18
4.3.9 Climate Change	18
4.3.10 Summary – Flood Risk Identification	19
4.4 INITIAL FLOOD RISK ASSESSMENT	19
4.4.1 Site Survey and Drainage	19
4.4.2 Stage 3 Flood Modelling	20
4.4.3 Hydrological Flood Conceptual Model	21
4.4.4 Summary – Initial Flood Risk Assessment	21
5. JUSTIFICATION TEST	22
5.1 REQUIREMENT FOR A JUSTIFICATION TEST	22
5.2 DETAILED FLOOD RISK ASSESSMENT	22
5.2.1 Crossing over the Clonmore Stream and Strogue Stream	23
5.2.2 Proposed End Masts and Proposed New Access Roads	23
5.3 JUSTIFICATION TEST	23
6. REPORT CONCLUSIONS	25
7. REFERENCES	26

FIGURES IN TEXT

Figure A: Site Location Map	7
Figure B: Local Hydrology Map	9
Figure C: OPW Past Flood Events Map	15
Figure D: GSI 2015/2016 Surface Water Flood Mapping	16
Figure E: OPW National Indicative Flood Mapping at the Site	18
Figure F: Modelled Flood Zones (Fluvio R&D Ltd, 2023)	20

TABLES IN TEXT

Table A: Briskalagh – Return Period Rainfall Depths (mm)	10
Table B: Surface Water Flow Monitoring	19
Table C: S-P-R Assessment of Flood Sources	21
Table D: Matrix of Vulnerability versus Flood Zone	22
Table E: Format of Justification Test for Development Management	23

1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) was engaged by Tetra Tech RPS to undertake a site-specific Flood Risk Assessment (FRA) for the Proposed Grid Connection. The Proposed Grid Connection will connect the Consented Wind Farm to the national grid via a loop in - loop out connection to the existing overhead Ikerrin to Thurles 110kV line.

This FRA is written to accompany Chapter 8 of the Environmental Impact Assessment Report (EIAR) for the Proposed Grid Connection. The Proposed Grid Connection is described in full in Chapter 3 of the EIAR.

The following assessment is carried out in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' (DoEHLG, 2009). This FRA has also been completed in accordance with the drainage and flood risk management objectives (Objectives 8-J) and policies (Policy 11-9 to 11-11) detailed in the Tipperary County Development Plan (2022-2028).

1.2 STATEMENT OF AUTHORITY

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.

This FRA has been completed by Michael Gill, David Broderick and Conor McGettigan.

Michael Gill P.Geo (BA, BAI, Dip Geol., MSc, MIEI) is a Civil/Environmental Engineer and Hydrogeologist with over 24 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms and renewable projects in Ireland. In addition, he has substantial experience in geological characterisation, peatland morphology, and surface water drainage design and SUDs design and surface water/groundwater interactions. Michael has worked on the EIS/EIAR for Oweninny WF, Cloncreen WF, Derrinlough WF and over 100 other wind farm related projects across the country.

David Broderick (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.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with over 5 years' experience in the environmental sector in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin. Conor routinely prepares the hydrology and hydrogeology chapters of environmental impact assessment reports for wind farm developments. Conor also routinely prepares flood risk assessments and Water Framework Directive compliance assessments for various renewable energy developments in Ireland.

1.3 REPORT LAYOUT

This FRA report has the following format:

- Section 2 describes the site setting and details of the Proposed Grid Connection;
- Section 3 outlines the hydrological and geological characteristics of the receiving environment;
- Section 4 presents our initial flood risk identification undertaken for the Proposed Grid Connection based on desk studies, walkover surveys and previous flood modelling undertaken for the Consented Wind Farm;
- Section 5 presents a Justification Test for the Proposed Grid Connection;
- Section 6 outlines the drainage design for the Proposed Grid Connection in terms of flood prevention,
- Section 7 presents the FRA report conclusions.

2. BACKGROUND INFORMATION

2.1 INTRODUCTION

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

2.2 SITE LOCATION AND TOPOGRAPHY

The Site is located in the townlands of Clonmore and Strogue approximately 3.8km northeast of the town of Templemore, Co. Tipperary. The proposed 110kV Substation, wind farm control buildings, and associated temporary construction compound are in agricultural pastures in the townland of Clonmore, to the southeast of the Consented Wind Farm.

The underground cabling route is located in the townlands of Clonmore and Strogue and measures approximately 2.1km (900m within the road network and 1.2km within agricultural fields). From the proposed 110kV substation, the underground cabling route travels to the east through agricultural fields for 120m. The Proposed Grid Connection underground cabling route then travels along the local road network (L7039, R433 and L7038) for approximately 900m. The remainder of the Proposed Grid Connection underground cabling route (~1.2km) is located off of the existing road network and is proposed within new access tracks through agricultural grassland to the north of the Cork – Dublin Railway line or beneath the proposed temporary construction compound. The proposed 2 no. end masts are located in grasslands underneath the Ikerrin to Thurles 110kV overhead line. The Site has a total area of 47.5 hectares (ha).

Topography at the Site is relatively flat, ranging from 108 to 111mOD (metres above Ordnance Datum). Topography falls very gently to the southwest.

A site location map is shown as **Figure A**.

2.3 PROPOSED GRID CONNECTION DETAILS

The Proposed Grid Connection comprises a proposed 110kV onsite substation, approx. 2.1km of 110kV underground cabling, c.1.2km of new access track and 2 no. end masts, 1 no. watercourse crossings on the Clonmore Stream (existing bridge on L-7039) and 1 no. proposed new crossing on the Strogue Stream.

The Proposed Grid Connection is described in full in Chapter 3 of the EIAR.

Horizontal Directional drilling will be used to cross the existing bridge on the L-7039 road while a new clear span bridge will be constructed at the proposed new crossing on the Strogue Stream.

