

QUINTAIN DEVELOPMENTS IRELAND LIMITED

Portmarnock South Phase 1D

Flood Risk Assessment

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SECTION 1: Introduction

1.1 General

Quintain Developments Ireland Limited is applying for Planning Permission to An Bord Pleanála (ABP) for a residential development at Portmarnock South Phase 1D in the townlands of Maynetown and Portmarnock, Co Dublin. The development will consist of 172 residential units, associated roads, landscaping, and services. An upgrade to an existing temporary wastewater pumping station to the north of the residential development is also proposed. This report has been prepared in support of the Planning Application.

The aim of this FRA is to identify, quantify and communicate to decision makers and other stakeholders the risk of flooding associated with the proposed development.

The FRA has been carried out in accordance with 'The Planning System and Flood Risk Management Guidelines' (hereafter referred to as the FRM Guidelines) published in November 2009 jointly by the then Department of the Environment, Heritage and Local Government, DEHLG, (now the Department of the Environment, Community and Local Government, DECLG) and the Office of Public Works (OPW).

The proposed development site is located to the southeast of Portmarnock Train Station in Portmarnock, Co. Dublin, as shown in *Figure 1-1* below. Access to the development will be from Station Road to the north and Moyne Road to the south.



Figure 1-1: Location of Proposed Development (Source: Google Maps, annotation by J.B. Barry & Partners)

1.2 Portmarnock South –Local Area Plan (2013-2019 - Extended to 2023)

The proposed site is located within the Portmarnock South Local Area Plan (LAP) lands. The Strategic Flood Risk Assessment (SFRA) included in the LAP recommends a site specific flood risk assessment for areas identified at risk in the event of development. The recommendations of the SFRA have been reviewed and the suggested mitigation measures will be applied in the proposed development.

SECTION 2: Flood Risk Assessment Methodology

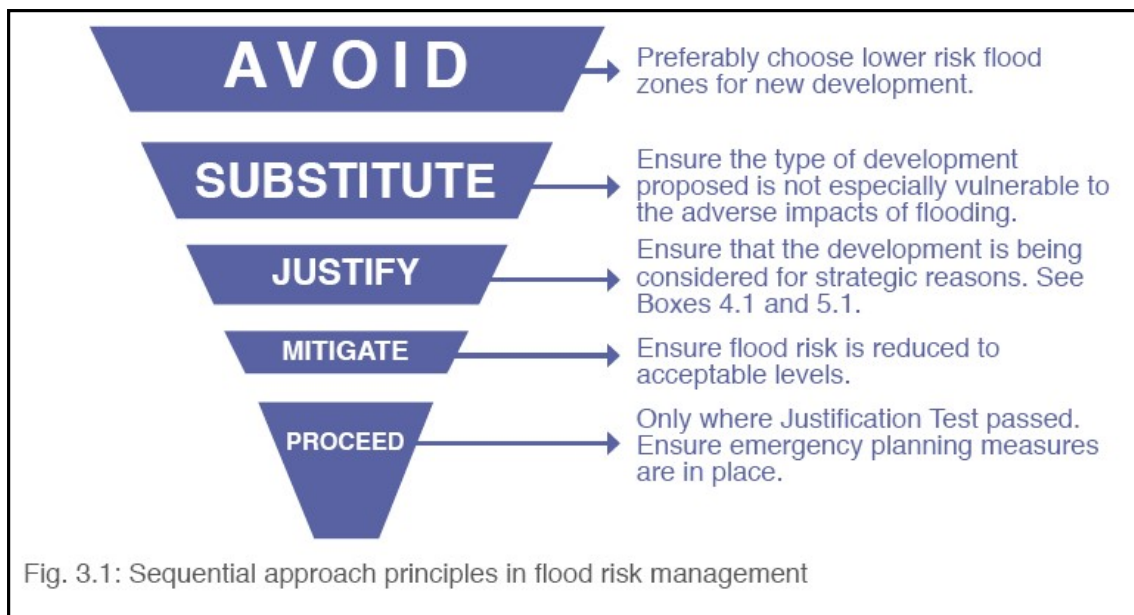
2.1 Methodology

The methodology used for the flood risk assessment for the proposed development is based on ‘*The Planning System and Flood Risk Management, Guidelines for Planning Authorities*’ (2009)’. The FRM Guidelines require the planning system at national, regional and local levels to:

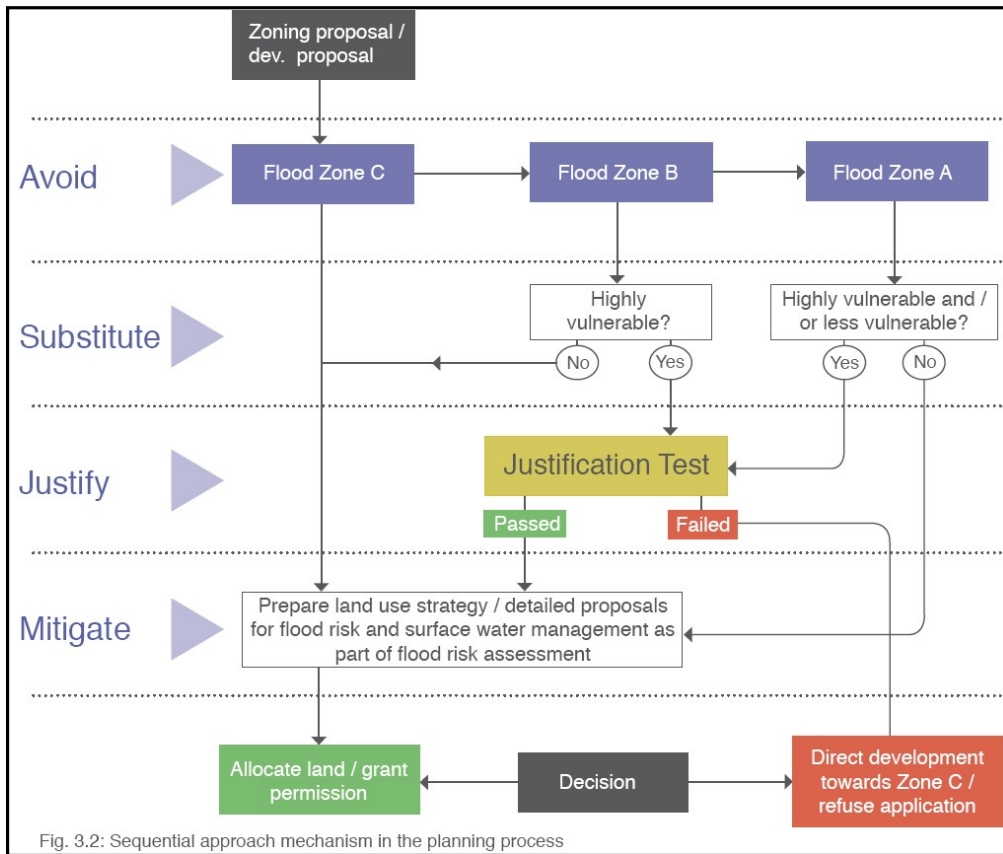
- Avoid development in areas at risk of flooding, particularly floodplains, unless there are proven wider sustainability grounds that justify appropriate development;
- Adopt a sequential approach to flood risk management when assessing the location for new development based on avoidance, reduction and then mitigation of flood risk; and
- Incorporate flood risk assessment into the process of making decisions on planning applications and planning appeals.

The sequential approach (see Figure 3.1 of the FRM Guidelines below) in flood risk management requires the following three steps to identify the necessity for the justification test for a development:

- Step 1: Identification of the Flood Zone at the proposed development site (Section 2.23 of the FRM Guidelines);
- Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines); and
- Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development.



While Figure 3.1 of The FRM Guidelines sets out the broad philosophy underpinning the sequential approach in the flood risk management, Figure 3.2 of the Guidelines (shown below) describes the mechanism of the sequential approach for use in the planning process.



According to the FRM Guidelines, Flood Zones are graphical areas within which the likelihood of flooding is in a particular range. 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 Flood Zones, namely,

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% AEP or 1 in 100 year 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% AEP or 1 in 1000 year and 1% AEP or 1 in 100 year for river flooding and between 0.1% AEP or 1 in 1000 year and 0.5% AEP or 1 in 200 year for coastal flooding); and
- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding).

Flood Zones A, B and C are based on the current assessment of the 1% AEP and the 0.1% AEP fluvial events and the 0.5% AEP and 0.1% AEP tidal events, without the inclusion of climate change factors. Table 3.1 of the FRM Guidelines (see below) shows the classification of the vulnerability to flooding of different types of development.

