The Tecpro Building,
Clonshaugh Business & Technology Park,
Dublin 17, Ireland.

T: + 353 1 847 4220
F: + 353 1 847 4257
E: info@awnconsulting.com
W: www.awnconsulting.com

STAGE 1 FLOOD RISK ASSESSMENT

110KV SUBSTATION & ASSOCIATED UNDERGROUND TRANSMISSION LINE

ARKLOW, CO. WICKLOW

Report Prepared For

Crag Wicklow Ltd

Report Prepared By
Alan Wilson BSc
Environmental Consultant

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Cork Office
Unit 5, ATS Building,
Carrigaline Industrial Estate,
Carrigaline, Co. Cork.
T: + 353 21 438 7400
F: + 353 21 483 4606

AWN Consulting Limited
Registered in Ireland No. 319812
Directors: F Callaghan, C Dilworth,
T Donnelly, T Hayes, D Kelly, E Porter

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Name	Alan Wilson BSc	Marcelo Allende
Title	Environmental Consultant	Senior Environmental Consultant
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1.0 INTRODUCTION

AWN Consulting Ltd (AWN) has been appointed by Crag Wicklow Ltd. to undertake a Stage 1 Flood Risk Assessment ("FRA") for a proposed development located within the townlands of Kish, Bogland, Ballynattin, and Ballintombay, to the South of Arklow, County Wicklow. This assessment has been completed in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities' 2009 (FRM Guidelines).

The Site area consists of three main areas: 110 kV Substation Site, Circuit Route A, Circuit Route B; these areas are described below.

The first, the '110 kV Substation Site', is located within the Kish Business Park and comprises part of an irregularly shaped field bounded by hedgerows typical of its agricultural setting. The 110 kV Substation Site is currently in use as agricultural lands.

The 110 kV Substation Site is presently bounded by greenfield agricultural lands to the north and east, which are subject to a Permitted Development for a 3 no. ICT Facility Buildings and associated development Wicklow County Council (WCC) Reg. Ref.: 201088. The 110 kV Substation Site is currently accessed via the existing permitted access from the Kish Business Park Road.

The second, the 'Circuit Route A', is a linear route of 2934 m; between the 110 kV Substation Site to the existing 110 kV overhead line located to the west.

The third, the 'Circuit Route B', is a linear route of 2216 m; between the 110 kV Substation Site to the existing 110 kV overhead line located to the west.

The county town of Wicklow is located approximately 25 km north, with Dublin city centre 65 km further to the north of the site. The M11 motorway provides an excellent transport link to the surrounding area.

Insert 1.1 *Site Location and Surrounding Land Use (source: Google Earth Pro, 2022)*

This report was prepared by Alan Wilson (BSc), and Marcello Allende (BSc, BEng). Alan is an Environmental Consultant (Hydrologist) with AWN Consulting. Alan holds a BSc Honours in Environmental Management in Agriculture/Environmental and Geographical Sciences, working on projects involving EIA Reports, Environmental Site Investigation and contaminated lands on a range of developments. Alan has over 2 years' experience as an Environmental Consultant including roles in Ecology and Forestry related work. Marcelo is a Water Resources Engineer with over 15 years of experience in environmental consultancy and water resources studies. Marcelo is an Senior Environmental Consultant (Hydrologist) with AWN Consulting, a member of the International Association of Hydrogeologists (Irish Group) and a member of Engineers Ireland (MIEI).

1.1 PLANNING CONTEXT

The following planning policy documents are relevant to the assessment of the proposed development:

- The National Planning Guidelines published by the OPW and the Department of the Environment, Heritage and Local Government in November 2009 entitled 'The Planning System and Flood Risk Management Guidelines for Planning Authorities';
- National Development Plan 2018-2027;
- Wicklow County Development Plan 2016-2022;
- Adopted Wicklow County Development Plan 2022-2028.

1.2 PURPOSE OF A SITE SPECIFIC FLOOD RISK ASSESSMENT

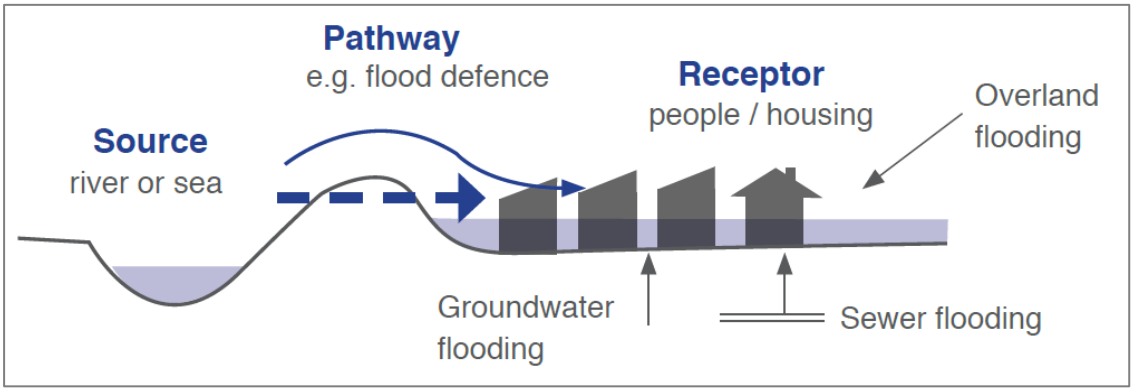
In line with the Guidelines, a Site Specific Flood Risk Assessment should be undertaken for a scale of individual site planning applications. The purpose of this FRA is to assess all types of flood risk for a new development. A FRA identifies the sources of flood risk, the effects of climate change on this, the impact of the development, the effectiveness of flood mitigation and management measures and the residual risks that remain after those measures are put in place.

Note: The SSFRA is a live document that is designed to be updated as further flood risk information becomes available and changes *to the development plan are proposed under any variations. Accordingly, all information in relation to flood risk is provided for general policy guidance only. It may be altered in light of future data and analysis. As a result, all landowners and developers are advised to take all reasonable measures to assess the vulnerability to flooding of lands in which they have an interest prior to making planning or development decisions.*

1.3 THE PLANNING SYSTEM AND FLOOD RISK MANAGEMENT GUIDELINES

This assessment was undertaken in accordance with the Department of the Environment, Heritage and Local Government (DoEHLG) Flood Risk Management Guidelines for Planning Authorities published by the OPW in 2009 (hereafter referred to as the FRM Guidelines) in order to introduce comprehensive mechanisms for the incorporation of flood risk identification, assessment and management into the planning process.

For carrying out a Site-specific Flood Risk Assessment (SSFRA), the OPW Guidelines recommend using Source-Path-Receptor (S-P-R) concept model to identify where the flood originates from, what the floodwaters path is and the areas in which assets and people might be affected by such flooding (Section 2.18 of the OPW Guidelines, 2009). Insert 1.2 shows a schematic representation of S-P-R model.



Insert 1.2 *Source-Pathway-Receptor Model (OPW, 2019)*

A Flood Risk Assessment (FRA) is undertaken over several stages with the need for progression to a more detailed stage dependent on the outcomes of the former stage.

As per the FRM Guidelines a tiered approach has been taken. This usually begins with a Stage 1 Assessment which aims to quantify the risk posed to the development and to the surrounding environment by this development. The main aim of this FRA is to determine the risk of flooding to the site and the impact development will have on the

floodplain, developments off site, upstream and downstream levels and any mitigation measures necessary.

This hierarchy of assessment ensures that flood risk is taken into account at all levels of the planning system but also that the right level of detail is considered. This avoids the need for detailed and costly assessments prior to making strategic decisions.

In terms of the Flood Risk Assessment and Management Study the scope of this work incorporates three stages:

- ***Stage 1: Flood Risk Identification -*** to identify whether there may be any flooding or plan issues related to a plan area or proposed development site that may warrant further investigation.

- ***Stage 2: Initial Flood Risk Assessment -*** to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. The extent of the risk of flooding should be assessed which may involve preparing indicative flood zone maps. Where existing river or coastal models exist, these should be used broadly to assess the extent of the risk of flooding and potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures; and,

- ***Stage 3: Detailed Flood Risk Assessment -*** to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or construction of a hydraulic model of the river or coastal cell across a wide enough area to appreciate the catchment wide impacts and hydrological processes involved.

However, as explained in the following sections, based ~~of~~ on the nature of the development and the results of the flood risks identified during Stage 1, it was not necessary to proceed to Stages 2 and 3.