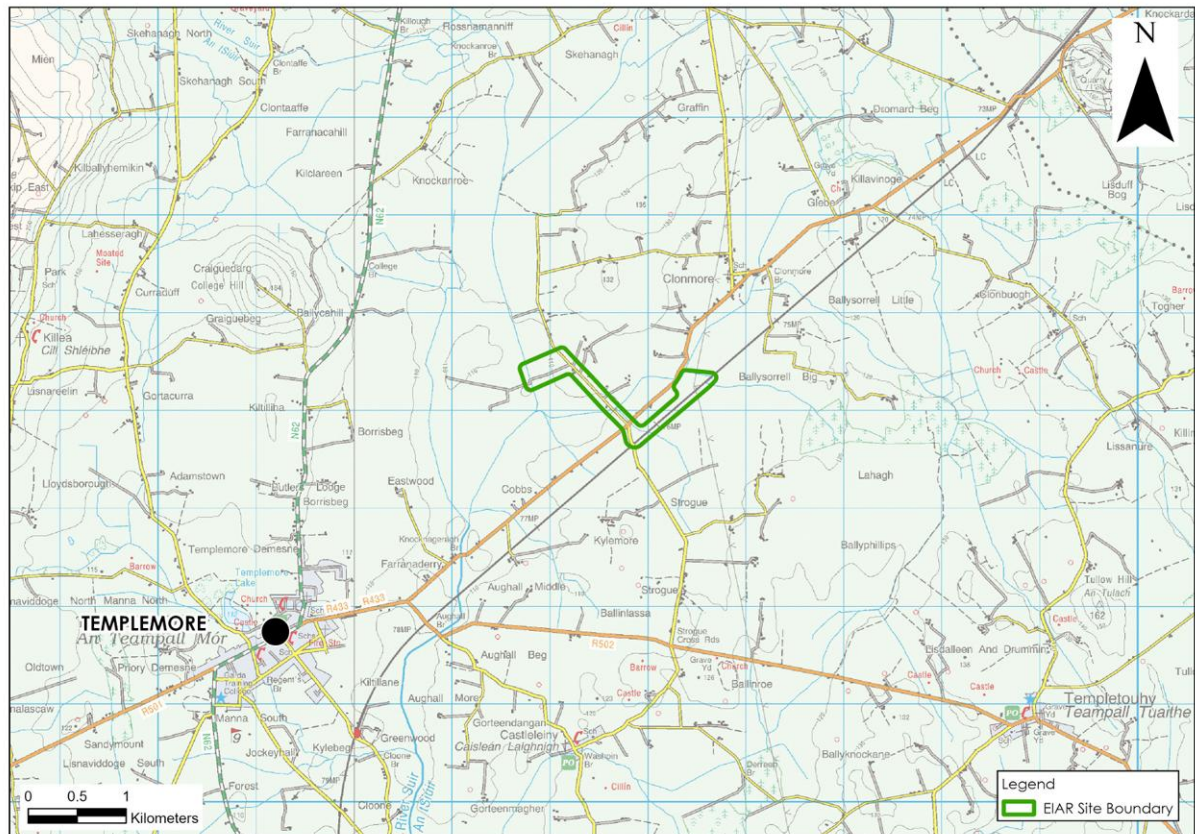


Figure A: Site Location Map

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 area.

3.2 HYDROLOGY

3.2.1 Regional and Local Hydrology

Regionally the Site is located in the River Suir regional surface water catchment within Hydrometric Area 16 of the South Eastern River Basin District. More locally the Site is located in the Suir_SC_010 sub-catchment and 2 no. WFD river sub-basins. The north of the Site, including the proposed 110kV substation, the temporary construction compound, 80m of new access track and approximately 800m of the underground cabling route are mapped in the Suir_020 WFD river sub-basin. Meanwhile, approximately 1.1km of new access track, the 2 no. end masts and approximately 1.3km of the underground cabling route are mapped in the Clonmore Stream (Suir)_010 WFD river sub-basin.

Within the Clonmore Stream (Suir)_010 WFD river sub-basin, a small 1st order stream flows to the northwest, approximately 60m from the northern proposed end mast. This stream is locally unnamed but is referred to as the Lahagh Stream (EPA Code: 16L41) on the EPA blueline database. This stream flows to the northwest before it discharges into the Clonmore Stream (EPA Code: 16C11) which flows to the west. The underground cabling route crosses the Clonmore Stream at an existing bridge located along the L-7039. A new watercourse crossing, over a tributary of the Clonmore Stream, is also proposed along the underground cabling route where the route is proposed to pass through agricultural pastures to the north of the Dublin-Cork Railway Line. Here it is proposed to construct a new access track over a small 1st order stream, referred to by the EPA as the Strogue Stream (EPA Code: 16S60).

Within the Suir_020 WFD river sub-basin, the River Suir flows to the south approximately 150m west of the proposed 110kV substation. The Clonmore Stream discharges into the River Suir downstream of the Site, before the River Suir continues to flow to the south, past Templemore.

A local hydrology map is shown as **Figure B** below.