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 3.1 Classification of vulnerability of different types of development

Table 3.2 of the FRM Guidelines (shown below) identifies the types of development that would be appropriate for each Flood Zone and those that would be required to meet the Justification Test. Since dwelling houses are classified as highly vulnerable development the section highlighted in Table 3.2 presents the required actions for each flood zone.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Table 3.2: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.

The FRM Guidelines (Chapter 2) outlines the following three stages of flood risk assessment:

Stage 1: Flood risk identification – to identify whether there may be any flooding or surface water management issues relating to the proposed development site that may warrant further investigations.

Stage 2: Initial flood risk assessment – to confirm sources of flooding that may affect the 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. This stage involves the review of existing studies and hydraulic modelling to assess flood risk and to assist with the development of FRM measures.

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 impacts 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 across a wide enough area to appreciate the catchment wide impacts and hydrological process involved.

2.2 Data Collection

Data required for the flood risk assessment was obtained from various sources, as described below.

- The historic flood data was obtained from the National Flood Hazard Mapping website www.floodmaps.ie
- The Subsoil and Aquifer vulnerability data was obtained from the Geological Survey of Ireland website www.gsi.ie
- The Preliminary Flood Risk Assessment (PFRA) map was obtained from the Catchment Flood Risk Assessment and Management study website www.cfram.ie
- Greater Dublin Strategic Drainage Study (GSDSDS) – 2005
- Dublin Coastal Flooding Protection Project (DCFPP) – 2005
- Irish Coastal Protection Strategy Study (ICPSS) Phase III – 2008
- Fingal East Meath Flood Risk Assessment and Management Study (FEMFRAM Study)
- Portmarnock South Local Area Plan 2013-2019

SECTION 3: Existing Hydrological Environment

3.1 Salient Hydrological Features

The main hydrological features of the area are the Sluice River, the Mayne River and Baldoyle Estuary. The Sluice River flows in a south easterly direction to the north east of the site and flows in to the Baldoyle Estuary to the east of the site. The Mayne River flows in an easterly direction to the south of the site. *Figure 3-1* below illustrates the main hydrological features associated with the site. Given its location, the primary flood risk to the site is from the fluvial flood from the Sluice River and tidal/coastal flood from Baldoyle Estuary.



Figure 3-1: Hydrological Features of the Area (Source: EPA Map Viewer, annotation by J.B. Barry & Partners)

3.2 Existing Geology and Hydrogeology of the Area

The Geological Survey of Ireland (GSI) website provides information on their public online mapping service at www.gsi.ie on subsoil type. The map presented in Figure 3-2 (Source: www.gsi.ie, annotation by J.B. Barry & Partners) depicts the subsoil for the proposed development site. The GSI subsoil mapping indicates that the site consists of both deep well drained mineral and poorly drained mineral.

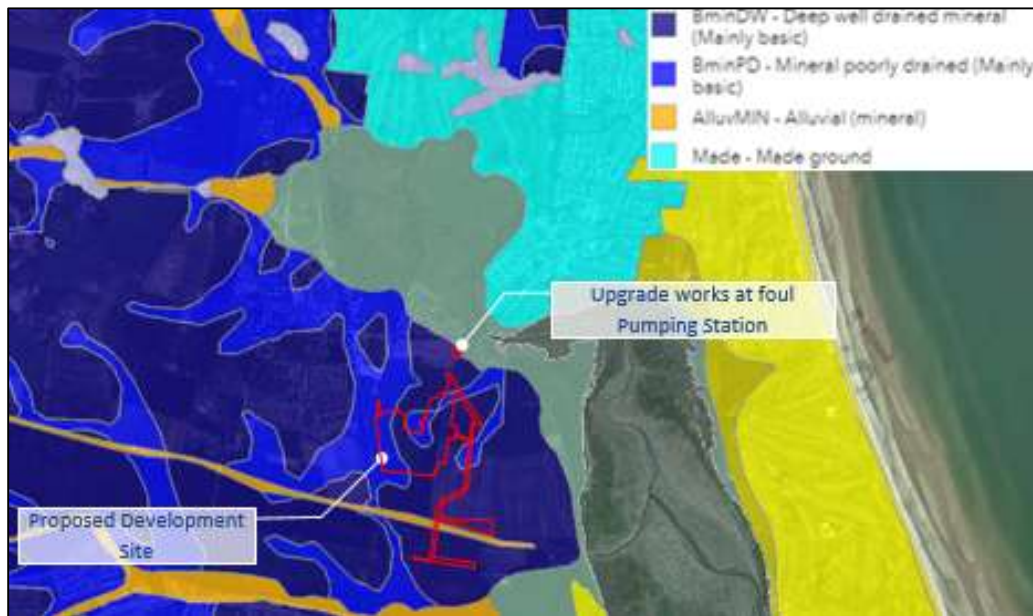


Figure 3-2: GSI Subsoil Mapping (Source: www.gsi.ie, annotation by J.B. Barry & Partners)

Furthermore, the interactive web-mapping site classifies the aquifer vulnerability in this region as having a low vulnerability rating (*Figure 3-3*). The GSI state that “Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities”. The GSI further describes that the vulnerability of groundwater depends on:

- (i) The time of travel of infiltrating water (and contaminants);
- (ii) The relative quantity of contaminants that can reach the groundwater; and
- (iii) The contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate

Firstly, the vulnerability rating for an area indicates, and is a measure of, the likelihood of contamination. Secondly, the vulnerability map helps to ensure that a groundwater protection scheme is not necessarily restrictive on human economic activity. Thirdly, the vulnerability map helps in the choice of preventative measures and enables developments, which have a significant potential to contaminate, to be located in areas of lower vulnerability.

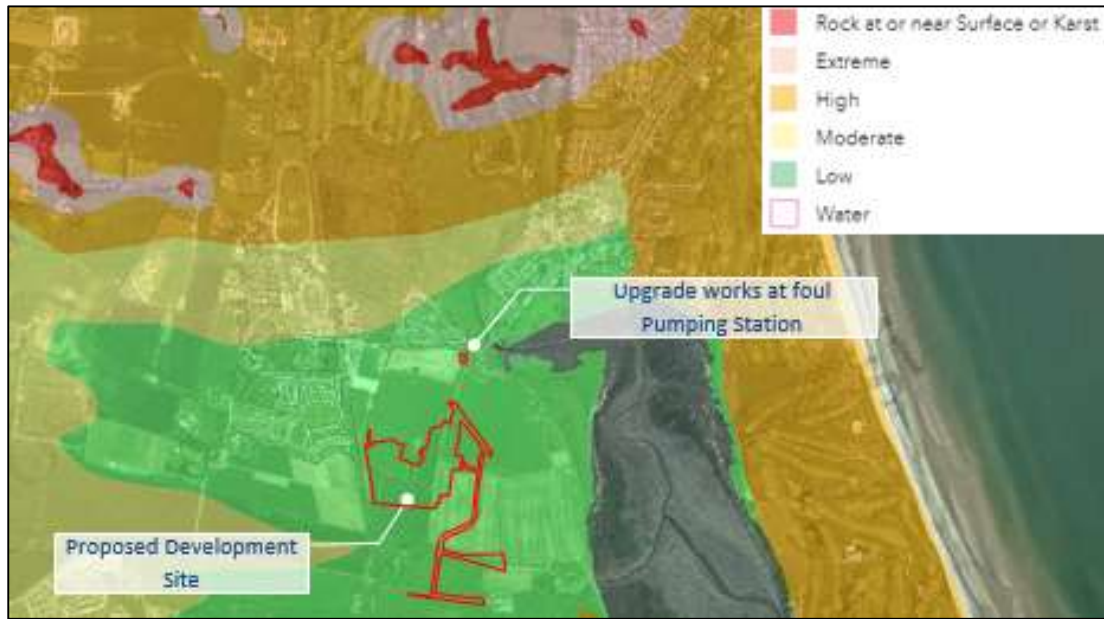


Figure 3-3: GSI Aquifer Vulnerability Mapping (Source: www.gsi.ie, annotation by J.B. Barry & Partners)

3.3 Flood Regime of the Area

The National Flood Hazard Mapping Website www.floodmaps.ie does not show any records of historic floods occurring at the proposed development site, however it does show records of recurring floods at the junction of Station Road and Strand Road which is within the vicinity of the proposed development site (Figure 3-4). A report on the flood prepared by Fingal County Council, identifies that flooding occurred on Strand Road in 2002 as a result of high sea levels in the Baldoyle Estuary.

A Summary Local Area Report (SLAR) was generated for the site, which identifies all flooding events, which occurred within the vicinity of the proposed development site (included in Appendix 1).

The following further information is available in the above website on the above flooding incidents at Strand Road.

- 1st February 2002: House No 1 and its front garden flooded; House No’s 2 - 6 front garden and driveways flooded; House No’s 6 – 18 requested and were provided with sand bags
- 20th & 21st October 2002: Flooding occurred on the Strand Road because gullies did not function properly. The gullies are connected to soakaways, as a gravity system is not available, which have blocked.