As described in the FRM guidelines flood risk is a combination of the likelihood of flooding and the potential consequences arising. This is normally expressed in terms of the following relationship:

Flood risk = Probability of flooding x Consequences of flooding

The likelihood of flooding is normally expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates the flood level that is expected to be reached on average once in 100 years, i.e. it has a 1% chance of occurring in any one year. Therefore:

- 100-year flood = 1% Annual Exceedance Probability (AEP).
- 1000-year flood = 0.1% AEP.

In the FRM Guidelines, the likelihood of a flood occurring is established through the identification of Flood Zones which indicate a high, moderate, or low risk of flooding from fluvial or tidal sources, as defined as follows:

- *Flood Zone A* - Where the probability of flooding is highest (greater than 1% AEP or 1 in 100 for river flooding and 0.5% AEP or 1 in 200 for coastal flooding) and where a wide range of receptors would be vulnerable.
- *Flood Zone B* - Where the probability of flooding is moderate (between 0.1% AEP or 1 in 1000 and 1% AEP or 1 in 100 for river flooding and between 0.1% AEP or 1 in 1000 year and 0.5% AEP or 1 in 200 for coastal flooding); and
- *Flood Zone C* - Where the probability of flooding is low (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding).

Insert 1.3 *Indicative Flood Zone Map (OPW, 2009)*

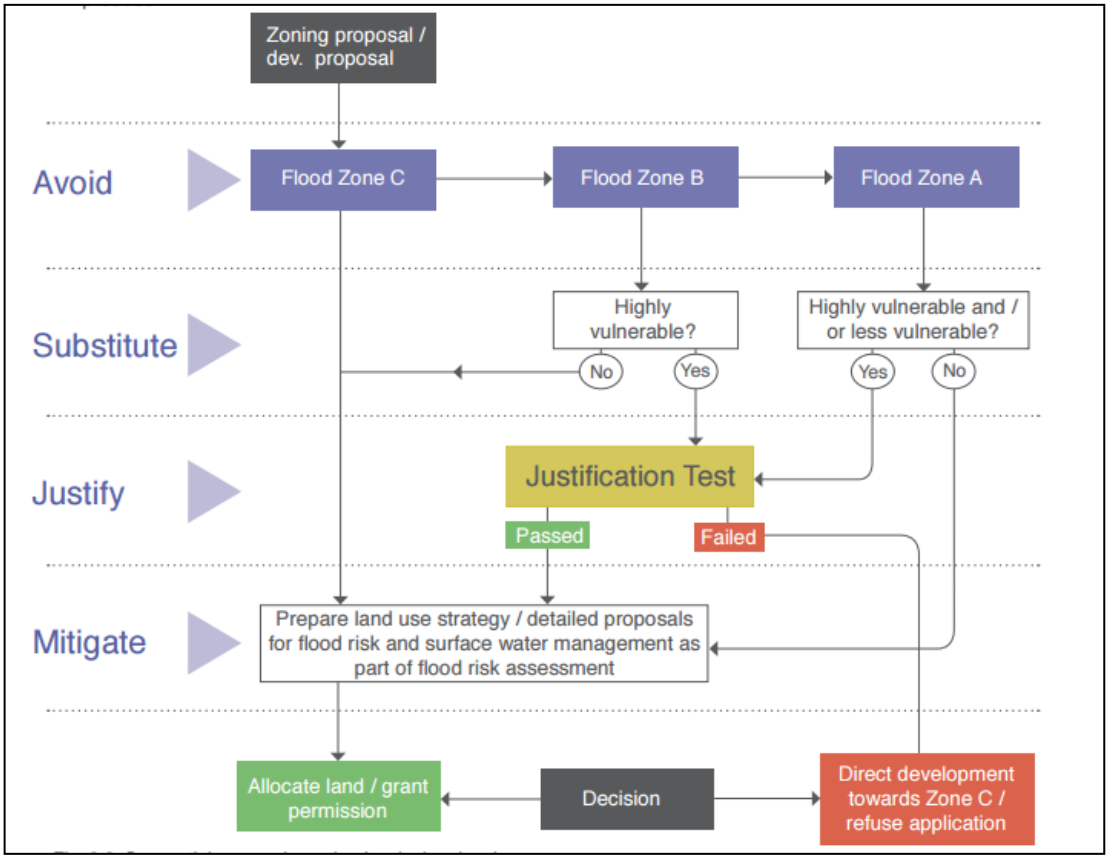
According to the OPW Guidelines, the planning implication of each of the zones mentioned above are:

- *Zone A* - High probability of flooding. Most types of development would be considered inappropriate in this zone.
- *Zone B* - Moderate probability of flooding. Highly vulnerable development, such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses and primary strategic transport and utilities infrastructure, would generally be considered inappropriate in this zone
- *Zone C* - Low probability of flooding. Development in this zone is appropriate from a flood risk perspective (subject to assessment of flood hazard from sources other than rivers and the coast) but would need to meet the normal range of other proper planning and sustainable development considerations.

Potential impacts of the proposed development were considered within the study area. This is defined as the area within the proposed development site boundary (i.e. the proposed development site), and the wider hydrological setting of the area (refer to Insert 1.1 above and 2.1 below). A sequential plan approach was undertaken for this risk assessment under guidance from the local planning authorities (2009). Specifically, a sequential approach is first and foremost directed towards land that is at low risk of flooding. The underpinning philosophy of the sequential approach is highlighted in the illustration below. It should be noted that the above guidance is

applicable in the layout and design of the specific subject site at the development management stage.

Based on the CFRAM PRFA (Preliminary Flood Risk Assessment) and Wicklow County Development Plan 2016-2022, the subject site resides in Flood Zone C (refer to Section 4 below). This report contains the first stage of the flood risk assessment.



Insert 1.4 *Sequential approach mechanism in the planning process*

1.4 METHODOLOGY

This assessment follows the FRM Guidelines; the methodology involves researching the following data sources:

- Base maps – Ordnance Survey of Ireland;
- Flood Hazard Maps and flooding information for Ireland, www.floodinfo.ie Office of Public Works (OPW);
- Geological Survey of Ireland (GSI) maps on superficial deposits;
- EPA hydrology maps;
- National River Basin Management Plan 2018-2021;
- Geological Survey of Ireland (GSI) maps on superficial deposits (current and historical);
- Circular PL2/2014 Flooding Guidelines;
- The National Development Plan 2018 – 2027;
- Wicklow County Development Plan 2016-2022;
- Adopted Wicklow County Development Plan 2022-2028.

The proposed development and its component parts have been assessed against the FRM Guidelines Classification of Vulnerability. It is considered that the proposed development would reside within the essential infrastructure category ('*utilities distribution, including power stations and substations*'); as such it is classified as '*Highly Vulnerable Development*' (see Table 1.1).

According to the FRM Guidance, a Highly Vulnerable Development requires a Justification test for Flood Zone A and B, and is appropriate for Flood Zone C (see Table 1.2).

Table 1.1 *Classification of vulnerability of different types of developments.*

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).
*Uses not listed here should be considered on their own merits	

Table 1.2 *Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.*

	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

1.5 CLIMATE CHANGE

Flood risk is anticipated to increase as a result of climate change. Projected impacts for Ireland include:

- Sea level rise of between 18cm and 59cm this century;
- More intense storms and rainfall events;
- Increased likelihood and magnitude of river and coastal flooding; and
- Increased storm surges.

With respect to this assessment and the development area only changes in the intensity of rainfall events and the magnitude of river flooding are of direct relevance.

In all developments, climate change should be considered when assessing flood risk and in particular residual flood risk. Consideration of climate change is particularly important where flood alleviation measures are proposed, as the design standard of the proposal may reduce significantly in future years due to increased rainfall, river flows and sea levels.

The Guidelines recommend that a precautionary approach to climate change is adopted due to the level of uncertainty involved in the potential effects. A significant amount of research into climate change has been undertaken on both a national and international front, and updates are ongoing.

Based on these two scenarios the OPW recommended allowances for climate change are given in Table 1.3. These climate change allowances are particularly important at the development management stage of planning and will ensure that proposed development is designed and constructed to take into account best current knowledge.

Table 1.3 *Allowances in Flood Parameters for the Mid-Range and High-End Future Scenarios for Fluvial and Tidal Sources*

Parameter	MRFS	HEFS
Extreme Rainfall Depths	+20%	+30%
Peak Flood Flows	+20%	+30%

Mean Sea Level Rise	+500 mm	+1,000 mm
Land Movement	-0.5 mm/year [1]	-0.5 mm/year [1]
Urbanisation	No General Allowance – Review on a Case by Case Basis	No General Allowance – Review on a Case by Case Basis
Forestation	-1/6 Tp [2]	-1/3 Tp [2] +10% SPR [3]

Note 1: Applicable to the southern part of the country only (Dublin – Galway and south of this)

Note 2: Reduction in the time to peak (Tp) to allow for potential accelerated runoff that may arise as a result of drainage of afforested land

Note 3: Add 10% to the Standard Percentage Runoff (SPR) rate: This allows for temporary increased runoff rates that may arise following felling of forestry.