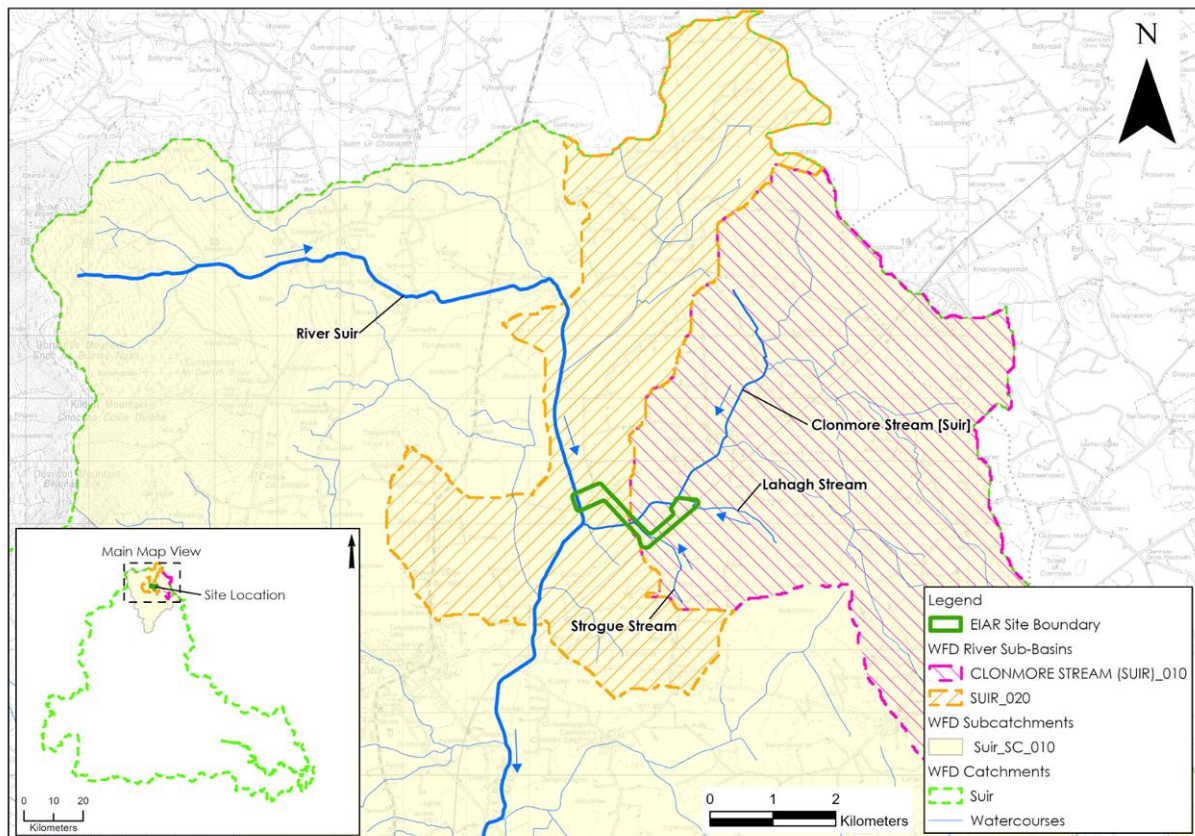


Figure B: Local Hydrology Map

3.2.2 Rainfall and Evaporation

Long term rainfall and evaporation data were sourced from Met Éireann. The 30-year Annual Average rainfall (AAR) (1981-2010) recorded at Templehouhy (Bord na Mona) station, located approximately 6km southwest of the Site is 876mm/year.

Met Éireann also provide a grid of modelled AAR for the entire country for the period of 1991 to 2020. The data for the Site, assigned to location E215000, N174000, and the AAR at the Site is modelled to be 1,049mm/yr. This is considered to be the most accurate estimate of AAR from the available sources.

The average Potential Evapotranspiration (PE) at Kilkenny, approximately 40km to the southeast of the Site, is taken to be 459mm (www.met.ie). The Actual Evapotranspiration (AE) is calculated to be 436mm (95% PE). Using the above figures, the Effective Rainfall (ER)¹ for the area is calculated to be $(ER = AAR - AE) \sim 613\text{mm/yr}$.

In addition to average rainfall data, extreme value rainfall depths are available from Met Éireann. **Table A** below presents return period rainfall depths for the area of the Site. These data are taken from <https://www.met.ie/climate/services/rainfall-return-periods> and they provide rainfall depths for various storm durations and sample return periods (1-year, 5-year, 30-year, 100-year).

¹ ER – Effective Rainfall is the excess rainfall after evaporation which produces overland flow and recharge to groundwater.

Table A: Return Period Rainfall Depths (mm)

Duration	Return Period (Years)			
	1	5	30	100
5 mins	3.7	5	9.2	12.2
15 mins	6.0	9.4	15.0	20.0
30 mins	7.8	12.2	18.8	24.7
1 hours	10.2	15.4	23.5	30.5
6 hours	20.3	29.0	41.9	52.6
12 hours	26.5	37.1	52.4	64.9
24 hours	34.6	47.4	65.5	80.1
2 days	42.6	56.6	75.8	90.9

3.3 GEOLOGY

The published EPA soil map (www.epa.ie) for the area shows that the Site is overlain predominantly by mainly basic poorly drained mineral soils (BminPD). The EPA also map some mineral alluvium soils along the underground cabling route, associated with the Clonmore Stream. Soils in the surrounding lands are mapped typically as BminPD soils, with some peat and basic well drained mineral soils (BminDW) mapped in the wider area.

The published GSI subsoils map (www.gsi.ie) for the local area shows that the Site is underlain predominantly by till derived from Carboniferous limestones (TLs). Some alluvium subsoils are also mapped along the underground cabling route, associated with the Clonmore Stream. Subsoils in the surrounding lands are mapped largely as TLs subsoils, with some cutover peat (Cut) mapped in the wider area. No peat subsoils are mapped to overlap with any element of the Proposed Grid Connection.

Soils and subsoils at the Site have been verified through the use of intrusive site investigations comprising of soil probes at targeted locations and the excavation of a trial pit at the proposed 110kV substation location.

Based on the GSI bedrock mapping (www.gsi.ie), the majority of the Site, including the proposed 110kV Substation, control buildings, temporary construction compound, end masts and the north and west of the underground cabling route, is underlain by the Ballysteen Formation. The Ballysteen Formation is described as comprising of dark muddy limestone and shale. Meanwhile, approximately 920m of the underground cabling route is mapped to be underlain by the Lisduff Oolite Member. The Lisduff Oolite Member is comprised of oolitic limestone.

The GSI do not map the presence of any bedrock outcrop within the vicinity of the Site. Similarly, there are no mapped karst features in the area of the Site. The closest mapped karst feature is a cavity which was identified in a borehole to the south of Templemore. This mapped karst feature is located approximately 3.7km to the northeast of the Site.

3.4 DESIGNATED SITES & HABITATS

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

The Site is not located within any designated conservation site. However, there are downstream hydrological connections to several designated sites as described below:

- The Lower River Suir SAC (Site Code: 002137) is located ~18km south and downstream of the Proposed Grid Connection along the River Suir. The length of the hydrological flowpath between the Site and this SAC is approximately 24.5km.
- The Cabragh Wetlands pNHA (Site Code: 001934) is located ~18.5km to the south and downstream of the Proposed Grid Connection along the River Suir. The length of the hydrological flowpath between the Site and this pNHA is approximately 25.3km.

Other designated sites within close proximity to the Site include:

- Templemore Wood pNHA (Site Code: 000942) which is located directly north of Templemore town, approximately 3.9km southwest of the Site.
- The Kilduff, Devilsbit Mountain pNHA and SAC (Site Code: 000934) is located approximately 7.2km west from the Site.
- Nore Valley Bogs NHA (001853) is located approximately 9.6km to the north.

