poga CONSULTING ENGINEERS
STRUCTURAL & CIVIL

Site Specific Flood Risk Assessment

Charlestown Place SHD, Charlestown Place and St Margaret's Road, Charlestown, Dublin 11.

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1.0 INTRODUCTION

A Site Specific Flood Risk Assessment was undertaken for the proposed development following the guidelines given in The Planning System and Flood Risk Management document published by the Office of Public Works (OPW) and the Department of the Environment Heritage and Local Government (DEHLG) in 2009. The following items detail the subject report structure, objectives, general qualifications and conditions of use.

1.1 TERMS OF REFERENCE

POGA Consulting Engineers were engaged by Puddenhill Property Ltd to carry out a Flood Risk Assessment (FRA) on a site located at Charlestown Place/St Margaret's Road junction in Charlestown, Finglas, Dublin 11, for the purpose of an application for a strategic housing development.

The National Catchment Flood Risk Assessment and Management (CFRAM) Programme was developed to meet the requirements of the EU Floods Directive (2007/60/EC), as well as to deliver on core components of the 2004 National Flood Policy. Pilot CFRAM studies have been undertaken since 2006 in the Dodder and Tolka catchments, the LEE Catchment, the Suit Catchment and in the Fingal area. In 2011 the Preliminary Flood Risk Assessment (PFRA) mapping was published containing the Areas for Further Assessment (AFA) and studies were commissioned at the scale of the River Basin Districts. The Eastern Catchment Flood Risk Assessment and Management (ECFRAM) study commenced in June 2011 and was finished in 2016.

In 2016, Finglas County Council (FCC) prepared a Strategic Flood Risk Assessment (SFRA) as part of the County Development Plan for 2017 – 2023. The SFRA summarises the outputs for different flood risk studies which cover the county including the ongoing Eastern Catchment Flood Risk Assessment and Management Study (ECFRAM), Fingal East Meath Catchment Flood Risk Assessment and Management Study (FEMFRAM) and the Tolka Flooding Study (2004).

These documents have been consulted and heavily referenced when producing this report.

1.2 FLOOD RISK ASSESSMENT OBJECTIVES

It was requested by the client that a Site Specific Flood Risk Assessment (FRA) is undertaken to assess all types of flood risk for a new development. This requires identification of the sources of flood risk, the effects of climate change on the flood risk, the impact of the proposed development, the effectiveness of flood mitigation and management measures, and the residual risks that remain.

The FRA endeavours to identify the potential risks from sources including coastal, fluvial, pluvial flooding from public sewers and groundwater. It also quantifies the risks to the subject site from these sources into the following categories; very low, low, medium, high, and very high.

As previously stated, this flood risk assessment has been conducted in accordance with the criteria setout by the Planning System and Flood Risk Management Guidelines for Planning Authorities. Furthermore, the proposed mixed use development will be assessed under Sections Five and Six of the SRFA completed by Finglas County Council.

1.3 GENERAL QUALIFICATIONS AND CONDITIONS OF USE

The subject report is intended to be an accurate and unbiased account of the site flooding risks. It has been compiled based on information received from the following sources:

- Preliminary Flood Risk Assessment (PRFA) flood maps from the CFRAM Programme.
- Strategic Flood Risk Assessment (SFRA) document completed by Fingal County Council as part of the Fingal Development Plan 2017 – 2023.
- 'Floodmaps.ie' – The national flood hazard mapping website operated by the Office of Public Works (OPW), where information about past flood events is recorded and made.
- 'Floodinfo.ie'– The new interactive website operated by the Office of Public Works (OPW), where printable maps of the communities included in the "Areas for Further Assessment" are made available.
- 'Gis.epa.ie' – The new interactive website operated by Environmental Protection Agency (EPA).
- 'Gsi.ie' – Geological Survey Ireland (GSI) is the national earth science knowledge centre operated by the Department of Communications, Climate Action and Environment.
- Internet based search into local flooding.

This report is based on the above information and prepared for the purpose of making a planning application for a strategic housing development on this particular site only. The risk categorised above are based on the judgement and experience for the Engineer carrying out the assessment, and may be based on information or documentation supplied by others.

Moreover, the report is intended for the sole use of Puddenhill Property Ltd and their elected agents and advisors and, further, solely for the purpose for which it was originally commissioned. It may not be assigned or copied to third parties or relied upon by third parties.

1.4 REPORT STRUCTURE

An overview of the subject development location, topography, existing watercourses and existing drainage are described in Section 2 of this report. The flood risk assessment and proposed mitigation measures are identified in Section 3. Lastly, the conclusions reached are given in Section 4.