For most development, including residential, nursing homes, shops and offices, the medium-range future scenario (20% increase in flows) is an appropriate consideration. This should be applied in all areas that are at risk of flooding (i.e. within Flood Zone A and B) and will be considered for sites which are in Flood Zone C but are adjacent to Flood Zone A or B. This is because land which is currently not at risk may become vulnerable to flooding when climate change is taken into account.

Where the risk associated with inundation of a development is low and the design life of the development is short (typically less than 30 years) the allowance provided for climate change may be less than the 20% / 0.5m level.

In general, climate change will be accounted for by the setting of finished floor levels to a height which includes an allowance for climate change. However, climate change may also reveal additional flow paths which need to be protected or give rise to flows which exceed culvert capacity or overtop defences. These outcomes will need to be specifically investigated for each site, and an appropriate response provided.

2.0 EXISTING HYDROLOGICAL ENVIRONMENT

2.1 SITE LOCATION

The location of the proposed development site is located entirely within the Hydrometric Area No. 10 (WFD Catchment: Ovoca-Vartry) in Ovoca-Vartry WMU (Water Management Unit) within the former Eastern River Basin District (ERBD) (now the Irish River Basin District) and Avoca WFD Subcatchment (WFD name: Avoca_SC_020, ID 10_9; EPA, 2022) – Refer to Figure 1 in Appendix 1).

The current EPA watercourse mapping shows existing watercourses within and adjacent to the proposed development site. The site is drained by a local network which is composed of ditches and watercourses (Moneylane 10 & Springfield 10) which traverse the site. The Springfield 10 is located in the eastern area of the proposed development site; however, this feature is not shown in any of the historical mapping (1832 to 1913) records provided within the GeoHive website. A site walkover conducted in January 2020 included a visual inspection of this watercourse. This visit was after significant rain and stagnant water was visible in this watercourse, additionally the watercourse is heavily modified with a straight channel delineating a

field boundary. The inspection suggests that the watercourse is a manmade drainage feature with intermittent or ephemeral and likely fed from surface runoff from the clay soils shown in the majority of the trial pits across the site.

The Springfield 10 flows in a westerly direction and enters the Moneylane 10 along the sites eastern boundary. The Moneylane 10 flows North before merging with the Ballyduff Stream c. 1.4km downstream. The Ballyduff Stream enters the River Avoca a further 2.2km downstream before eventually flowing into the southwestern Irish Sea at Ballybrittas Bay c. 8km downstream of the proposed development site – Refer to Insert 2.1 below.

Insert 2.1 *Regional Hydrological Environment (source: EPA, 2022)*

There are no Europeans sites at the mouth of the Avoca River, the closest, Buckroney-Brittas Dunes and Fen SAC (Site code 000729), is located approximately 5 km to the north of the river mouth. The Kilpatrick Sandhills SAC is located over 6km to the south along the coast. Potential adverse effects on these European sites from the proposed development are highly unlikely given the distance of removal.

The nearest protected site is the Arklow Rock Askintinny (Site Code 001745). This is an area of outcrop with associated habitat. There is no hydrological connectivity to this proposed Natural Heritage Site – Refer to Figure 2 in Appendix 1.

2.2 EXISTING SITE GEOLOGY AND HYDROGEOLOGY

The subsoil map (refer to Figure 3 in Appendix 1) presents the area to be made up of Irish Sea Till derived from limestones derived from Lower Palaeozoic sandstones and shales (IrSTLPSsS) with matrix of Irish Sea Basin origin present within small areas in the southern portions of the site. There is no indication of alluvium subsoil underlying the proposed route.

The absence of Alluvium indicate that there are no historic rivers or flood plains on the site. Reference to the GSI Bedrock Geology indicates that the site is underlain by the Kilmacrea formation (Llandeilo-Caradoc Stage, Rock Unit code: OCKILM). This geological formation comprises primarily of buff-weathering grey and black slates and shales, with occasional sandstones. There are some tuffaceous horizons, and distinction between shale-rich parts of volcanic formations and tuff-rich parts - Refer to Figure 4 in Appendix 1.

The GSI online mapping shows the site crosses three groundwater vulnerability categories. The western boundary of the site experiences a High (H) Vulnerability, the south-western and south-eastern areas of the site experience Low (L) vulnerability and the majority of the site is classified with a "Moderate" vulnerability status – See Table 1.4 below denoting the general overburden depths of each vulnerability class - Refer to Figure 5 in Appendix 1.

Table 1.4 *Vulnerability Mapping Guidelines (source: GSI, 2022)*

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m	0 - 3.0m	-
High (H)	>3.0m	3.0 - 10.0m	3.0 - 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 - 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Notes: (1) N/A = not applicable.
(2) Precise permeability values cannot be given at present.
(3) Release point of contaminants is assumed to be 1-2 m below ground surface.

Groundwater vulnerability is based on the thickness of the subsoil overlying the bedrock aquifer. Overall, the GSI groundwater vulnerability was mapped as being 'Moderate' for the majority of and vicinity of the proposed development site which indicates a general overburden depth potential of >10 m. Ground Investigations carried out by Ground Investigations Ireland 2022 (GII) in the East of the site did not encounter competent bedrock in any of the boreholes <10mbgl. Therefore, the local groundwater is not considered as a sensitive receptor due to the presence of the low permeability subsoil (Irish Sea Till) and the thickness of this overburden.

3.0 DEVELOPMENT CHARACTERISTICS

The Proposed Development consists of three main components the 110 kV Substation Site, Circuit Route A, Circuit Route B these areas are described below – See Figures 6 & 7 in Appendix 1 for Cable Circuit Route Layout and Typical Mast Detail.

110kV Gas Insulated Switchgear (GIS) Substation

Construction of a 2 storey 110kV Gas Insulated Switchgear (GIS) Substation to be located on lands at Kish and Boglands, to the south of Arklow, County Wicklow. The proposed comprises a 110kV Substation building that includes, cable room, battery room relay room, stair cores and circulation areas, welfare facilities, with an overall height of c. 14.5 m, a Client Control Building that of c. 6 m, and site infrastructure 4 no. transformer bays, fire walls (c. 10 m high), drainage works, all internal road/footpath

access routes, landscaping and boundary treatment works, vehicular access and provision of 8 no. car parking spaces in the overall compound. Disabled parking spaces and electric car charging ports are not proposed due to occupancy and usage of the substation. The proposed 110 kV Substation will serve the ICT Facility permitted under WCC Reg. Ref.: 201088.

The proposed 110 kV Substation layout is shown on Figure 2.2 below.

Cable Circuits and New Masts

The underground cable (Cable Circuit A) is a single circuit 110 kV cable and communications ducts and 5 joint bays that will follow a liner route of 2,934 m; originating at the proposed 110 kV Substation and terminating at the existing 110 kV overhead line. The 2,934 m route can be summarised as approximately:

- extending to the north-west c. 434 m from the proposed 110 kV Substation including a 103 m horizontal directional drilling (HDD) crossing under the Dublin-Rosslare rail line via.
- c. 800 m in the existing carriageway ducting along the R772 to the M11 Junction 21
- c. 300 m in carriageway through the M11 Junction 21
- Proceeding to the northwest c. 1,400 m in the existing carriageway along the L6187.
- At the terminus the cable connects to the existing 110 kV overhead line via a proposed c. 17 m above ground level mast adjacent to Knockeneahan Road (L2190).

The underground cable (Cable Circuit B) is a single circuit 110 kV cable and communications ducts and 4 joint bays that will follow a liner route of 2,216 m; originating at the proposed 110 kV Substation and terminating at the existing 110 kV overhead line. The 2,216 m route can be summarised as approximately:

- extending to the north-west c. 416 m from the proposed 110 kV Substation including a 103 m horizontal directional drilling (HDD) crossing under the Dublin-Rosslare rail line via.
- 158 m in farmland crossing, and carriageway ducting along the R772
- 142 m under the M11 via HDD
- 600 m in private road (IDA), and future development lands (IDA)
- 900 m in farmland
- At the terminus the cable connects to the existing 110 kV overhead line via a proposed c. 17 m above ground level mast adjacent to Knockeneahan Road (L2190).