There is no hydrological or hydrogeological connectivity between the Site and Templemore Wood pNHA, Kilduff, Devilsbit Mountain pNHA and SAC or the Nore Valley Bogs NHA.

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.

- 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.

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, if a Justification Test is required.

4.3 FLOOD RISK IDENTIFICATION

4.3.1 Historical Mapping

To identify those areas as being at risk of flooding, historical mapping (*i.e.* 6" and 25" base maps) were consulted.

There was no identifiable map text on local available historical 6" or 25" mapping for the Site that would identify lands that are "liable to flood" in the vicinity of the proposed 110kV substation, and associated construction compound, or along the vast majority of the underground cabling route.

However, the local 6" basemap indicates that lands in the very east of the Site, in the vicinity of the proposed end masts and the Ikerrin to Thurles 110kV overhead line, are "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, mineral alluvium is mapped along the course of the Clonmore Stream in the vicinity of the Site. Mineral alluvium is mapped where the underground cabling route is proposed to cross the Clonmore Stream along the L-7039. An existing bridge exists at this location.

Alluvium soils are also mapped to extend to the south from the Clonmore Stream and encroach into the Site in the vicinity of the proposed end masts and the Ikerrin to Thurles 110kV overhead line.

4.3.3 OPW Past Flood Events Map

To identify those areas as being at risk of flooding, OPW's Past Flood Events Map was consulted (www.floodinfo.ie).

The OPW Past Flood Events Maps does not record any recurring or historic flood instances within or in the vicinity of the Site. The closest mapped past flood event to the Site is in Templemore Town (Flood ID: 13509) and dates from 30th December 2015. This past flood event is located approximately 4.5km to the southwest of the Site. Several other past flood events are also mapped in Templemore (Flood ID: 4986 dated 5th November 2000 and Flood ID: 4991 dated 1st December 1968). A recurring flood event is also mapped in Templemore (Flood ID: 3780) associated with fluvial flooding.

However, the OPW's Past Flood Event extent map, which also records the boundary of a previous flood event, does record several areas of historic flooding in the local area. These flood extents were recorded on 10th January 2008.

Additionally, the vast majority of the Site is located within a Drainage District. Drainage Districts were carried out by the Commissioners of Public Works under a number of drainage and navigation acts from 1842 to the 1930s to improve land for agriculture and to mitigate flooding. Channels and lakes were deepened and widened, weirs removed, embankments constructed, bridges replaced or modified and various other work was carried out. The purpose of the schemes was to improve land for agriculture, by lowering water levels during the growing season to reduce waterlogging on the land beside watercourses known as callows.

Local authorities are charged with responsibility to maintain Drainage Districts. Furthermore, all watercourses in the vicinity of the Site, including the River Suir, the Clonmore Stream, the Stroge Stream and the Lahagh Stream, are mapped as drainage district channels.

Historic and recurring flood events in the vicinity and downstream of the Site are shown on **Figure C** below.

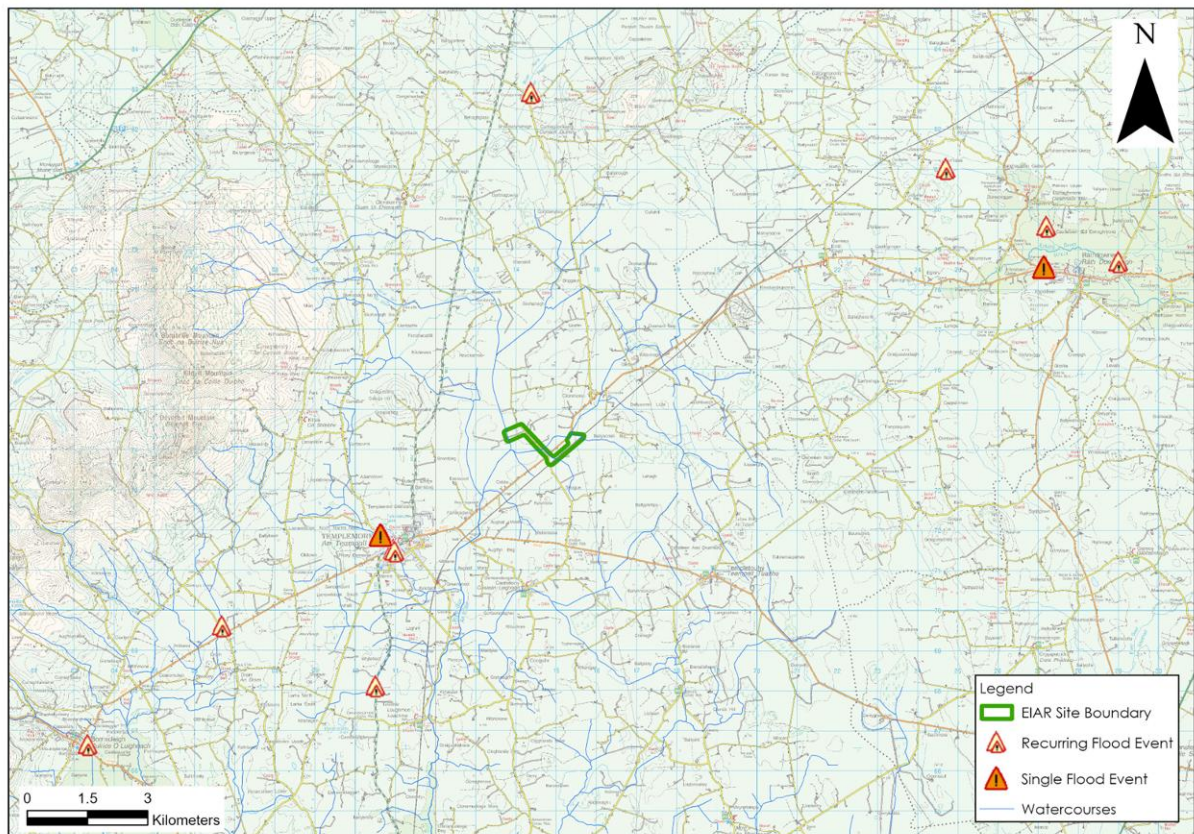


Figure C: OPW Past Flood Events Map

4.3.4 GSI Winter 2015/2016 Surface Water Flood Mapping

The GSI Winter 2015/2016 Surface Water Flooding map shows fluvial (rivers) and pluvial (rain) floods, excluding urban areas, during the winter 2015/2016 flood event, which was the largest recorded flood event in many areas. This surface water flood map is available at www.floodinfo.ie.