2.0 SITE BACKGROUND

A description of the subject site topography, location and geology is provided in this section, as well as information about existing drainage networks and watercourses that occur in the surrounding areas.

2.1 SITE DESCRIPTION

The subject site is approximately 3.31 Hectares in size and is located off the Finglas Road/North Road close to the M50 and Junction 5, specifically at Charlestown Place Road/St Margaret's Road (R104) junction, refer to Figure 1. The site currently contains a carpark used as an overflow from the adjacent Charlestown Shopping Centre. The site is bounded to the North by Charlestown Place, to the South by recreational lands, to the East by St Margaret's Road (R104), and to the west by industrial lands.

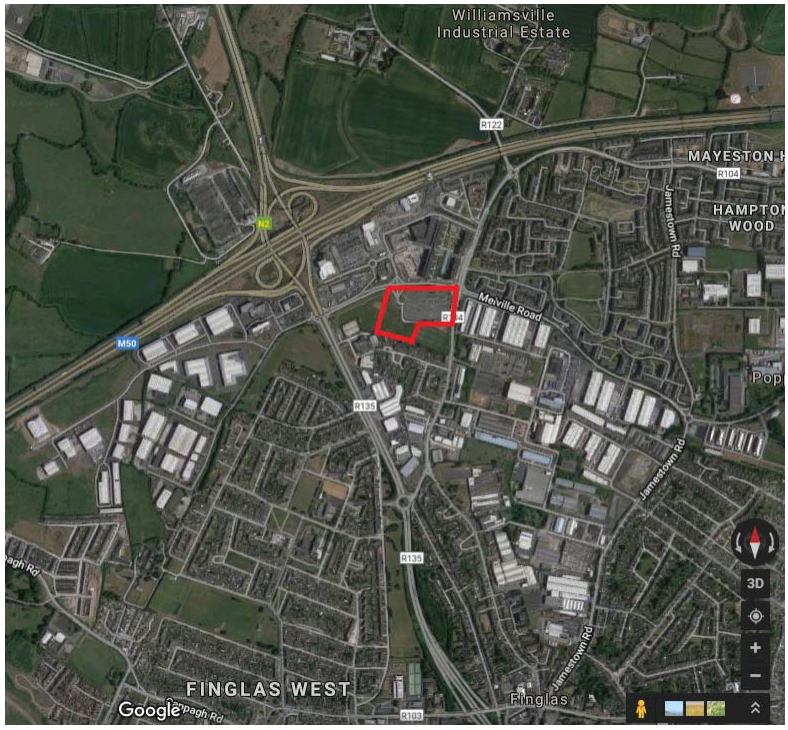


Fig 1 – Site location map (Extract from www.google.com)

Regarding topographic information, the site moderately slopes from the North West corner adjacent to the link road at Charlestown Place to the South East corner; with levels dropping from approximately 70.00m AOD to 67.50m AOD. This represents a fall of approximately 1:100. There are no significant surface features or outcrops.

In relation to the site geology, records in the Geological Survey of Ireland website show that the subsoil within the site and surrounding area consists of Dark limestone & shale (calp). The underlying bedrock is classified as the Lucan Formation, refer to Figure 2, and the associated groundwater vulnerability classification varies in between 'moderate' and 'high' as shown on Figure 3 below.