According to the Fingal County Council Area Engineer Report (2005) available in the above website, flooding at Portmarnock Bridge occurred due to combination of high tides and high river flow. The road was raised by 380mm in 2004 and hence this should rectify the problem of recurrence flooding.

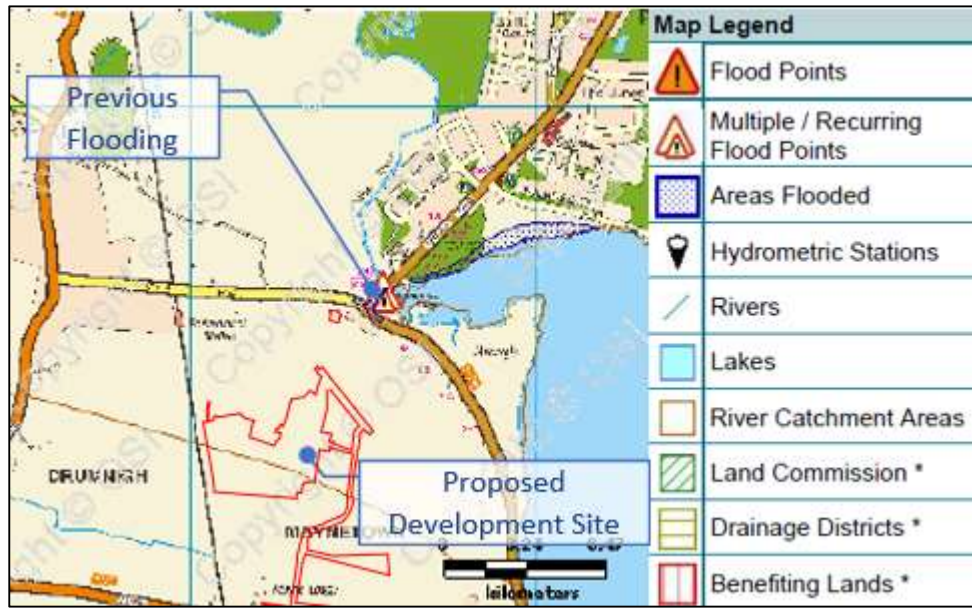


Figure 3-4: Location of historic flooding in the vicinity of the proposed site (Source: www.floodmaps.ie annotation by J.B. Barry & Partners)

3.4 Existing Flood Studies

3.4.1 Greater Dublin Strategic Drainage Study

The Greater Dublin Strategic Drainage Study (GSDSDS), published in March 2005, identifies policies for the management of drainage services in the Greater Dublin Area. According to the GSDSDS, all new development should incorporate Sustainable Urban Drainage Systems (SuDS) for the management of surface water runoff.

According to Volume 5 (Climate Change) of the GSDSDS, the sea level for 0.5% AEP, based on historic records, is +2.89mOD at Dublin Port. However, as the February 2002 tidal flood level was +2.95mOD, Volume 5 suggested that the precautionary position is to use +2.95mOD. With an increase in sea level by 440mm in the future (2080 – 2100) horizon, the design 0.5% AEP tidal level shall be taken as **+3.4mOD**.

3.4.2 Dublin Coastal Flooding Protection Project

The Dublin Coastal Flooding Protection Project (DCFPP), undertaken jointly by Dublin City Council and Fingal County Council, was completed in 2005. The project covers the Dublin City coastal area from the Martello Tower in Sandymount to the north of Portmarnock. The project was implemented as a response to the extreme tide and flood event that was experienced across Dublin on the 1st February 2002. This tide was the highest on record since 1922, being in excess of 1 metre above the predicted tide for that day.

The report included a detailed analysis of mean sea levels using actual historic data as well as a review of the latest international best practice. A number of hydraulic models were constructed to look at wave conditions, tidal modelling, river modelling and overtopping modelling.

The study also investigated the significance of the February 2002 event and concluded that it was an extreme event having a return period in excess of approximately 60 years. According to the DCFPP Report, the 0.5% AEP extreme tide level at Dublin Port is **+3.13mOD** (without adding any allowance for climate change).

3.4.3 Irish Coastal Protection Strategy Study

The Irish Coastal Protection Strategy Study (ICPSS) is a national study that was commissioned in 2003 with the objective of providing information to support decision making about how to best manage risks associated with coastal flooding and coastal erosion. The Study was completed in 2013 and provides strategic coastal flood hazard maps for the national coastline. The study involved modelling of combined storm surges and tide levels, which estimated extreme water levels and coastal flood extent for various design AEP's along the coastline.

The ICPSS current scenario flood maps for the 0.5% AEP and 0.1% AEP flood extents in the vicinity of the study area are presented in Appendix 2. The extract from the ICPSS tidal flood extent map (*Figure 3-5*) indicates that the proposed residential development site and pumping station are located outside of both the 0.1% AEP and 0.5% AEP coastal flood extents. Consequently, the residential site and pumping station are considered to be located in Flood Zone C, where the probability of tidal flooding is lowest.

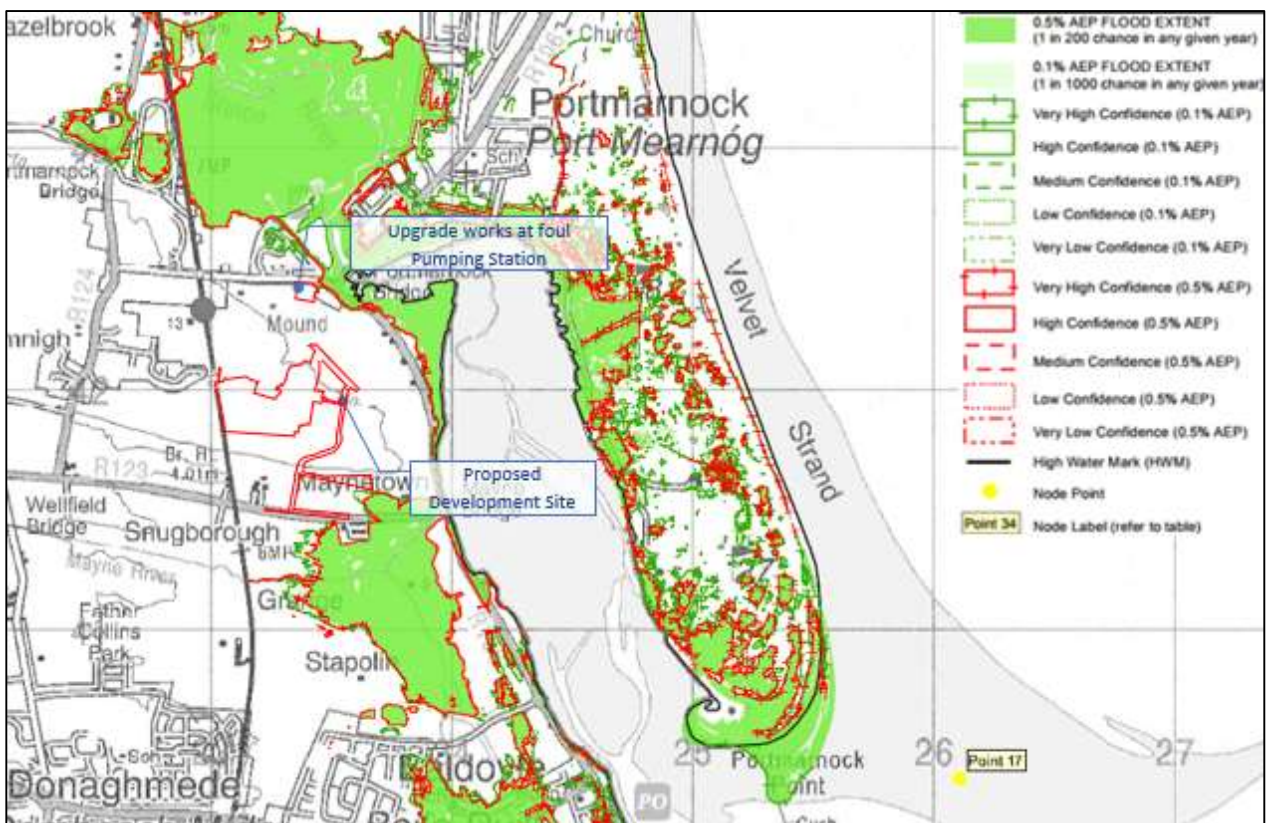


Figure 3-5: Extract of ICPSS Flood Map (Source: www.opw.ie, annotation by J.B. Barry & Partners)

3.4.4 Catchment Flood Risk Assessment and Management Study (CFRAMS)

The OPW, as lead agency for flood risk management in Ireland, is producing Flood Risk Management Plans (FRMP), in line with National Flood Policy and the requirements of the EU Floods Directive. Draft FRMP's are currently being produced by the OPW under the CFRAM Study. The Draft FRMP's make use of the information provided through the flood maps that have previously been produced under the CFRAM Programme and previous parallel projects. The Draft FRMP's set out a range of proposed measures and actions to manage and reduce flood risk within the catchments and coastal reaches covered by each Draft Plan, focusing on the 300 areas of potentially significant flood risk around Ireland that were identified under the PFRA. The Flood Maps associated with the FRMP's are currently being finalised and will be made available online to view when the Draft Plans are published for consultation.