The GSI do not record any historic flood zones in the area of the proposed 110kV substation, temporary construction compound or along the vast majority of the underground cabling route. However, historic surface water flood zones are mapped in the east of the Site in the vicinity of the proposed end masts. The elements of the Proposed Grid Connection located in this historic surface water flood zone comprise of the end masts and approximately 200m of the Proposed Grid Connection underground cabling route and associated access roads.

The GSI 2015/2016 surface water flood map is included as **Figure D** below.

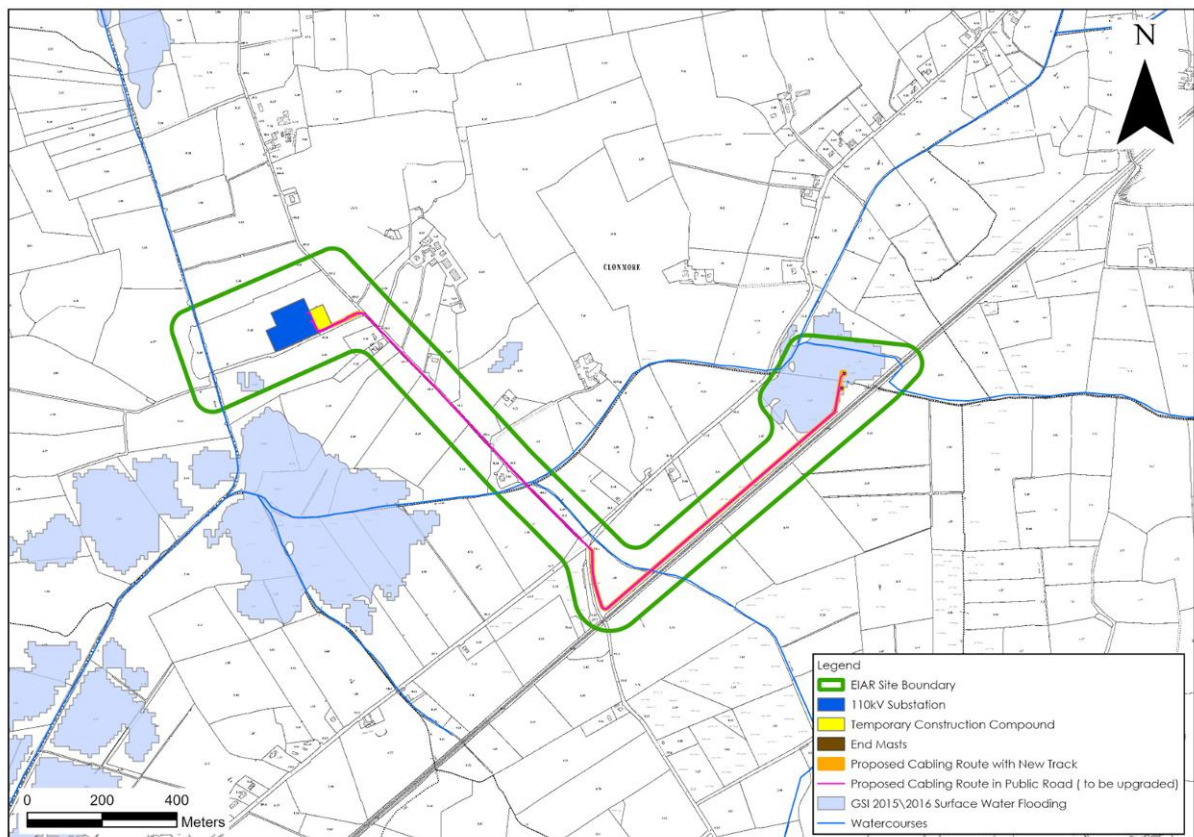


Figure D: GSI 2015/2016 Surface Water Flood Mapping

4.3.5 CFRAM Flood Extent Mapping

Where complete, the Catchment Flood Risk Assessment and Management (CFRAM)² OPW Flood Risk Assessment Maps are now the primary reference and most accurate for flood risk planning in Ireland. CFRAM mapping of river flood extents are available at www.floodinfo.ie.

² 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.

CFRAM mapping has not been completed for the area of the Site. The closest CFRAM flood zones are located on the River Suir approximately 800m to the southwest and downstream of the proposed 110kV substation.

4.3.6 National Indicative Fluvial Flood Mapping

The National Indicative Fluvial Flood Mapping (NIFM) (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 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, low (1 in 1,000-year) and medium (1 in 100-year) probability fluvial flood zones are mapped along the length of the River Suir and the Clonmore Stream in the vicinity of the Site.

NIFM flood zones are mapped along the River Suir to the west of the proposed 110kV substation. However, these flood zones do not encroach upon the proposed substation location.

NIFM fluvial flood zones are mapped along the Clonmore Stream where the underground cabling route travels along the L-7039. An existing bridge is located at this crossing location along the underground cabling route. Fluvial flood zones are also mapped in the east of the Site in the vicinity of the proposed end masts and the Ikerrin to Thurles 110kV overhead line.

The proposed 2 no. end masts and approximately 200m of proposed access roads are located within the 100-year fluvial flood zones. There is no significant difference in the mapped extent of the 100-year and 1,000-year fluvial flood zones in the local area.

A fluvial map showing the National Indicative Fluvial Flood Mapping for the present-day scenario at the Site is included as **Figure E** below.