There is no existing public foul network at the site, properties in the adjacent development to the 110 kV Substation site within Kish Business Park treat their wastewater on site. There is no public surface water infrastructure located within or adjacent to the site. The 110 kV Substation site is drained by a series of agricultural ditches which connect to the Moneylane Stream which ultimately discharges into the Avoca River.

There is a direct pathway from the site to the Moneylane Stream via over land flow that will require appropriate management. The permitted development WCC Reg. Ref. 201088 includes for the ~~the~~ removal, infilling and redirection of the existing agricultural ditches that currently drain the site. Surface water discharge from the site will be

managed and controlled for the duration of the construction works until the permanently attenuated surface water drainage system of the proposed site is complete. A temporary drainage system shall be installed prior to the commencement of the construction works to collect surface water runoff by the site during construction.

All run-off will be prevented from directly entering into the existing water courses and drainage ditches. See Chapter 5 (Land, Soils, Geology and Hydrogeology) and Chapter 6 (Hydrology) for a full description of mitigation measures proposed.

During construction, contractors will require temporary power for onsite accommodation, and construction equipment and plant. The power requirements will be relatively minor. It is anticipated that generators will be provided on site to provide temporary power until a temporary connection to mains can be established.

Telecommunications including fibre required during the construction phase will be provided via a mobile connection.

The 110 kV Substation in itself do not require an operational electrical supply, there is limited water, and waste water demand associated with welfare facilities within the 110 kV Substation building, the new hardstanding and resultant surface water is to be managed via the permitted (WCC Reg. Ref. 201088) surface water drainage system.

The Cable Circuit B and Drop Down Mast in themselves do not require an operational electrical supply, there is no water, or waste water demand and no new hardstanding or surface water generation

Refer to Drainage and Water Services Design Report and Chapter 6 of the EIAR for further details.

4.0 STAGE 1 – FLOOD RISK IDENTIFICATION

In broad terms, the potential sources of flooding at the site can be categorised as:

- Fluvial (River) Flooding: The main risk of fluvial flooding is from the local hydrological environment. Fluvial or 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 area.

- Tidal/Coastal Flooding: The risk from coastal flooding is from surge events in the Irish Sea, this would appear to be low as the site is a considerable distance inland from the coast (c. 2km). Refer to Section 4.2 below.

- Pluvial Flooding: Pluvial flooding occurs when the capacity of the local urban drainage network is exceeded during periods of intense rainfall. At these times, water can collect at low points in the topography and cause flooding.

- Groundwater Flooding: Groundwater Flooding can occur during lengthy periods of heavy rainfall, typically during late winter/early spring when the groundwater table is already high. If the groundwater level rises above ground level, it can pond at local low points and cause periods of flooding. Groundwater flood is usually associated with areas of high karstification i.e. the west of Ireland.

Each of these potential sources of flooding are considered in this FRA.

4.1 HISTORICAL FLOODING RECORDS

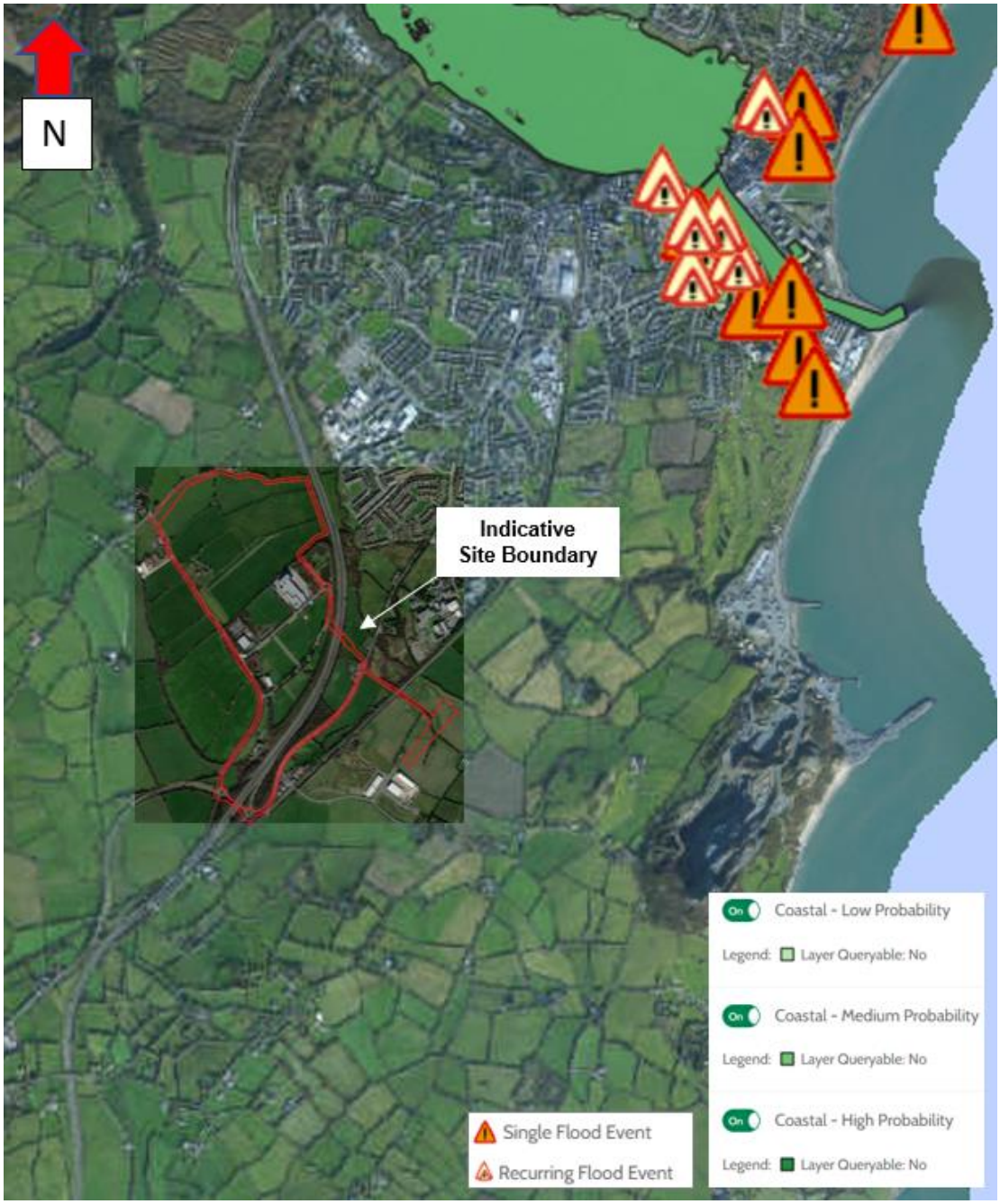
A review of the OPW Preliminary Flood Risk Assessment (PFRA) mapping data there are no previous flood events recorded within the proposed development site. Furthermore, the site in the proposed scenario will be developed and carefully managed for surface water runoff and attenuation will be in place to cater for the 1 in 100 year rainfall event as per the GDSDS document. There are no historic flood events recorded in the vicinity of the site.