Figure 3-6 below is an extract from the Fluvial Flood Extent Map concerning the proposed development site. This map is included in Appendix 3. Observation of *Figure 3-6* demonstrates that the residential site

and pumping station site lie outside of the 0.1% Fluvial AEP event and are therefore located within Flood Zone C.

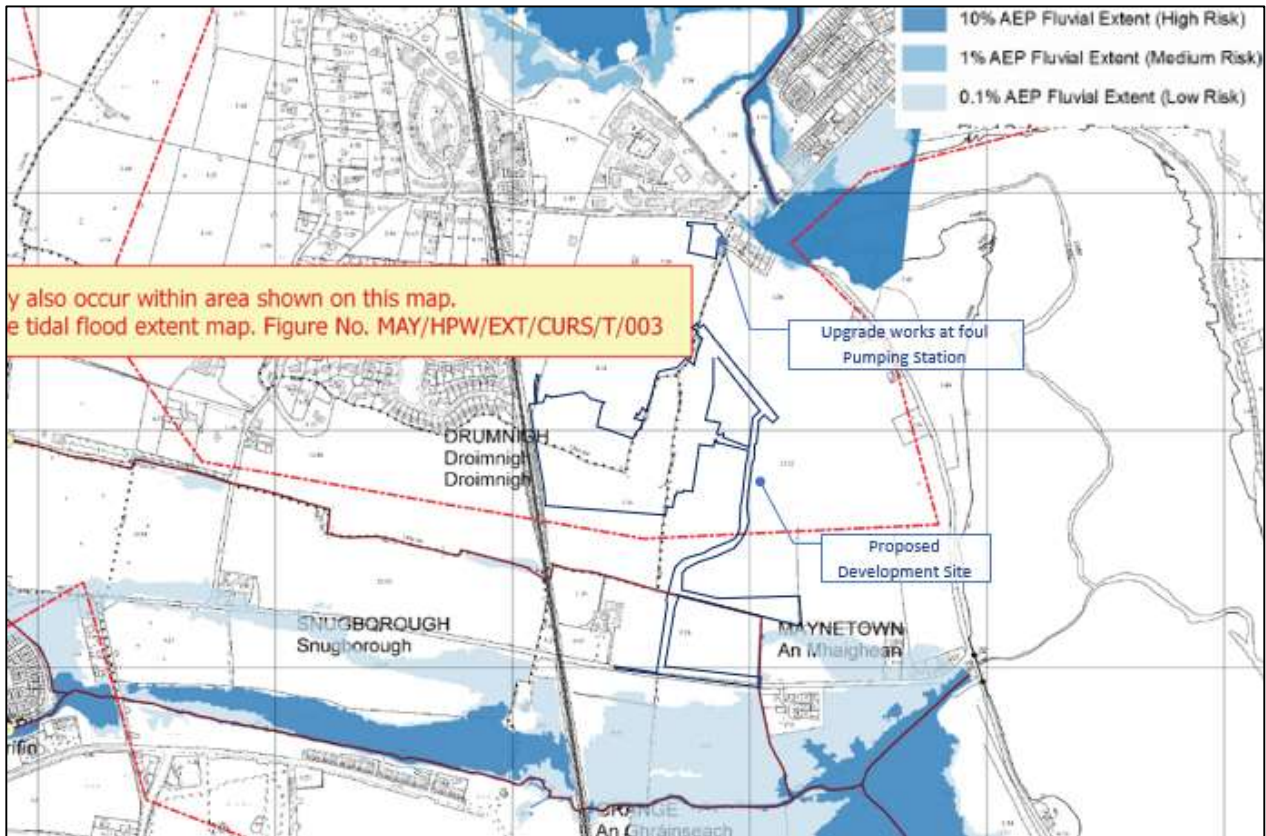


Figure 3-6: Extract from the FEMFRAMS Current Scenario Fluvial Flood Extent Map

Figure 3-7 below is an extract from the Coastal Flood Extent Map on the CFRAMS website concerning the proposed development site. There was no pdf map available at the exact location of the site, however the coastal flood map adjacent to the site shows that the flood extent does not extend to the site boundaries. This map is included in Appendix 3. It can be seen from Figure 3-7 that the proposed residential development site and pumping station site lie outside of the 0.1% Coastal AEP event and are therefore located within Coastal Flood Zone C, where flooding is not considered to be significant. This is consistent with the ICPSS flood map shown in Figure 3-5.

The CFRAMS coastal map in Appendix 3 also provides the coastal flood levels near the proposed development site during the 0.5% and 0.1% AEP Coastal Events. To the east of the site, water levels in the estuary at the nearby Node 073 are +3.2mOD and +3.43mOD for the 0.5% and 0.1% AEP flood events respectively.

It is recommended by the OPW that potential future scenarios are considered. In a conservative fashion, the High End Future Scenario (HEFS) will be considered for the purpose of this FRA. The OPW have set out allowances for the Mean Sea Level Rise for the HEFS scenario discussed above. It is recommended to utilise a mean sea levels rise of +1000mm for the HEFS. Accordingly, the resulting design water levels for the proposed development are shown in Table 3-1 below.

Table 3-1: Design Water Levels for the Proposed Development

Current Scenario 0.5% AEP Flood Level	HEFS Scenario 0.5% AEP Flood Level
+3.2mOD	+4.2mOD
Current Scenario 0.1% AEP Flood Level	HEFS Scenario 0.1% AEP Flood Level
+3.43mOD	+4.43mOD

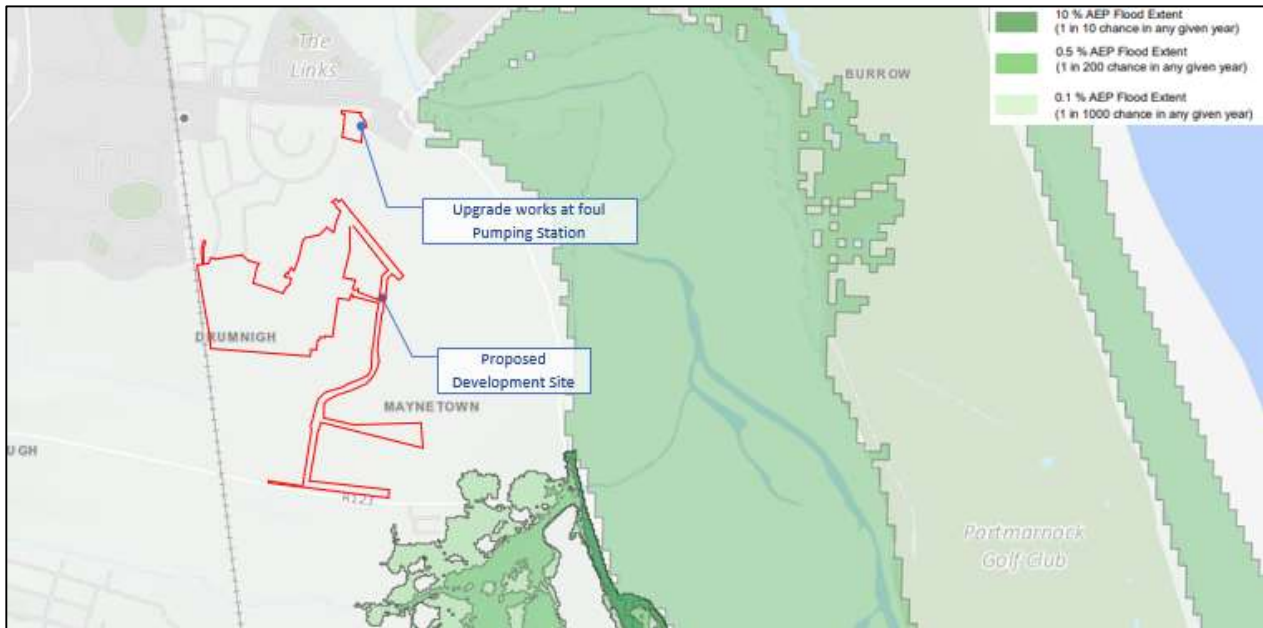


Figure 3-7: Extract from the FEMFRAMS Current Scenario Coastal Flood Extent Map

3.4.5 Portmarnock South Local Area Plan – Flood Risk Assessment (2013-2019 – Extended to 2023)

Fingal County Council commissioned a Strategic Flood Risk Assessment for the Portmarnock South Local Area Plan in November 2012. The study, which was based mainly on review of flood maps produced by FEM FRAMS recommended that a site-specific FRA should be carried out for any proposal for development of these lands, or where any works proposed could potentially impact on these lands, made several recommendations in this regard.