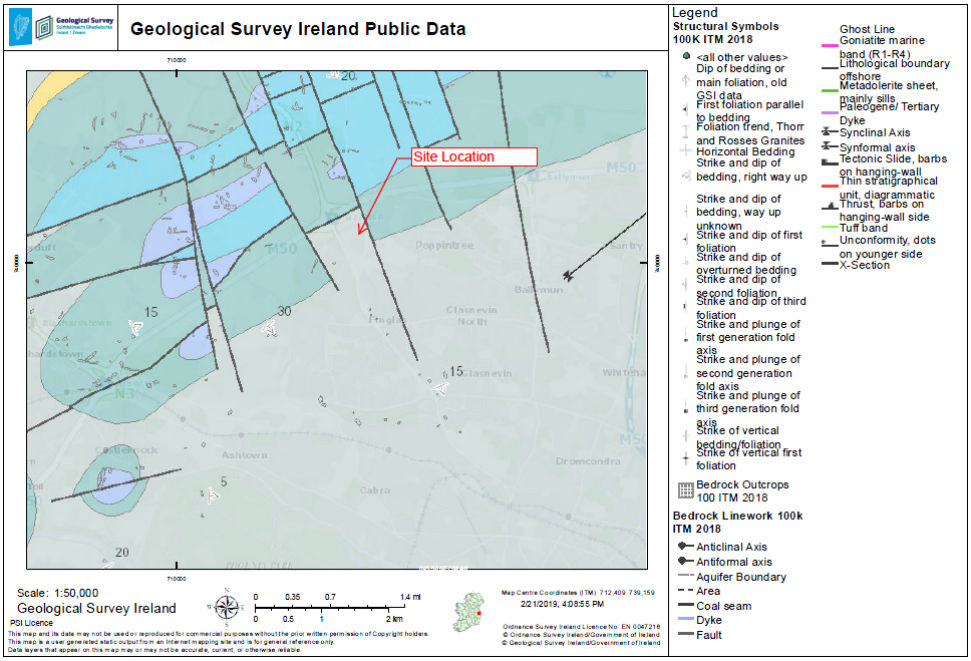


Fig 2 – Geological Survey (Extract from www.gsi.ie)

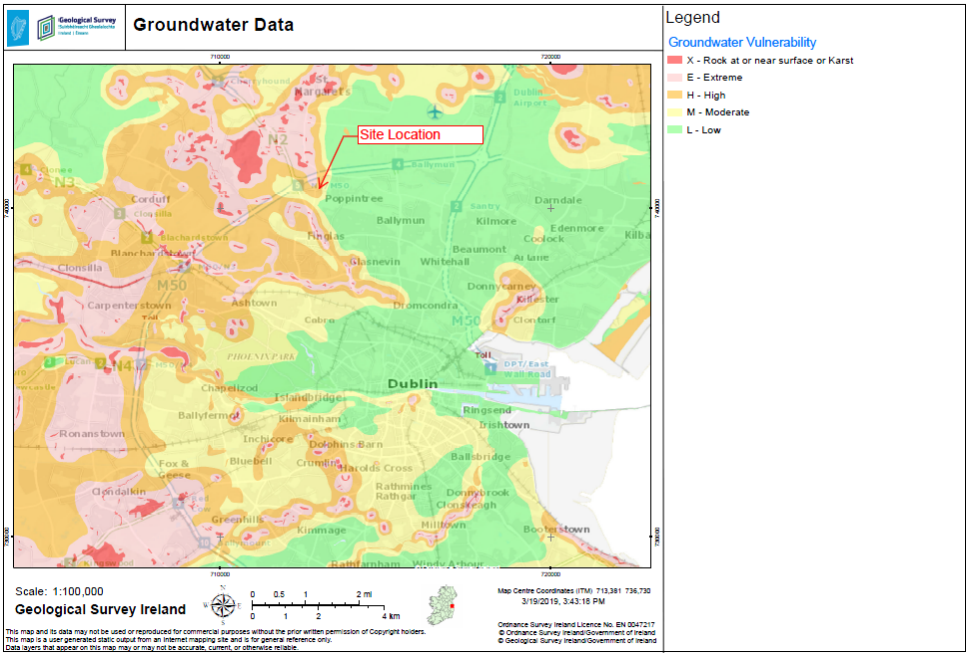


Fig 3 - Groundwater Vulnerability (Extract from www.gsi.ie)

From the perspective of rock depths, this would indicate an overburden depth of >10m at the site according to the table presented in Figure 4.

Depth to rock	Hydrogeological Requirements for Vulnerability Categories				
	Diffuse recharge			Point Recharge	Unsaturated Zone
	high permeability (sand/gravel)	Moderate permeability (sandy subsoil)	low permeability (clayey subsoil, clay, peat)	(swallow holes, losing streams)	(sand & gravel aquifers only)
0–3 m	Extreme	Extreme	Extreme	Extreme (30 m radius)	Extreme
3–5 m	High	High	High	N/A	High
5–10 m	High	High	Moderate	N/A	High
>10 m	High	Moderate	Low	N/A	High

i N/A = not applicable.
ii Release point of contaminants is assumed to be 1–2 m below ground surface.
iii Permeability classifications relate to the engineering behaviour as described by BS 5930.
iv Outcrop and shallow subsoil (i.e. generally <1.0 m) areas are shown as a sub-category of extreme vulnerability.

(amended from Deakin and Daly (1999) and DELG/EPA/GSI (1999))

Fig 4 - Depth to rock *versus* Vulnerability Categories (Extract from www.gsi.ie)

2.2 EXISTING SITE DRAINAGE

This section outlines the existing drainage networks in the vicinity of the subject site.