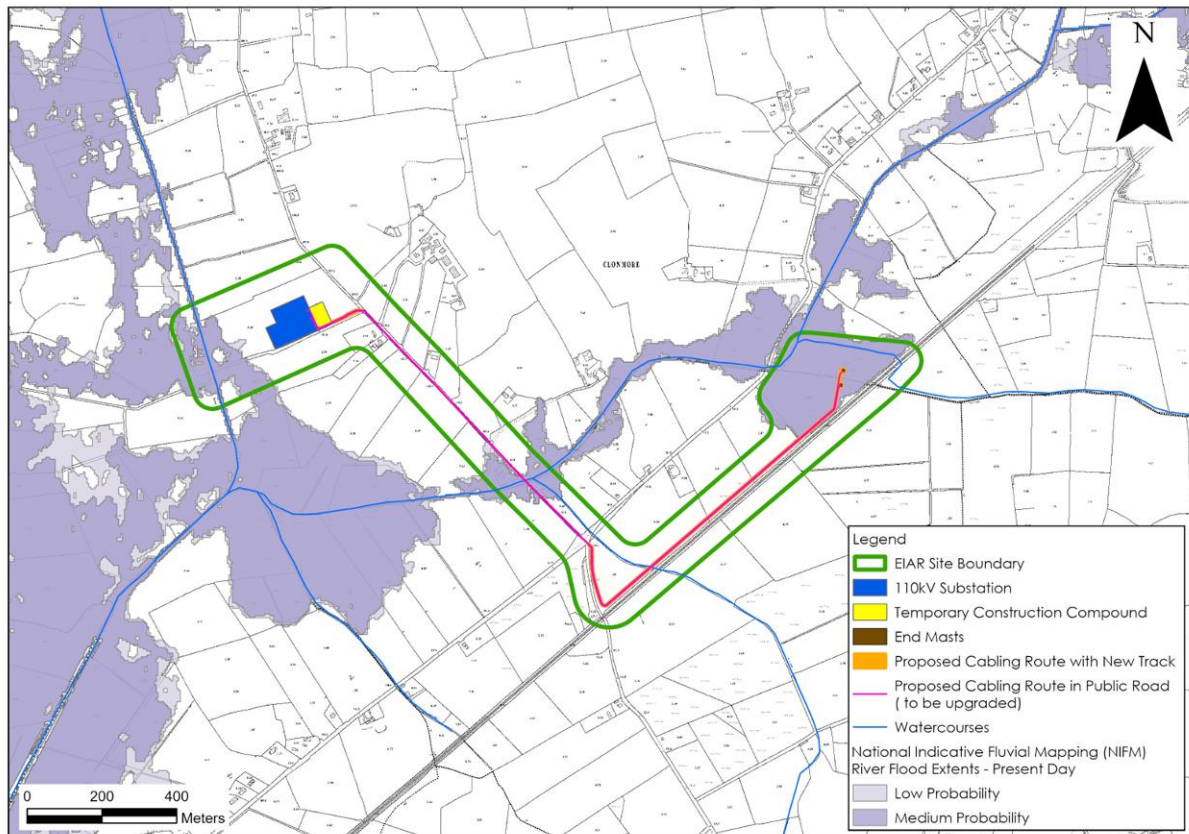


Figure E: OPW National Indicative Flood Mapping at the Site

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 the surrounding lands. The closest areas of groundwater flooding are mapped approximately 3.5km to the southwest of the Site.

4.3.8 Coastal Flooding

The Site is located approximately ~110km from the coast and at elevations in excess of 100mOD. As such, there is no risk of coastal flooding at the Site.

4.3.9 Climate Change

It is likely that climate change will have significant impacts on flooding and flood risk in Ireland due to rising sea levels, increased winter rainfall and more intense rainfall. The CFRAM Programme has modelled flooding associated with potential future climate change scenarios. These CFRAM flood zones have been modelled for 2 no. potential future climate change scenarios, with the Mid-Range and High-End Future Scenario flood extents generated using an increase in rainfall of 20% and 30% respectively.

However, as stated above no CFRAM modelling has been completed in the immediate vicinity of the Site.

The NIFM flood zones have been modelled for the 2 no. potential future climate change scenarios. 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 at 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, the Site is not significantly constrained by flooding. The vast majority of Site, including the proposed 110kV substation and temporary construction compound locations, is located in Fluvial Flood Zone C and is at a low risk of fluvial flooding according to NIFM mapping.

Much of the underground cabling route is also located in Flood Zone C. However, some sections of the route, in the vicinity of local watercourses are mapped in fluvial flood zones along with the 2 no. end masts.

The proposed 2 no. end masts and approximately 200m of proposed access roads are located within the 100-year fluvial flood zones according to NIFM mapping.

4.4 INITIAL FLOOD RISK ASSESSMENT

4.4.1 Site Survey and Drainage

Detailed walkover surveys of the Site were undertaken by HES between November 2022 and September 2023 and in August 2025.

The proposed 110kV Substation, temporary construction compound, 1.2km of the underground cabling route and the end masts are located in agricultural pastures. Approximately 900m of the underground cabling route is located along public roads (L-7038, R433 and L7039).

In addition to the EPA mapped watercourses several manmade field drains can be found within the Site. the Proposed Grid Connection will therefore also require new proposed culverts and proposed culvert upgrades at field drain crossings.

During the walkover surveys and flow monitoring there was little evidence of previous out of bank flow from within the various watercourse channels. No widespread or localized flooding was observed during these site visits; all flow was contained within the channels.

Surface water flow monitoring in the vicinity of the Site was completed on 28th August 2025. 2 no. occasions in 2023 at SW1, SW2 and SW3. Both SW1 and SW3 of these monitoring locations are on the River Suir, with SW2 located on the Clonmore Stream. The data are presented in **Table B**.

Table B: Surface Water Flow Monitoring

Location/Date	Watercourse – EPA Name	28 th August 2025
SW1	River Suir	~900
SW2	Clonmore Stream	~200
SW3	River Suir	~700

4.4.2 Stage 3 Flood Modelling

Stage 3 FRA flood modelling was completed for the Consented Wind Farm by Fluvio R&D Limited³. The assessment involved a detailed river channel and bridge/culvert topographic survey along with use of aerial acquired Lidar data to develop a digital elevation model of the river and floodplain and included modelling of the area of the proposed 110kV substation in the west of the Site. The area of the grid connection 2-no. end masts was not within the model extent.

The flood level modelling was undertaken using HEC-RASTM open channel flow software. HEC-RAS is a 2-dimensional flow model which can calculate channel water depth/level using parameters such as flood volumes, channel dimensions, slope and friction coefficients (Mannings n number). To investigate the potential for flooding within the Site, modelling of design flood volumes (i.e. 100-yr and 1000-yr) was undertaken for the watercourses and flood plains with allowance for climate change (20%).