The study identifies the potential sources of flooding in four areas, and recommended mitigation measures to mitigate the flood risk in each of these areas (See Appendix 4). Of the four potential sources of flooding areas, Area 1 is located near the proposed development. The Portmarnock South LAP FRA study has made the following recommendation to mitigate flooding at Area 1(Refer to Appendix 4 for SFRA Map).

- Set the building finished floor levels at an appropriate level above the appropriate predicted flood levels.
- Determine as part of the detailed design the impact of flooded outfalls/tide locking on the outfall from this area and mitigate against the same.
- Provide adequate overland flood routing away from this area, ensuring flood routing is directed away from properties and vulnerable infrastructure.

The mitigation measures incorporated to the development in order to meet the above recommendations are discussed in Section 4.5.

SECTION 4: Flood Risk Assessment

4.1 Introduction

As outlined in Section 2 of this report the FRM guidelines identifies three stages of Flood Risk Assessment namely;

- Stage 1: Flood Risk Identification
- Stage 2: Initial Flood Risk Assessment
- Stage 3: Detailed Flood Risk Assessment

4.2 Flood Risk Identification

According to the FRM Guidelines, flood risk identification is the process for deciding whether a plan or project requires further investigation. This is a desk-based exercise based on existing information. All the existing information is described in Section 3 and the identification of flood risk from each of the five sources of flooding (coastal, fluvial (river), groundwater, pluvial (rainfall) and from artificial drainage systems) is considered.

Coastal Flood Risk

The ICPSS Map in Appendix 2 and CFRAM Map in Appendix 3 both indicate that the proposed development site lies outside of the 0.1% AEP coastal flood event and hence is located within **Flood Zone C** for Coastal flood risk, where the risk of flooding is low.

Fluvial Flood Risk

The CFRAMS Map in Appendix 3 indicates that the proposed development site lies outside of the 1% and 0.1% AEP fluvial flood extents and thus is deemed to be in **Flood Zone C**. The OPW Summary Local Area Report shows no indication of previous fluvial related flooding at the proposed site.

Groundwater Flood Risk

There is no historical evidence of groundwater flooding at the site and there is no indication on the maps of any springs or wells on this site. The GSI vulnerability map states the site as having a low vulnerability rating suggesting a low water table. Groundwater risk is therefore not considered to be significant.

Pluvial Flood Risk

During extreme rainfall events the application of SuDS principles will ensure surface water is managed sufficiently and sustainably discharged to the drainage network and the Baldoyle Estuary. This is in accordance with the Greater Dublin Strategic Drainage Study, 2005 which requires all new developments to incorporate SuDS unless it can be demonstrated that such facilities are not feasible. With these mitigation measures in place, pluvial related flooding is not considered to be significant following the completion of the development.

Artificial Drainage Systems Flood Risk

There are no artificial drainage systems currently present on site. However, the proposed development includes for a surface water sewer network which will connect into the existing surface water sewer network within the Portmarnock South lands. This ultimately flows through the existing regional wetland and discharges through a non-return valve into Baldoyle Estuary. The surface water sewer network has been modelled and no flooding occurs. Consequently, artificial drainage systems flood risk is not relevant.

4.3 Initial Flood Risk Assessment

The Stage 1 – Flood Risk Identification has identified that there are no significant flood risks to the site. Under the sequential approach identified in the FRM Guidelines a three-step approach is required to confirm the appropriateness of the development in terms of flood risk.

Step 1: Identification of the Flood Zone at the proposed development site

Using the Flood Zone criteria from the FRM Guidelines and as defined in Section 2 previously, the flood zones for the site was determined.

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 year 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 year and 1% or 1 in 100 year for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 year 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).

As previously noted in the above sections, the proposed development site is located outside of Flood Zones A and B and can be classified as being located within **Flood Zone C**.

Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines)

The different types of proposed infrastructure are then assigned a vulnerability classification according to the definitions in 'Table 3.1 – Classification of vulnerability of different types of development' of the FRM Guidelines.

As described in Section 1.2 above, the proposed development consists of a residential dwellings and as such is classified as 'highly vulnerable development'.

Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development

The proposed development site is located in Flood Zone C is categorised as 'highly vulnerable development'. Table 3.2 of the FRM Guidelines and Figure 3.2 – Sequential approach mechanism in the planning process (FRM Guidelines) stipulate that a justification test is not required for such a development and that it is deemed appropriate development for that flood zone category.

	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

Table 3.2: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.

Figure 4-1: Matrix of Vulnerability versus Flood Zone to illustrate appropriate development

4.4 Detailed Flood Risk Assessment

Following from Stage 2 – Initial Flood Risk Assessment, it was determined that there is no requirement to undertake a detailed flood risk assessment on the proposed development. The sequential approach as shown in *Figure 4-1* identifies that there is no need for a Justification Test to be undertaken.

4.5 Flood Risk Mitigation Measure and Residual Risks

Although there will be no depletion of flood plain storage due to the proposed development, any increased surface runoff from the development, if not properly managed, could increase the flood risk. Therefore, the surface water produced at the development will be managed using appropriate SuDS principles, as recommended in Section 9.3 of the Portmarnock South LAP. The proposed SuDS measures are detailed in the Water Services Report.

In addition to the SuDS measures, all three mitigation measures recommended in the Portmarnock South LAP – FRA for Area 1 will be implemented for the proposed development as described below:

(i) *Building Finished Floor Level*

From *Table 3-1* above, the design 0.1% AEP tidal flood level is approximately +4.43mOD. Adding a freeboard of 300mm, the minimum required finished floor level (FFL) of the residential development is +4.73mOD. The FFL of residential buildings for this phase of the development have a FFL ranging from +8.75mOD to +14.9mOD. Therefore, all buildings in the proposed development site have a FFL well in excess of **+4.73mOD**.

Finally, the access covers to the upgraded interim foul pumping station's storage tank and pumping chamber will also be set at a minimum of +4.73mOD.

(ii) *Determination of impact of flooded outfalls/tide locking*

The surface water drainage networks for the proposed development have been designed using Micro Drainage software package. The surface water drainage networks have been simulated for the critical duration rainfall events of 1, 30 and 100 year return periods for both free discharge to the estuary and for the tide level of +3.70mOD.

According to the Water Services Report, the simulations carried out with the proposed SW network in Micro Drainage using various scenarios of rainfall and tidal boundaries demonstrate that:

- The drainage network system, for the 1:1 year critical storm event, operates as an open channel under the free discharge condition with some minor surcharge without flooding under the +3.70mOD tidal condition.
- The system, for the 1:30 year critical storm, surcharges under both discharge conditions without flooding.
- Also, for the 1:100 year critical storm, the system surcharges but without flooding.

(iii) *Provide adequate flood routing*

The existing regional wetland will cater for the surface water runoff before it outflows to the Baldoyle Estuary. The wetland will help to maintain water quality in the estuary, provide attenuation and store flood water generated from the development.

As requested by Fingal County Council, drawings are included with the planning application which show overland flow paths through the proposed development. Refer to drawing 21205-JBB-00-XX-DR-C-04014 to 04017.

With the above mitigation measures in place, it is considered that there will be no residual risk to the proposed development.

SECTION 5: Conclusion

5.1 Summary of Results

A flood risk assessment for a proposed residential development at Portmarnock, Co. Dublin has been undertaken following the methodology recommended in the FRM Guidelines. The following is the summary of the flood risk assessment:

- The proposed development will consist of 172 residential units and roads, landscaping, site services, SuDS measures and sundry related works.
- The national flooding website www.floodmaps.ie does not have any record of historic flooding at the site.
- The ICPSS Flood Extent Map and CFRAMS Maps both indicate that the existing site lies within Flood Zone C.
- The CFRAMS coastal flood extent map identifies that the 0.1% AEP coastal flood level is +3.43mOD. Utilising a 1000mm increase in Mean Sea Level the HEFS coastal flood level was deemed to be +4.43mOD.
- The type of development is defined as 'Highly Vulnerable Development'. Using the sequential approach mechanism it is assessed that a justification test is not required for the proposed development.
- The Portmarnock LAP has recommended the setting of building finished floor levels at an appropriate level above the appropriate predicted flood levels. The design flood level was identified as +4.43mOD. Incorporating a 0.3m allowance for freeboard, this results in a minimum FFL of **+4.73mOD**. The proposed FFLs for the development are well in excess of this.
- The application of SuDS principles will ensure surface water is managed sufficiently and sustainably discharged to the drainage network.