4.2 FLUVIAL FLOODING

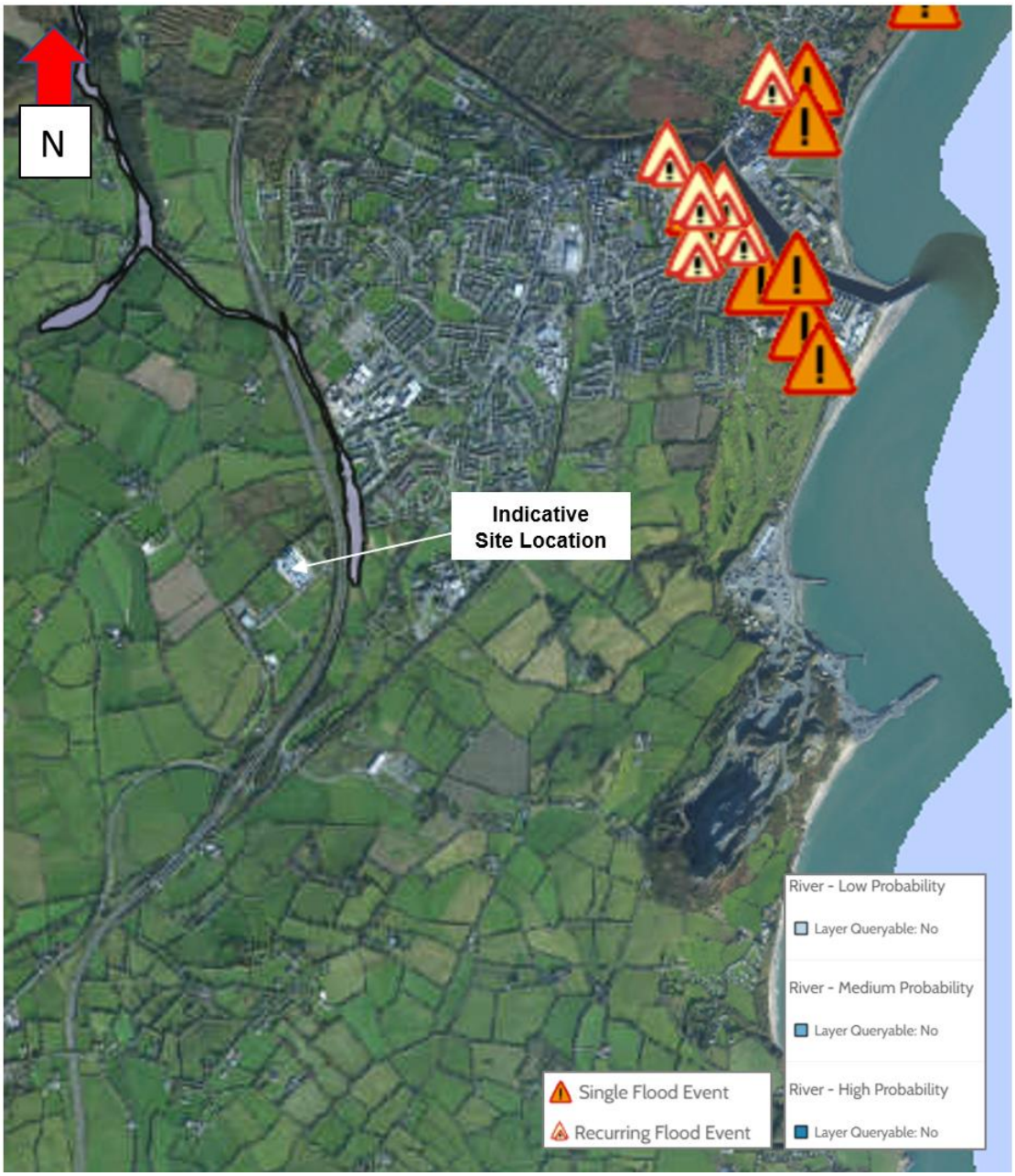
CFRAM Preliminary Flood Risk Assessment (PFRA)

The EU Floods Directive (2007/60/EC) required Member States to undertake a national preliminary flood risk assessment by 2011 to identify areas where significant flood risk exists or might be considered likely to occur. Members States were also required to prepare catchment-based Flood Risk Management Plans by 2018 that will set out flood risk management objectives, actions and measures. The OPW in co-operation with various Local Authorities produced a number of PFRAs which aimed to map out current and possible future flood risk areas and develop risk assessment plans. These have been used to form the Draft Flood Risk Management Plans aimed at identifying possible structural and non-structural measures to improve the flood risk.

As part of the CFRAM programme provisional flood maps had been produced by the OPW which have been used in this assessment. The PFRA flood maps do not indicate flooding risk throughout the proposed development site – Refer to Inserts 4.1 & 4.2 below.



Insert 4.1 *Extract from CFRAM Coastal Flooding Map for the Site Area (CFRAM, 2022).*



Insert 4.2 *Extract from CFRAM Fluvial Flooding Map for the Site Area (CFRAM, 2022).*

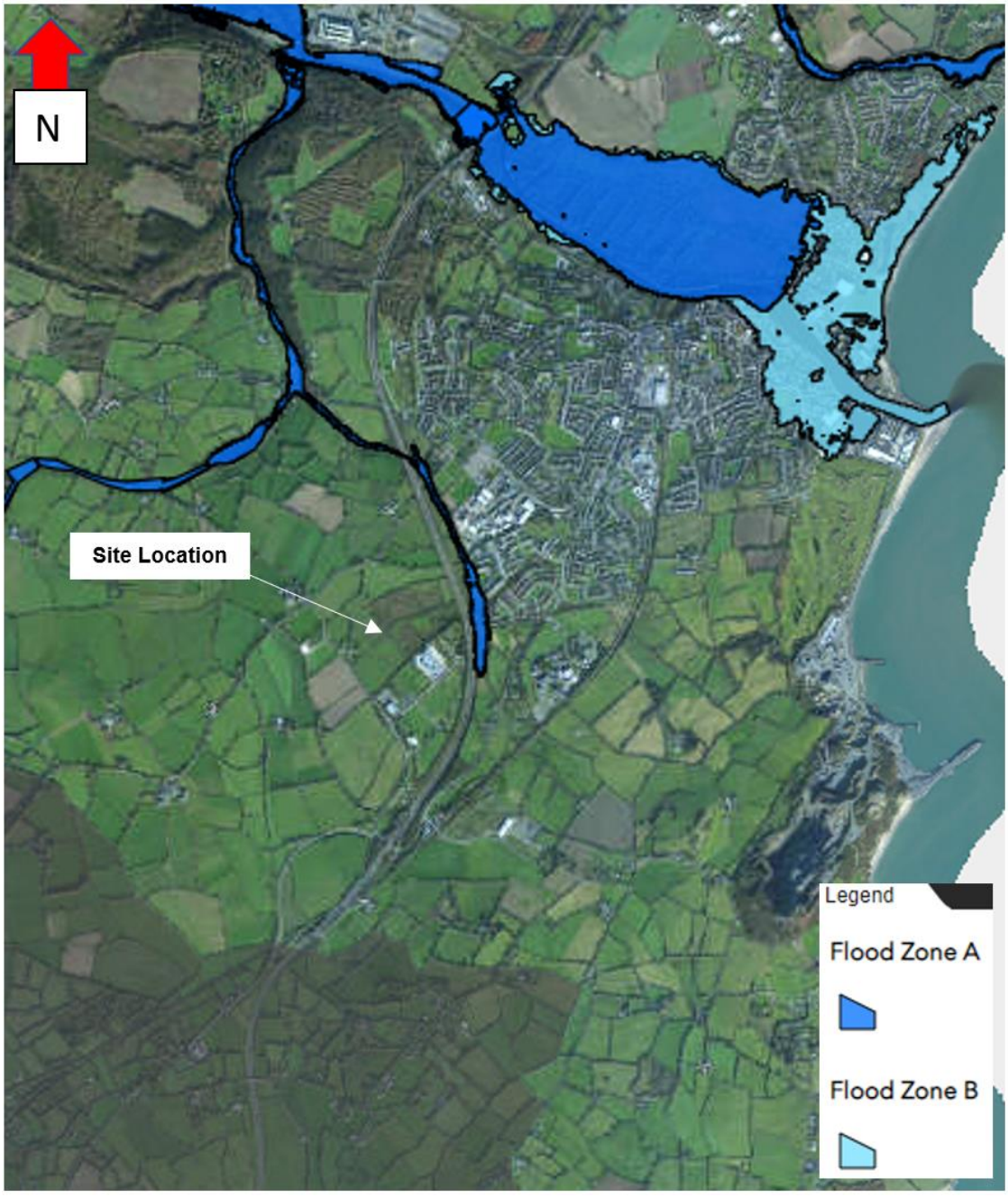
From reviewing Inserts 4.1 and 4.2 it is shown that the proposed development site is located entirely within Flood Zone C i.e. the probability of flooding is low (less than 0.1% AEP or in 1 in 1000 year) for Fluvial and Coastal flooding. The proposed development may be categorised as *"Appropriate"* as per the FRA Guidelines (OPW, 2009) as the development is "*Highly Vulnerable Development"*. Therefore a Justification Test for Development Management is not required in this case.

Strategic Flood Risk Assessment (SFRA) – Adopted Wicklow County Development Plan 2022-2028

Strategic Flood Risk Assessment (SFRA) for the Adopted Wicklow County Development Plan 2022-2028 was developed by Wicklow County Council (*Note: The SFRA will be finalised and published by 23rd October 2022*). Flood Risk Maps have been produced as part of this assessment based on desk and field studies including

predictive and historical indicators of flood risk, documented Council knowledge of lands, etc.

A Flood Risk Assessment mapping was developed by the Council and an extract is shown in Insert 4.3 below. The proposed development site is located nearby to flood zones A & B. However, the M11 forms the eastern boundary of the site acting as a natural flood defence from these zones if flooding were to occur. This shows the proposed development site is outside any defined flood risk zone and is located entirely within Flood Zone C (Source: https://www.wicklow.ie/Living/CDP2021).