The modelled flood zones are shown on **Figure F** below and correspond largely with the NIFM. The modelled flood zones show that the proposed substation to be located outside the 100-yr and 1,000-yr flood zones.

The only infrastructure mapped within the modelled flood zones relates to the underground cable route where it crosses the Clonmore Stream. As stated previously an existing bridge exists at this location.

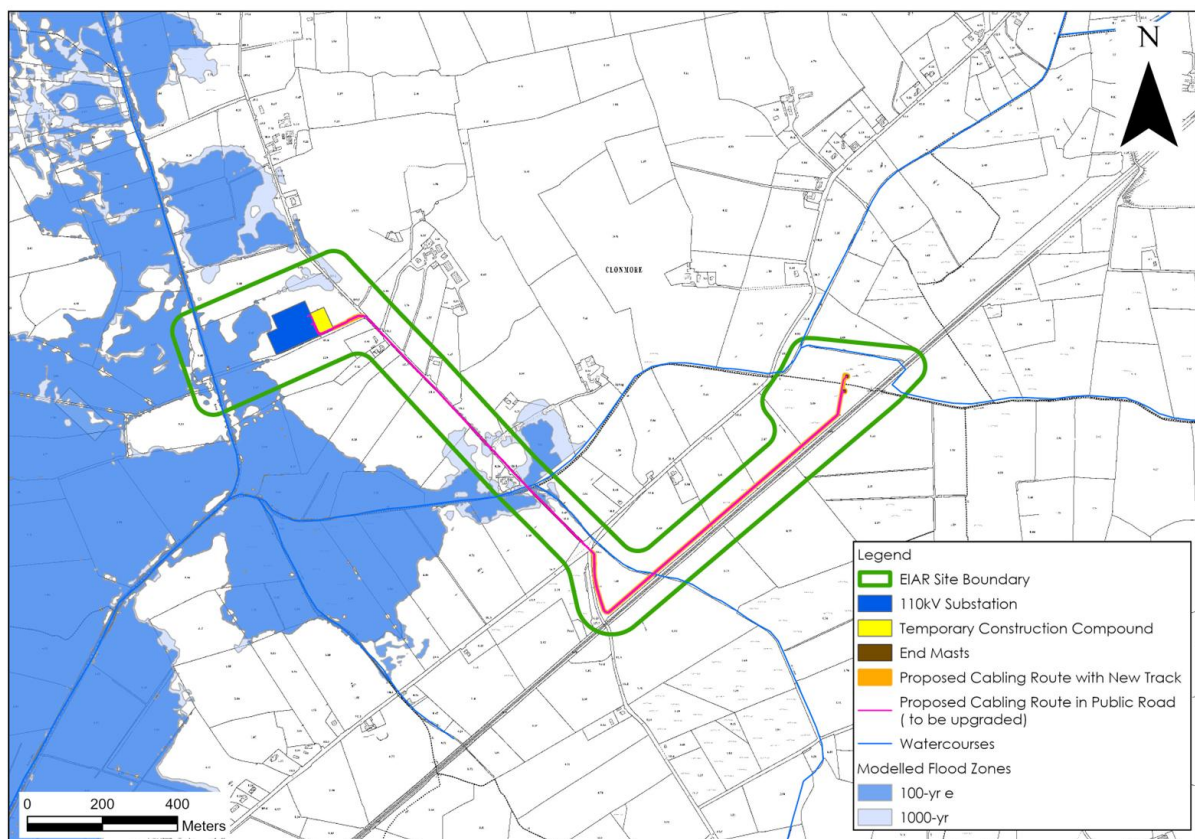


Figure F: Modelled Flood Zones (Fluvio R&D Ltd, 2023)

³ Fluvio R&D Limited (September 2023): Borrisbeg Wind Farm Flood Risk Assessment.

4.4.3 Hydrological Flood Conceptual Model

Potential flooding in the vicinity of the Site can be described using the Source – Pathway – Receptor Model ("S-P-R"). The primary potential source of flooding in this area, and the one with most consequence for the Proposed Grid Connection, is fluvial flooding of the Clonmore Stream. The potential receptors in the area are infrastructure and land as outlined below.

4.4.4 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 a risk at the Site. 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

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	Based on the NIFM and detailed flood modelling, the majority of the Site (including substation) is located in Fluvial Flood Zone C where there is a low risk of fluvial flooding. According to the NIFM mapping, the 2 no. proposed end masts and approximately 200m of underground cabling route and associated access tracks are mapped within a 100-year flood zone (Flood Zone A)
Pluvial	Ponding of rainwater on site	Land & infrastructure	Localised ponding of surface water may occur following periods of heavy rainfall.
Surface water	Surface ponding/ Overflow	Land & infrastructure	Same as above (pluvial).
Groundwater	Rising groundwater levels	Land & infrastructure	There are no historic or modelled groundwater flood zones located within the Site. The risk of groundwater flooding is low.
Coastal/tidal	Overbank flooding	Land, People, property	The Site is inland and stands at a significant elevation above sea level. Therefore, there is no risk of coastal/tidal flooding.

5. JUSTIFICATION TEST

5.1 REQUIREMENT FOR A JUSTIFICATION TEST

The matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test⁴ is shown in **Table D** below. The table indicates how the Justification Test applies to the Proposed Grid Connection infrastructure.

It may be considered that the majority of the components of the Proposed Grid Connection can be categorised as “Highly Vulnerable” as they are electricity generating infrastructure.

However, all “Highly Vulnerable” infrastructure including the proposed 110kV substation and the associated construction compound are in Flood Zone C (Low risk) and can therefore be considered as appropriate from a flood risk perspective.

Some elements of the Proposed Grid Connection, comprising ~200m of underground cabling and associated access road as well 2 no. end masts are located in Fluvial flood Zone A/B. These elements of the Proposed Grid Connection can be considered to be “Less Vulnerable Developments” for reasons described in **Section 5.2** below.

Table D: Matrix of Vulnerability versus Flood Zone

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification test	Justification test	<u>Appropriate</u>
Less vulnerable development	<u>Justification test</u>	<u>Appropriate</u>	<u>Appropriate</u>
Water Compatible development	Appropriate	Appropriate	Appropriate

Note: Taken from Table 3.2 (DoEHLG, 2009)

Bold: Applies to this project.