5.2 Impact of the development on the existing flood regime

The proposed development site is a greenfield site and it is located outside of any existing floodplain. Hence there will be no depletion of floodplain storage as a result of the development. The surface water generated at the proposed development will be managed using SuDS principles. Therefore, there will be no impact from the proposed development on the existing flood regime in the area.

5.3 Vulnerability of the proposed development to flooding

The finished floor levels of the proposed housing units are +8.75mOD to +14.9mOD which is significantly greater than the recommended minimum FFL of +4.73mOD. Access covers to the upgraded interim foul pumping station's storage tank and pumping chamber will also be set at a minimum of +4.73mOD.

Therefore, it is considered that the development is not vulnerable to flooding.

Appendix 1:

OPW Summary Local Area Reports

Summary Local Area Report

This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Dublin

NGR: O 233 424

This Flood Report has been downloaded from the Web site www.floodmaps.ie. The users should take account of the restrictions and limitations relating to the content and use of this Web site that are explained in the Disclaimer box when entering the site. It is a condition of use of the Web site that you accept the User Declaration and the Disclaimer.



Map Scale 1:19,468

Map Legend	
	Flood Points
	Multiple / Recurring Flood Points
	Areas Flooded
	Hydrometric Stations
	Rivers
	Lakes
	River Catchment Areas
	Land Commission *
	Drainage Districts *
	Benefiting Lands *

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained in the Glossary.

13 Results

	1. Flooding at Coast Road, Baldoyle, Dublin 13 on 24th Oct 2011 County: Dublin Additional Information: Reports (1) More Mapped Information	Start Date: 24/Oct/2011 Flood Quality Code:3
	2. Flooding at Brookstone Road, Baldoyle, Dublin 13 on 24th Oct 2011 County: Dublin Additional Information: Reports (1) More Mapped Information	Start Date: 24/Oct/2011 Flood Quality Code:3
	3. Dublin City Tidal Feb 2002 County: Dublin Additional Information: Photos (32) Reports (10) Press Archive (27) More Mapped Information	Start Date: 01/Feb/2002 Flood Quality Code:1
	4. Sluice Kinsaley Hall August 1986 County: Dublin Additional Information: Reports (1) More Mapped Information	Start Date: 25/Aug/1986 Flood Quality Code:3
	5. Strand Road Malahide Feb 2002 County: Dublin Additional Information: Reports (1) More Mapped Information	Start Date: 01/Feb/2002 Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information



6. Kinsealy Lane Area Oct 2002

County: Dublin

Start Date: 20/Oct/2002

Flood Quality Code:2

Additional Information: Reports (3) More Mapped Information



7. The Grange Road Baldoyle Oct 2002

County: Dublin

Start Date: 20/Oct/2002

Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information



8. Mayne Balgriffin Park June 1993

County: Dublin

Start Date: 11/Jun/1993

Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information



9. Grange Road Donaghmede Nov 1982

County: Dublin

Start Date: 07/Nov/1982

Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information



10. Mayne River Bridge Baldoyle Recurring

County: Dublin

Start Date:

Flood Quality Code:2

Additional Information: Reports (3) More Mapped Information



11. Sluice River Kinsealy Lane Recurring

County: Dublin

Start Date:

Flood Quality Code:3

Additional Information: Reports (2) More Mapped Information



12. Baldoyle Coastal Recurring

County: Dublin

Start Date:

Flood Quality Code:3

Additional Information: Reports (4) More Mapped Information



13. Sluice River Strand Road Portmarnock Recurring

County: Dublin

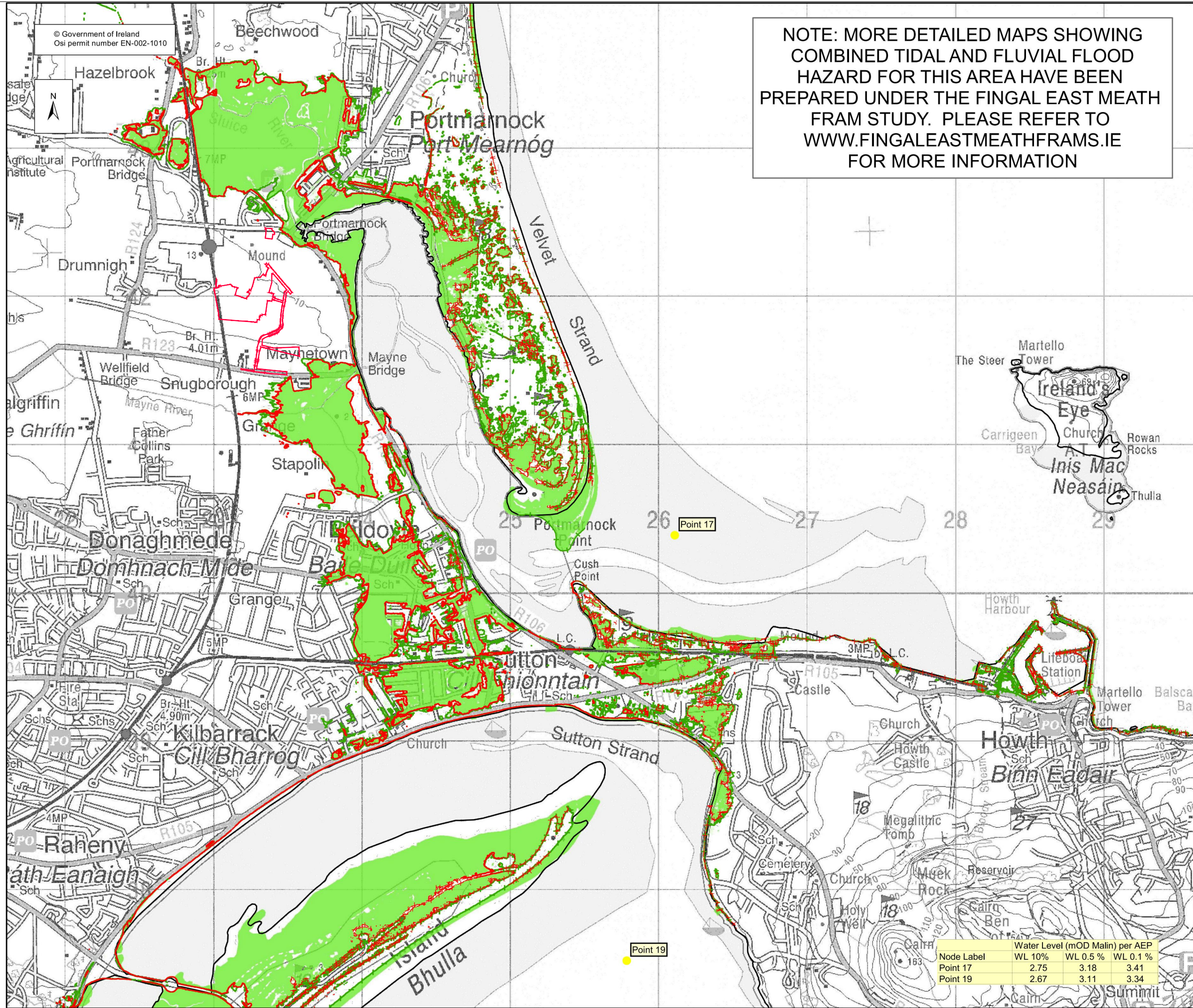
Start Date:

Flood Quality Code:3

Additional Information: Reports (4) More Mapped Information

Appendix 2:

ICPSS Map



NOTE: MORE DETAILED MAPS SHOWING COMBINED TIDAL AND FLUVIAL FLOOD HAZARD FOR THIS AREA HAVE BEEN PREPARED UNDER THE FINGAL EAST MEATH FRAM STUDY. PLEASE REFER TO WWW.FINGALEASTMEATHFRAMS.IE FOR MORE INFORMATION



EXTENT MAP

Legend:

- 0.5% AEP FLOOD EXTENT (1 in 200 chance in any given year)
- 0.1% AEP FLOOD EXTENT (1 in 1000 chance in any given year)
- Very High Confidence (0.1% AEP)
- High Confidence (0.1% AEP)
- Medium Confidence (0.1% AEP)
- Low Confidence (0.1% AEP)
- Very Low Confidence (0.1% AEP)
- Very High Confidence (0.5% AEP)
- High Confidence (0.5% AEP)
- Medium Confidence (0.5% AEP)
- Low Confidence (0.5% AEP)
- Very Low Confidence (0.5% AEP)
- High Water Mark (HWM)
- Node Point
- Node Label (refer to table)

USER NOTE:
 USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF A BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.