2.1.1 Surface Water

There is an existing ø750mm surface water sewer running along the Eastern and Southern boundary. This sewer was constructed as part of the existing Charlestown Shopping Centre development, which is located north of the subject site. The surface water from the existing Shopping Centre development is discharged into the existing ø 1.2m culvert on the subject lands to the South-East.

It is proposed to intercept the surface water outflow from Phases 1 & 2 of Charlestown Shopping Centre at two locations at the Northern boundary of the site and redirect them to a new attenuation tank that is under construction as part of the approved development knows as Phase 2B. Subsequently, a new connection on to the existing ø750mm sewer will be formed to the South of the site to drain combined attenuated outflow. This sewer is ultimately connected to the 1.2m culvert to the Bachelors Stream (Finglas River). The attenuation tank for phase 1, 2 and 2B has been designed to accommodate this proposed development.

All surface systems will be designed to conform to Sustainable Urban Drainage Systems (SUDS). The sizes of the all storm water treatment and attenuation facilities have been determined in accordance with the Greater Dublin Strategic Drainage Study.

2.1.2 Foul

It is proposed that the foul effluent generated by the development will drain by a ø 225mm gravity system before discharging into the existing ø 750mm Meakstown Foul Sewer (also known as the North Fringe Foul sewer) which lies adjacent to the Northern boundary of the site, beneath the link road at Charlestown Place.

2.3 EXISTING WATERCOURSES

The SFRA document contains a map with the watercourses and principal rivers located inside the Fingal County Boundaries. Figure 5 below shows the subject site location within Fingal County boundaries and its proximity to existing waterbodies.

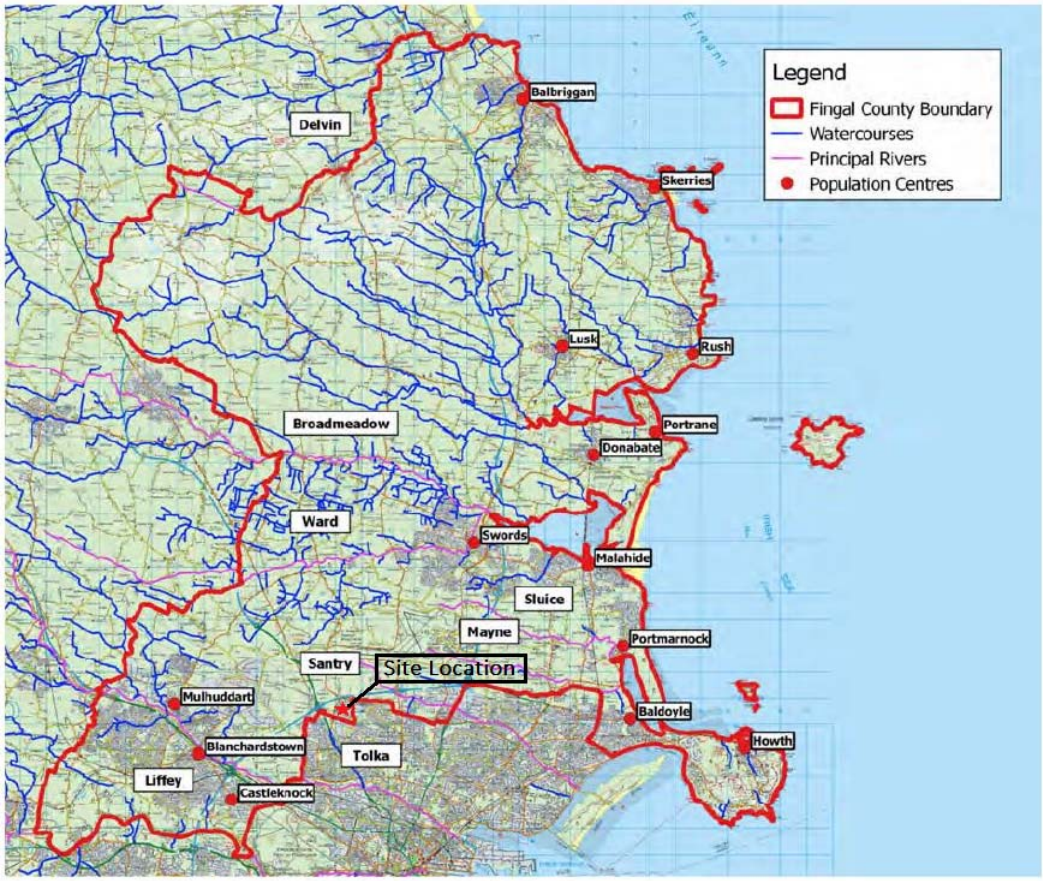


Fig 5 – Fingal County Boundaries and watercourses contained within
(Extract from FCC Development Plan 2017-2022)

The website operated by the Environmental Protection Agency also provides information about water features such as river networks. Figure 6 displays the area surrounding the subject site. The only waterbody within 1km radii of the site is the Bachelors Stream, also known as Finglas River, which is located approximately 600m from the Southern boundary of the site. The level at the start of the stream is about 4m lower than the subject site. This stream then flows from North to South and discharges into the principal river Tolka, which is located 22m lower than the site level in question.