Insert 4.3 *Extract from the Adopted Wicklow County Development Plan 2022-2028 (SFRA, 2022)*

4.3 PLUVIAL FLOODING

Flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours. The resulting water follows along natural valley lines, creating flow paths along roads and through and around developments and ponding in low spots, which often coincide with fluvial floodplains. Any areas at risk from fluvial flooding will almost certainly be at risk from surface water flooding.

An overall strategy for the management of pluvial risk is presented for the proposed development in the Drainage and Water Services Design Report. The development will incorporate a network of Sustainable Urban Drainage System (SUDS) measures, reducing flood risk and safeguarding water quality.

SUDS implementation aims to provide an effective system to mitigate the adverse effects of urban stormwater runoff on the environment by reducing runoff rates, volumes and frequency, reducing pollutant concentrations in stormwater, contributing to amenity, aesthetics and biodiversity enhancement and allowing for the maximum collection of rainwater for re-use where possible.

SUDS features will aim to replicate the natural characteristics of rainfall runoff by providing control of run-off at source

4.4 GROUNDWATER FLOODING

Groundwater flooding can be due to high water tables and increased recharge following extended periods of wet weather and usually associated with the karst areas of the west of Ireland. According to the OPW records, there have been no reported instances of groundwater flooding in the area of study. An analysis of datasets available online through GSI Mapping was undertaken to determine the potential for groundwater flooding. Groundwater flooding is most common in Karst areas. The GSI Groundwater Data Viewer shows no indication of any Karst features in the area. This indicates that the proposed site has a very low risk from groundwater flooding.

4.5 TIDAL/ COASTAL FLOODING

The risk from coastal flooding is from surge events in the Southwestern Irish Sea – Brittas Bay or in transitional waterbodies. As there is a considerable distance inland from the coast (c. 2 km) the proposed site has a very low risk from tidal or coastal flooding – refer to Insert 4.4 below.

Insert 4.4 *Extract from CFRAM Coastal Flooding Map for the Site Area (CFRAM, 2022).*

4.6 OTHER SOURCES OF FLOODING

There are no reservoirs, canals or other significant artificial sources in the vicinity of the development site. As such flooding from this source is not considered a risk to the site and therefore is not discussed further within this FRA.

4.7 OVERVIEW OF FLOOD RISK IDENTIFICATION

The OPW Historical records show that there is no evidence of flooding at the site. The desktop review shows the proposed development site is not at risk from coastal, pluvial, fluvial or groundwater flooding. Therefore, the proposed development is

located within Flood Zone C. Based of the 2009 Guidelines, it is concluded that this type of development is *appropriate* for this flood zonation.

Therefore, based ~~of~~on the nature of the development and the results presented above, it is considered that it is not necessary to proceed to Stages 2 and 3.

4.8 FLOOD MITIGATION MEASURES

A number of SuDS measures (refer to Chapter 6 of the EIAR and the Drainage and Water Services Design Report) are included in the design of the proposed development. In order to provide adequate stormwater attenuation for a 100-year rainfall event and 20% climate change (based on the allowances suggested by the OPW, refer to Section 1.5 above) while incorporating SUDS into the site and also incorporating long term and treatment storage, it is proposed to form a detention basin on the site.

The management of surface water for the proposed development has been designed to comply with the policies of the Waterford County Council and guidelines of the Greater Dublin Strategic Drainage Study (GDSDS) as reference (refer to the Drainage and Water Services Design Report). The overall objective is to minimise stormwater runoff and to collect and treat this minimised amount of runoff as close to the source as possible.

4.9 RESIDUAL RISK

According to the 2009 Guidelines, the residual risk remains after all risk avoidance, substitution and mitigation measures have been implemented, on the basis that such measures only reduce risk, not eliminate it.

The residual risk associated to climate change is considered to be low, based on CFRAM Mid-Range and High-End future models (refer to Section 1.5 – Table 1.3). Insert 4.1, Insert 4.2 & Insert 4.4 extracted from OPW and Insert 4.3 extracted from the Adopted Wicklow County Development Plan 2022-2028 (SFRA, 2022) show that the site is located within Flood Zone C for both cases.

Insert 4.5 Mid-Range *Future* Scenario *Flood Extent (OPW, 2022).*

Insert 4.6 *High End Future Scenario Flood Extent (OPW, 2022).*

In addition, the development include SUDS that have been designed with an allowance 20% increase in flows as suggested per 2009 Guidelines.

5.0 CONCLUSIONS

This Stage 1 Flood Risk Assessment has been undertaken in accordance with the FRM guidelines. The main aim of this FRA is to determine the risk of flooding to the site and the impact the development will have on the floodplain, upstream and downstream levels and any mitigation measures necessary. The OPW CFRAM online mapping and associated Maps were used to consider the risk of flooding to the proposed site. Based of the nature of the development and the results presented above, it is considered that it is not necessary to proceed to Stages 2 and 3.

The review of the available data on fluvial, pluvial, tidal/coastal and groundwater flooding shows that the proposed development site has no historical flood hazard identified in the vicinity; the entire site falls within Flood Zone C and no further

justification test is required. In addition, according to the EIAR Chapter 6 (Hydrology), there will be no impact on the existing hydrological regime and as such there is no likely flood risk associated with the proposed development. No residual risk is foreseen as the development is located outside any flooding zones associated with future scenarios (Mid Rane Future Scenarios "MRFS" and High End Future Scenarios "HEFS"). The development includes the implementation of SUDS that have been designed with an allowance 20% increase in flows as suggested per 2009 Guidelines.

Based on this information the proposed development complies with the appropriate policy guidelines for the area which include the Wicklow County Development Plan 2016-2022, Adopted Wicklow County Development Plan 2022-2028 (*Note: The SFRA will be finalised and published by 23rd October 2022*) and the National Development Plan 2018-2027.

Overall, it is concluded that this proposed development and the surrounding area is not at risk from flooding since the proposed development is located in Flood Zone C. The type of development is classed as a *'Highly Vulnerable Development'*. This type of development is deemed appropriate for this flood zonation.

6.0 REFERENCES

- The Planning System and Flood Risk Management Guidelines for Planning Authorities, DoEHLG, 2009.
- Base maps, Ordnance Survey Ireland.
- Flood Hazard Maps and flooding information for Ireland, www.floodinfo.ie
- GSI Bedrock Geology, Subsoils, Aquifers, Groundwater vulnerability online mapping, (source: www.gsi.ie).
- Wicklow County Council Development Plan 2016-2022 (source: Wicklow County Development Plan 2016-2022 | Wicklow.ie).
- Adopted Wicklow County Development Plan (2022-2028) (source: https://www.wicklow.ie/Living/Services/Planning/Development-Plans-Strategies/Stage-3-Draft-County-Development-Plan).
- Arklow and Environs Local Area Plan 2018 – Strategic Flood Risk Assessment (SFRA) (source: Microsoft Word - Appendix C - Strategic Flood Risk Assessment - ARKLOW & ENVIRONS LAP 2018 (wicklow.ie)
- The National Development Plan 2018 – 2027.
- Drainage and Water Services Design Report. 110kV GIS Substation. Alan Traynor Consulting Engineers Ltd, October 2022.

APPENDIX I

Figures

(AWN, 2022)