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BT 12 6RZ
Northern Ireland



Office of Public Works
17-19 Lower Hatch Street
Dublin 2
Ireland

Project :
 IRISH COASTAL PROTECTION STRATEGY
 STUDY - PHASE III

Map :
 NORTH EAST COAST FLOOD EXTENT MAP

Map Type : FLOOD EXTENT
 Source : TIDAL FLOODING
 Map area : RURAL AREA
 Scenario : CURRENT

Figure By : PJW Date : Jan 2010
 Checked By : JMC Date : Jan 2010

Node Label	Water Level (MOD Malin) per AEP		
	WL 10%	WL 0.5 %	WL 0.1 %
Point 17	2.75	3.18	3.41
Point 19	2.67	3.11	3.34

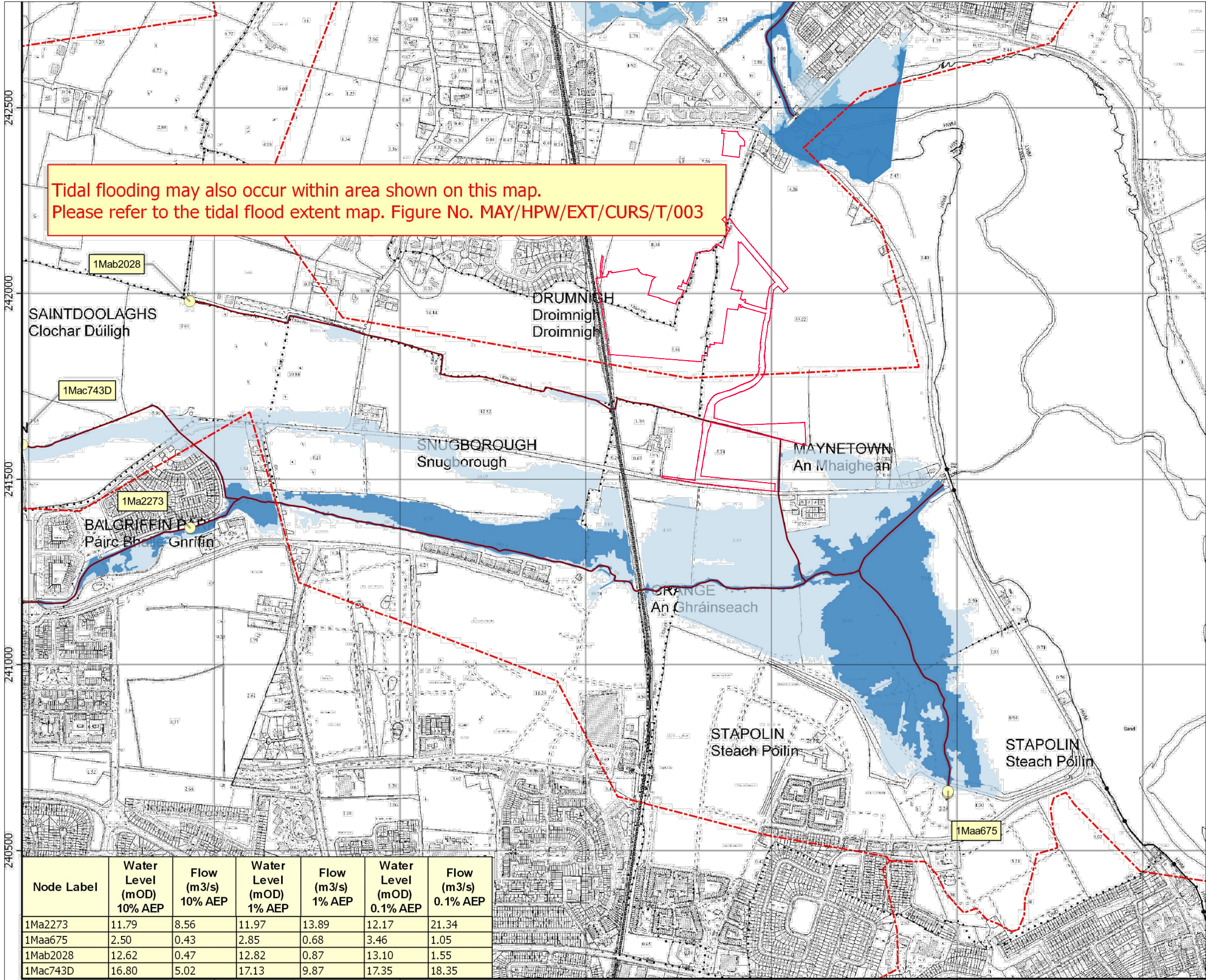
Figure No. :
 NE / RA / EXT / 17

Drawing Scale : 1:25,000 Plot Scale : 1:1 @ A3



Appendix 3:

CFRAMS Maps



LEGEND

- AFA Boundary
- Defended Area
- Modelled River Centreline
- Node Point
- 10% AEP Fluvial Extent (High Risk)
- 1% AEP Fluvial Extent (Medium Risk)
- 0.1% AEP Fluvial Extent (Low Risk)
- Flood Defence - Embankment
- Flood Defence - Wall
- Gate
- NODE123 Node Label
- x.x% AEP Standard of Protection of Flood Defence

IMPORTANT USER NOTE:
 THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.



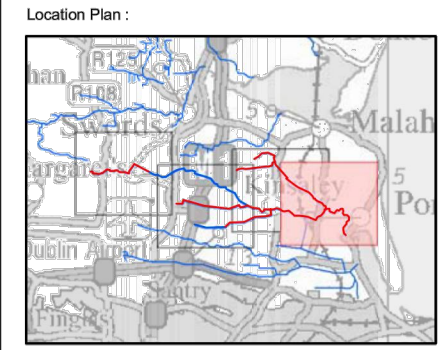
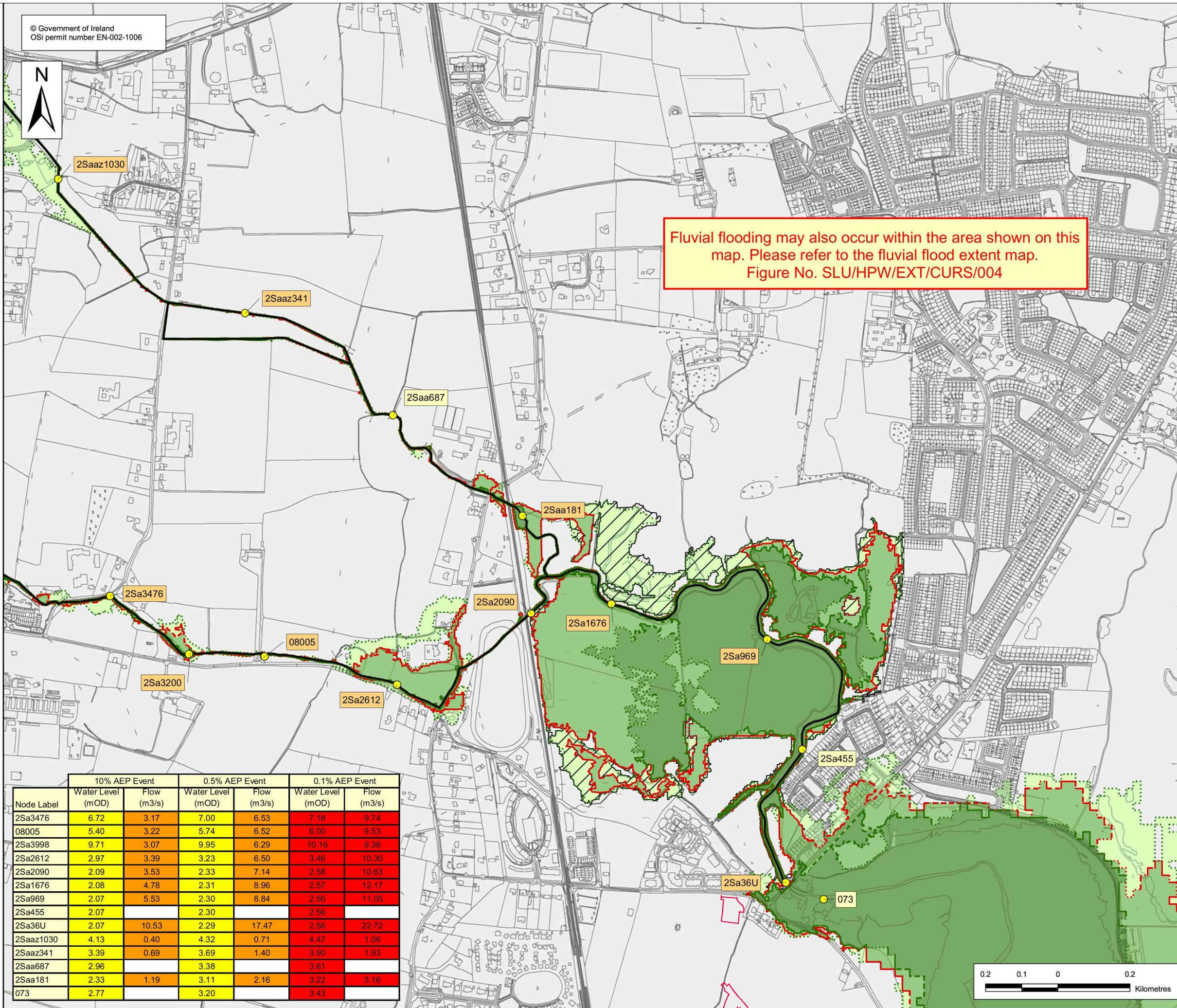
The Office of Public Works
 Jonathan Swift Street
 Trim
 Co. Meath