5.2 DETAILED FLOOD RISK ASSESSMENT

This section assesses the flood risk of the Proposed Grid Connection with regard to Section 5.28 of the Flood Risk Management Guidelines. The assessment is made based on the NIFM flood zone mapping as this has modelled flood zones within which some elements of the Proposed Grid Connection are located.

This detailed flood risk assessment addresses potential flood concerns at the watercourse crossings over the Clonmore Stream and Strogue Stream as well as the new proposed site access roads and end masts.

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).

5.2.1 Crossing over the Clonmore Stream and Strogue Stream

A section of the underground cabling route is located in Fluvial Flood Zone A where the L-7039 is mapped to cross the Clonmore Stream. An existing bridge crossing exists at this location. No instream works will be required and the crossing will be completed using Horizontal Directional Drilling (HDD) and in consultation with Inland Fisheries Ireland (IFI).

A clear span bridge will be constructed at the proposed new crossing on the Strogue Stream.

5.2.2 Proposed End Masts and Proposed New Access Roads

As stated above, the proposed end masts and approximately 200m of proposed new access road along with underground cabling are mapped in Fluvial Flood Zone A in the east of the Site.

The construction of new above-ground structures within floodplains has the potential to reduce the storage capacity of the floodplain and increase flood risk locally or downstream.

However, the foundations for the met masts and access road within the floodplain will be constructed as close to existing ground level as possible. The end masts will be lattice in design and therefore the structure cannot impede surface water flows. The grid cable will be placed below ground level.

Under road culverts will be placed at 25m intervals along this section of the access road to maintain the hydrological regime and to prevent a damming effect occurring during flood events. The access tacks will also be constructed of porous stone to allow water to diffusively pass through the road structure.

5.3 JUSTIFICATION TEST

Box 5.1 of "The Planning System and Flood Risk Management Guidelines" (PSFRM Guidelines) outlines the criteria required to complete a Justification Test and is shown on **Table E** below.

Table E: Format of Justification Test for Development Management

Box 5.1 Justification Test for Development Management (to be submitted by the applicant)
When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied: 1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines. 2. The proposal has been subject to an appropriate flood risk assessment that demonstrates: i. The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk; ii. The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible; iii. 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; and iv. 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. The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

Note: this table has been adapted from Box 5.1 of "The Planning System and Flood Risk Management Guidelines", (2009).

Referring to Point 1 and Points 2 (i) to (iv) inclusive:

The section of the new proposed access roads and the proposed end masts in the east of the Site are located in the mapped flood zones.

The closest downstream third-party sensitive receptor to the proposed infrastructure mapped within the flood zones is a farm house situated approximately 600m to the west/northwest of the proposed end masts. This receptor is downstream of the Site along the Clonmore Stream. There are several other sensitive receptors in the surrounding lands.

The Proposed Grid Connection has been the subject of a flood risk assessment (this report) and the following has been determined:

- i. Due to the relatively small footprint of the Proposed Grid Connection within the NIFM flood zones, the Proposed Grid Connection is predicted to have an imperceptible impact on flood water levels downstream of the Site. No increase in downstream flood risk is anticipated.
 - The new proposed crossing over the Strogue Stream will be completed using a clear-span crossing, in accordance with OPW guidelines and subject to Section 50 consent. There will be no instream works and no displacement of floodwaters.
 - The crossing of the over the Clonmore Stream will be completed using Horizontal Directional Drilling at an existing bridge location. There will be no instream works and no potential to increase the downstream flood risk.
 - The new proposed access road and proposed end masts within the floodplains have a small footprint and will be constructed as close to existing ground level as possible. Due to the nature of the development in the floodplain there will be no potential to increase the downstream flood risk.
- ii. The design of the Proposed Grid Connection has undergone an iterative process which ensured that the sensitive elements of the development i.e. the proposed 110kV substation and temporary construction compound are outside of the modelled flood zones.
- iii. No increase in flood risk to people, property, the economy or the environment during extreme flood events as a result of the Proposed Grid Connection is predicted due to the appropriate design measures which will result in imperceptible upstream and downstream effects; and,
- iv. The Proposed Grid Connection is compatible with the wider planning objectives of the area, including the provision of wind energy developments at appropriate locations and the proper planning and sustainable development of the area.

6. REPORT CONCLUSIONS

- A flood risk identification study was undertaken to identify existing potential flood risks associated with the Proposed Grid Connection. From this study:
 - OS maps identified some land that was “liable to flood” in the east of the Site at the proposed end mast location;
 - No instances of recurring flooding were identified on OPW maps within the Site, However, the OPW mapped a flood event dating from 2008 to encroach upon the east of the Site;
 - The GSI Historical 2015/2016 flood map records area of the historic surface water flooding in the east of the Site at the end mast location;
 - The Site is not mapped within any historic or predictive groundwater flood zone;
 - The Site is not identified as being within CFRAM Flood Zones; and,
 - The National Indicative Fluvial Flood Mapping records fluvial flood zones along the River Suir and the Clonmore Stream in the area of the Site and at the end mast location.
- The proposed 110kV substation, temporary construction compound and the majority of the underground cabling route are located in the Fluvial Flood zone C and are considered to be at low risk of flooding.
- The infrastructure located in the flood zones within the Site comprise of an existing bridge crossing along the underground cabling route over the Clonmore Stream, the proposed end masts and approximately 200m of proposed access tracks associated with the underground cabling route.
- The crossing over the Clonmore Stream will be completed using directional drilling and there will be no requirement for instream works. A clear span bridge will be constructed at the proposed new crossing on the Strogue Stream. Therefore, there will be no potential for the displacement of floodwaters.
- The proposed end masts and new access tracks will be constructed as close to ground level as possible. Given the small footprint of the development within the flood zones there is no potential to increase the downstream flood risk.
- In addition, the risk of the Proposed Grid Connection contributing to downstream flooding is also very low, as the long-term plan for the Site is to retain and slow down drainage water rates prior to release. Robust drainage measures will include silt traps, check dams, settlement ponds and buffered outfalls. Please refer to the hydrology Chapter of the EIAR for further details.

7. REFERENCES

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Fluvio R&D Limited	2023	Borrisbeg Wind Farm Flood Risk Assessment

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