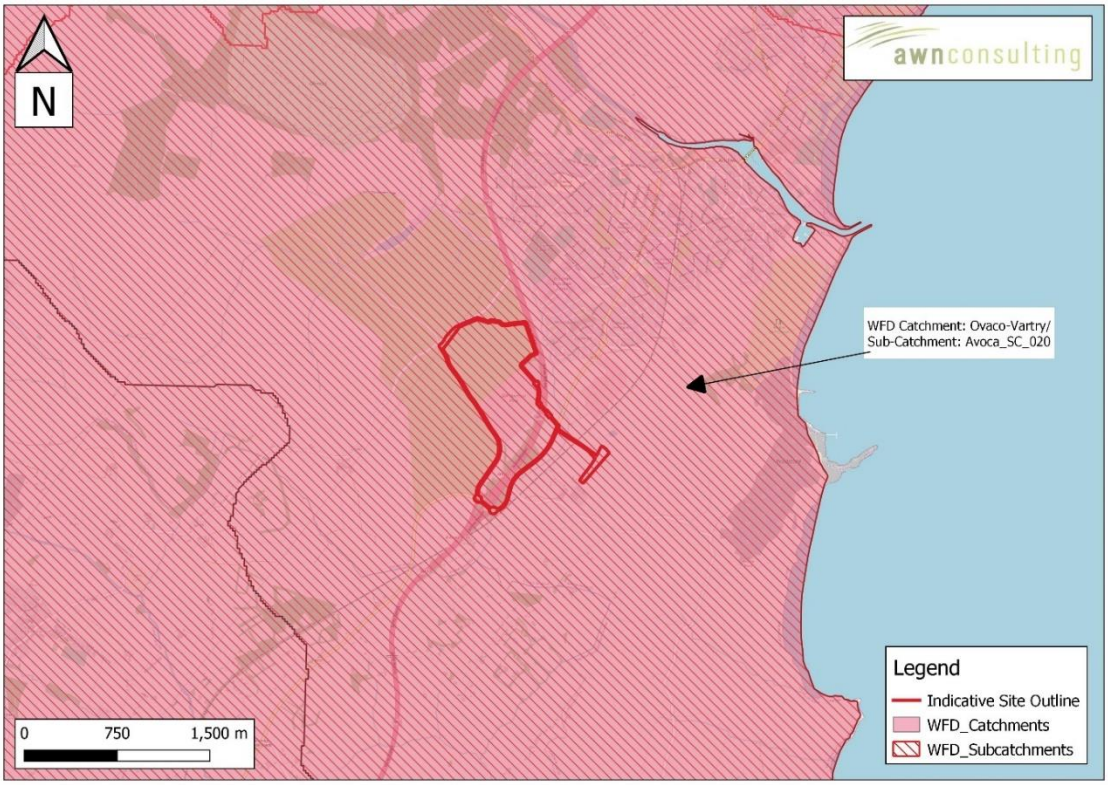


Figure 1 *WFD Catchments/Sub-Catchments (source: EPA, 2022)*

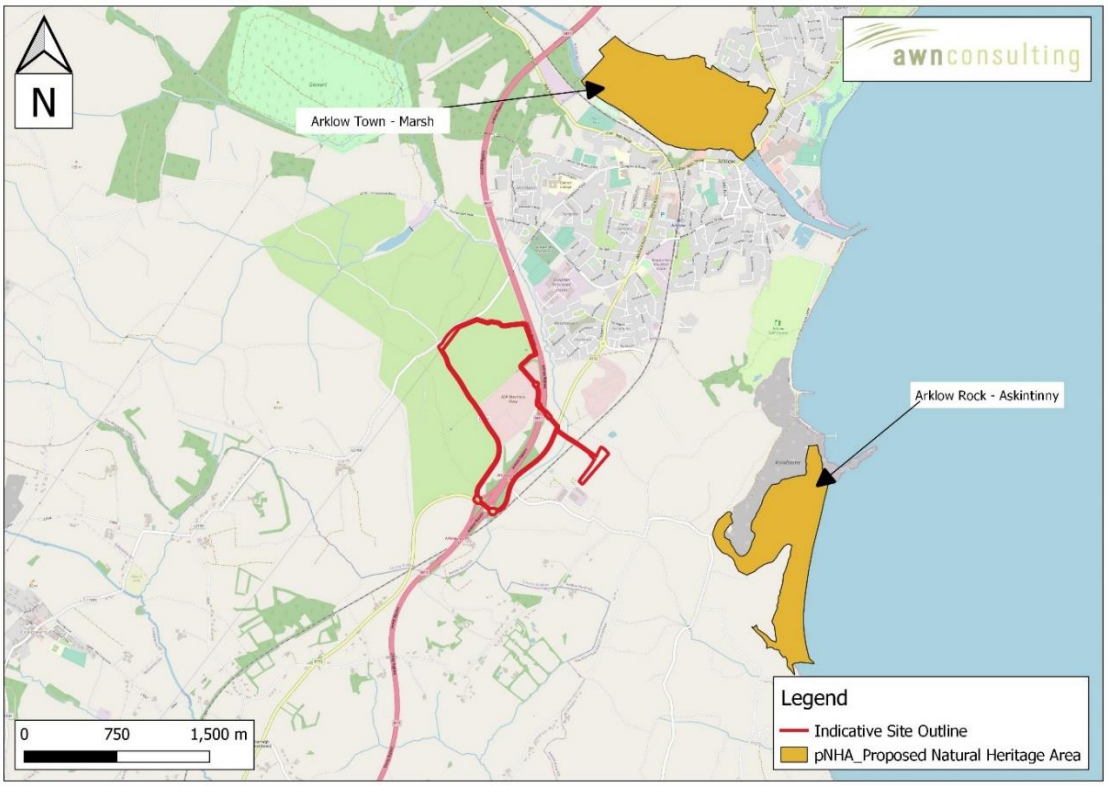


Figure 2 *Conservation Areas in context of the proposed development site (Source: EPA, 2022)*