Project: FINGAL EAST MEATH FRAM STUDY

Map: **Mayne Model**
FLUVIAL FLOOD EXTENT MAP

Map Type:	EXTENT		
Source:	FLUVIAL		
Map Area:	HPW		
Scenario:	CURRENT		
Drawn by:	IH	Date:	Nov - 2017
Checked by:	JM	Date:	Nov - 2017
Approved by:	JM	Date:	Nov - 2017
Map No.:	MAY/HPW/EXT/CURS/003		
Revision:	F1		
Map Scale:	1:10,000	Plot Scale:	1:1 @ A3

Node Label	Water Level (mOD) 10% AEP	Flow (m3/s) 10% AEP	Water Level (mOD) 1% AEP	Flow (m3/s) 1% AEP	Water Level (mOD) 0.1% AEP	Flow (m3/s) 0.1% AEP
1Ma2273	11.79	8.56	11.97	13.89	12.17	21.34
1Maa675	2.50	0.43	2.85	0.68	3.46	1.05
1Mab2028	12.62	0.47	12.82	0.87	13.10	1.55
1Mac743D	16.80	5.02	17.13	9.87	17.35	18.35



EXTENT MAP

- Legend:
- 10 % AEP Flood Extent (1 in 10 chance in any given year)
 - 0.5 % AEP Flood Extent (1 in 200 chance in any given year)
 - 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
 - Defended area
 - High Confidence (<20m) (10% AEP)
 - Medium Confidence (<40m) (10% AEP)
 - Low Confidence (> 40m) (10% and 0.1% AEP)
 - High Confidence (<20m) (0.5% AEP)
 - Medium Confidence (<40m) (0.5% AEP)
 - Low Confidence (>40m) (0.5% AEP)
 - Modelled River Centreline
 - Node Point
 - Node label with level data (refer to table)
 - Node level with flow & level data (refer to table)
- High confidence
 Medium confidence
 Low confidence refer to table

USER NOTE:
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Clients :



Project :

FEM FRAMS

Map :

SLUICE MODEL FLOOD EXTENT MAP

Map Type : FLOOD EXTENT

Source : TIDAL FLOODING

Map area : HIGH PRIORITY WATERCOURSE

Scenario : CURRENT

Figure By : Mara Ruiz Date : 18 January 2011

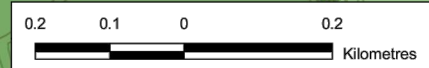
Checked By : Sergio Herbón Date : 18 January 2011

Approved By : Clare Dewar Date : 18 January 2011

Figure No. : SLU/HPW/EXT/CURS/T/004

Revision : 1

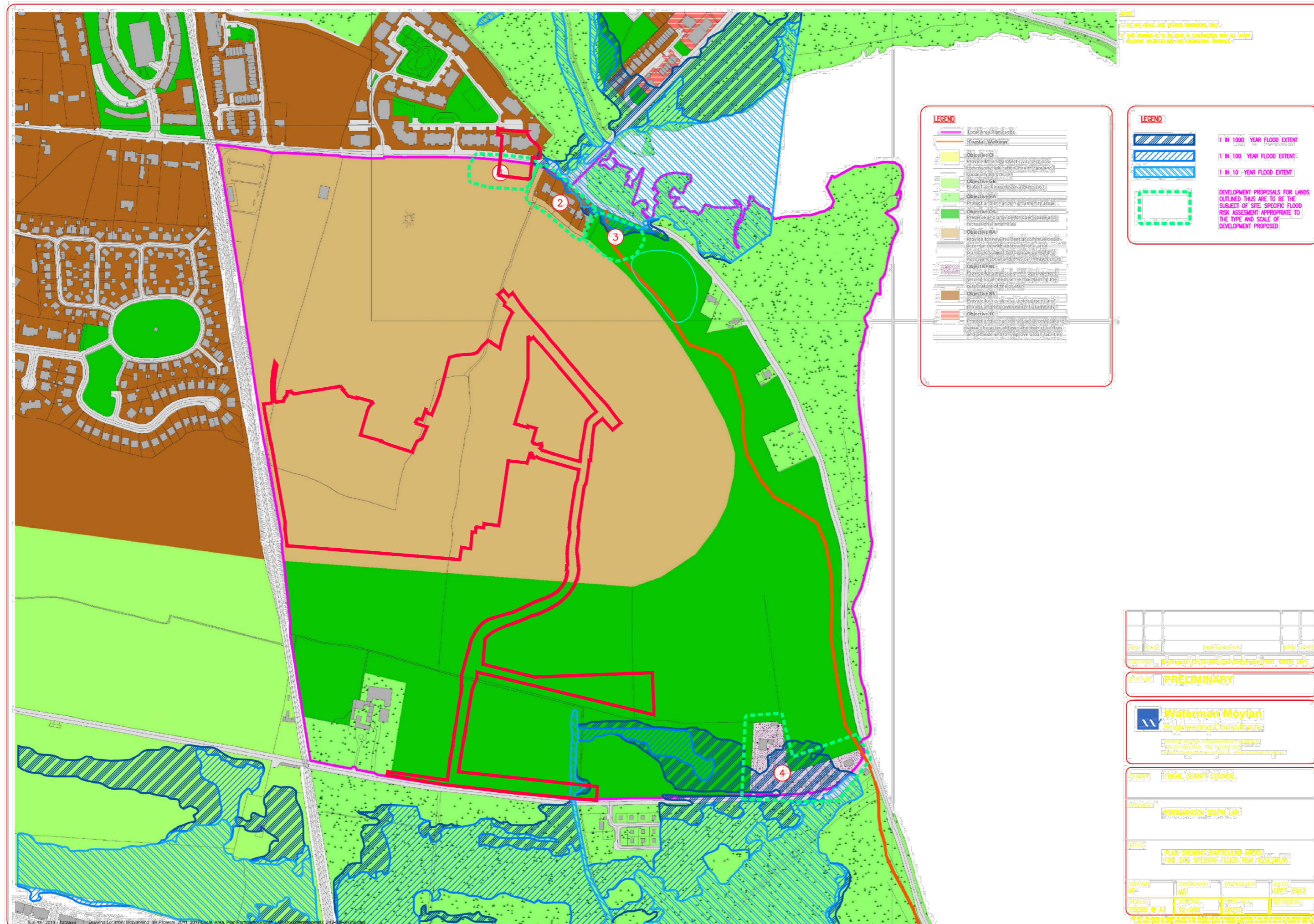
Drawing Scale : 1:10,000 Plot Scale : 1:1 @ A3



Node Label	10% AEP Event		0.5% AEP Event		0.1% AEP Event	
	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)
2Sa3476	6.72	3.17	7.00	6.53	7.18	9.74
08005	5.40	3.22	5.74	6.52	6.00	9.53
2Sa3998	9.71	3.07	9.95	6.29	10.16	9.38
2Sa2612	2.97	3.39	3.23	6.50	3.46	10.30
2Sa2090	2.09	3.53	2.33	7.14	2.58	10.63
2Sa1676	2.08	4.78	2.31	8.96	2.57	12.17
2Sa969	2.07	5.53	2.30	8.84	2.56	11.05
2Sa455	2.07		2.30		2.56	
2Sa36U	2.07	10.53	2.29	17.47	2.56	22.72
2Saaz1030	4.13	0.40	4.32	0.71	4.47	1.06
2Saaz341	3.39	0.69	3.69	1.40	3.90	1.93
2Saa687	2.96		3.38		3.61	
2Saa181	2.33	1.19	3.11	2.16	3.22	3.16
073	2.77		3.20		3.43	

Appendix 4:

Portmarnock South – Local Area Plan SFRA Map



Appendix C Map showing areas where site specific flood risk assessment is recommended