Figure 3 *Subsoils Map (Source: Teagasc, 2022)*

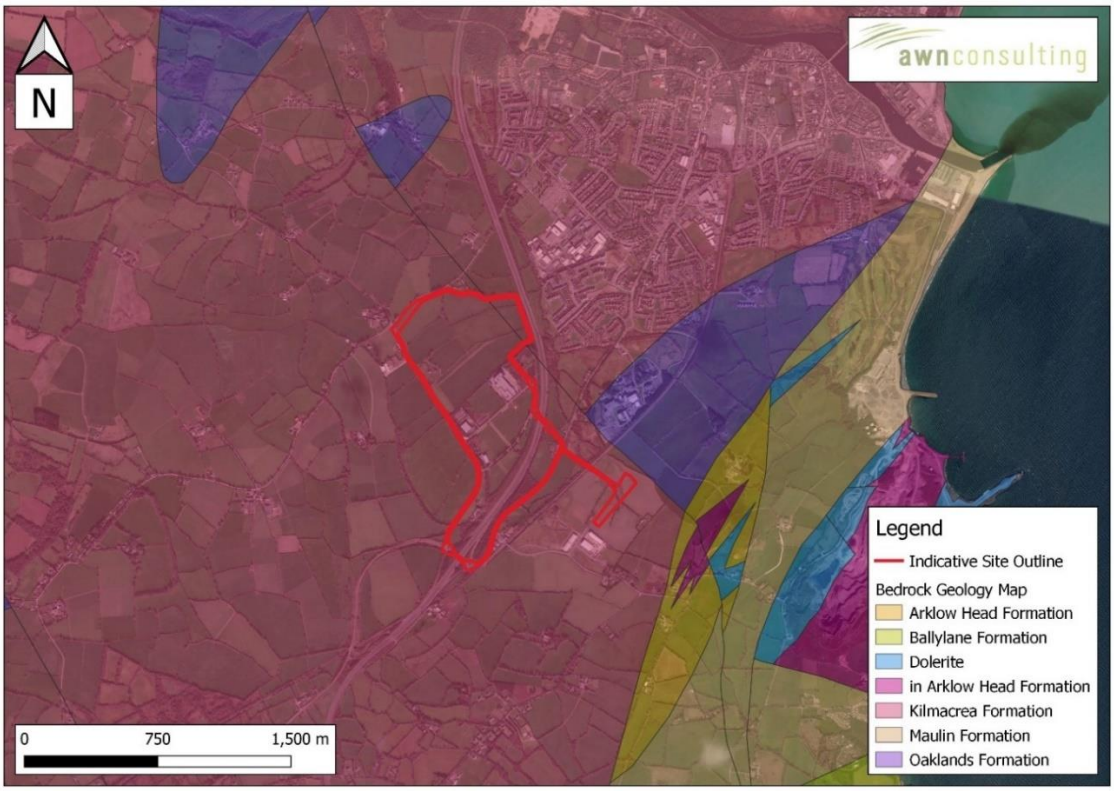


Figure 4 *Bedrock Geology Map (source: GS1, 2022)*

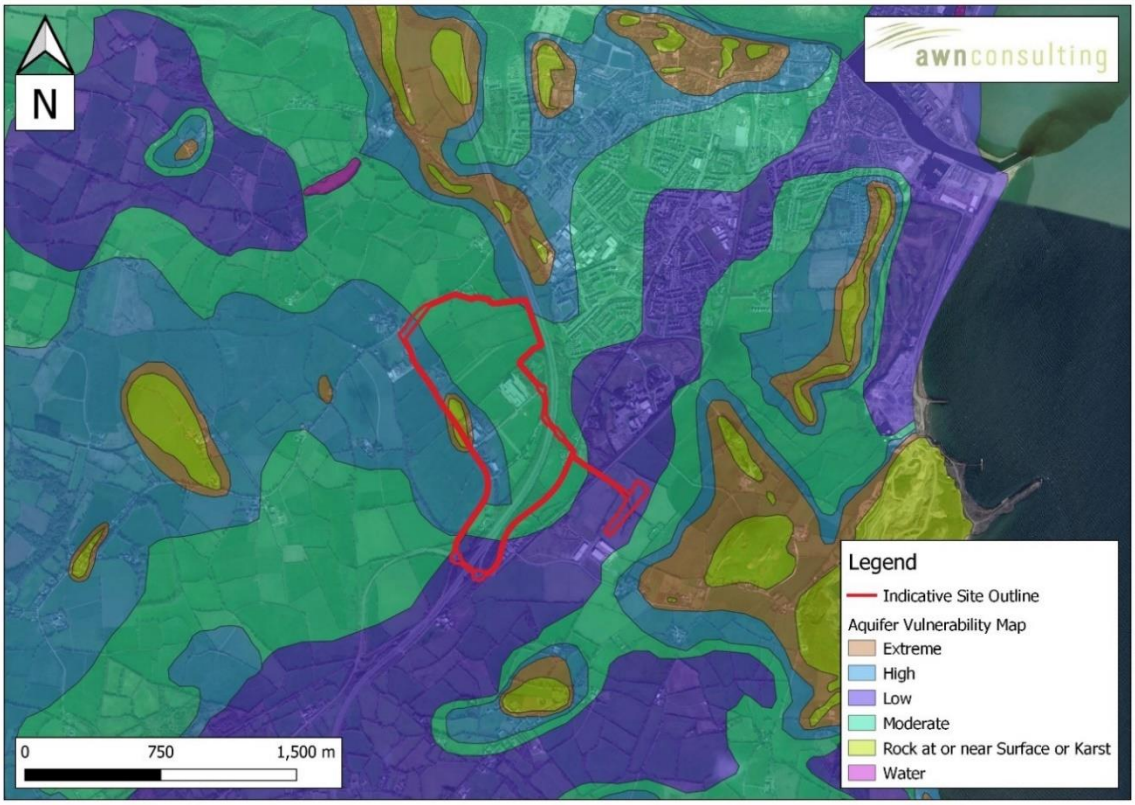


Figure 5 *Aquifer Vulnerability Map (Source: GSI, 2021)*

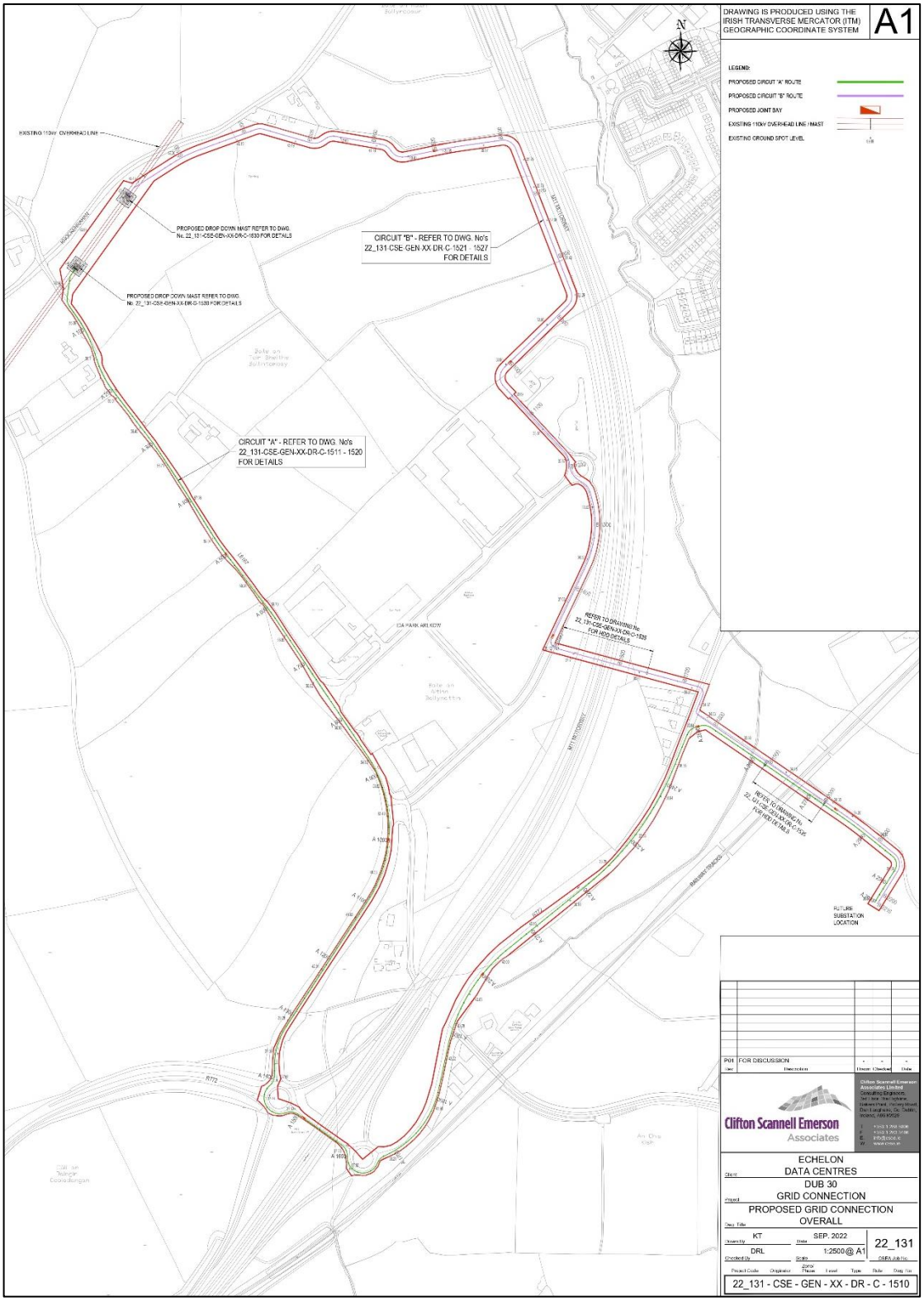


Figure 6 *Cable Circuit Site Layout (CSEA Sheet: 1510)*

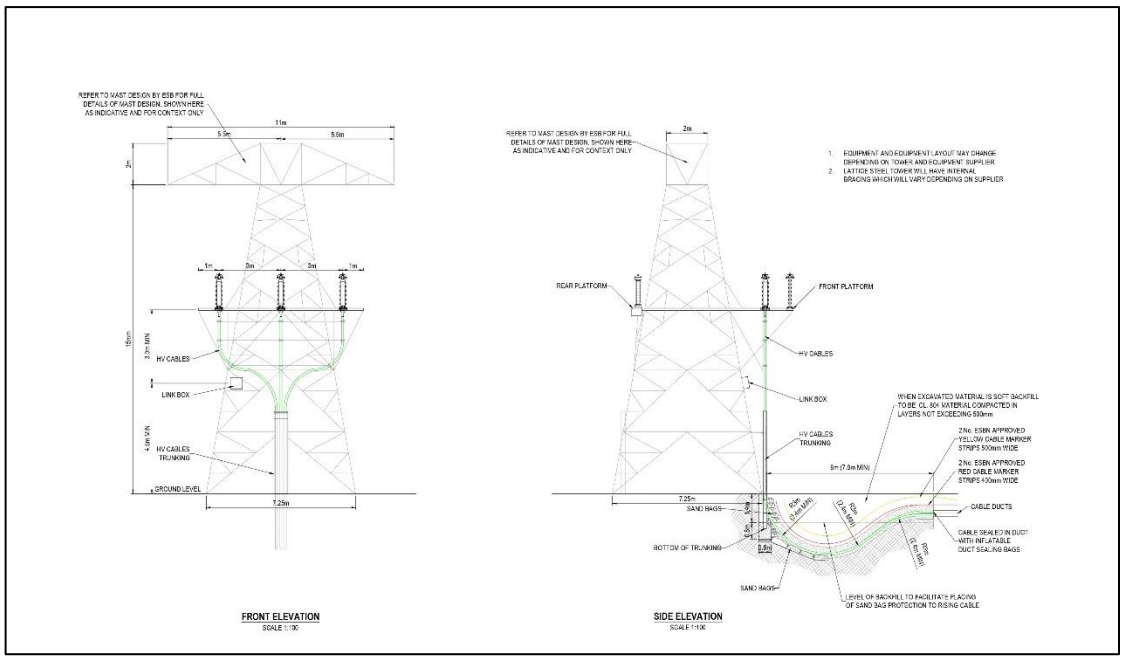


Figure 7 *Typical Mast Detail (CSEA Sheet:1530)*