Another watercourse in the region is the Santry River that runs west to east and it is located 2.6km to the Eastern boundary of the subject site.

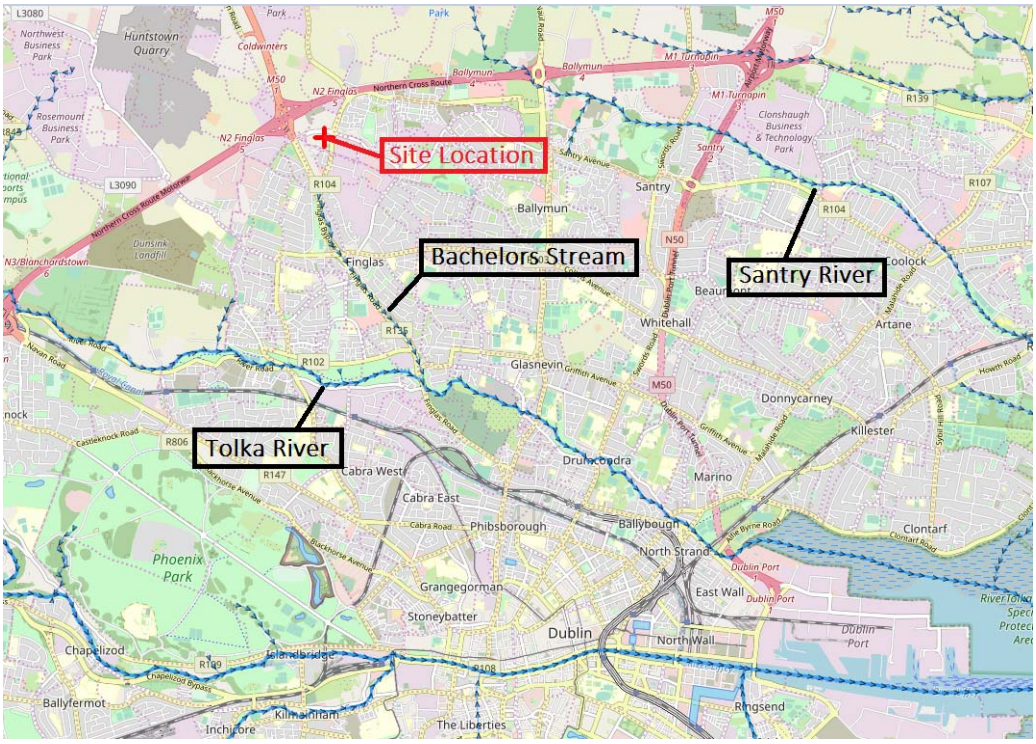


Fig 6 - Existing Waterbodies (Extract from www.gis.epa.ie)

3.0 FLOOD RISK ASSESSMENT

According to the SFRA document, there are two main courses of flooding: inland and coastal. Inland flooding is caused by prolonged and/or intense rainfall. This results in fluvial, pluvial or ground water flooding acting independently or in combination. Coastal flooding which is caused by high sea levels resulting in the sea overflowing onto the land. High sea levels can be caused by high tides, storm surges and wave action acting independently or in combination.

In addition, the OPW Guidelines state that flood risk is a combination of the likelihood of flooding and the potential consequences arising. It also defines the likelihood of flooding as the percentage probability of a flood of a given magnitude as occurring or being exceeded on average once in 100 years, i.e. it has 1 in 100 (1%) chance of occurring in any one year. Figure 7 displays flood event probabilities used in flood risk management.

Annual Exceedance Probability (%)	Return Period (Years)
50	2
10	10
1	100
0.5	200
0.1	1000

Fig 7 – Flood Event Probabilities (Extract from Finglas County Council SFRA)

When assessing the flood risk associated with this site, each developer is obliged to carry out the sequential approach for a proposed development, as per shown in Figure 8. If the proposed development is situated in a Flood Zone C, the justification test is not required. If the site is located in Flood Zones A or B the need for a Justification Test depends on the vulnerability of the proposed development. For all cases, it is still required that flood risks are assessed and a surface water management strategy is provided.

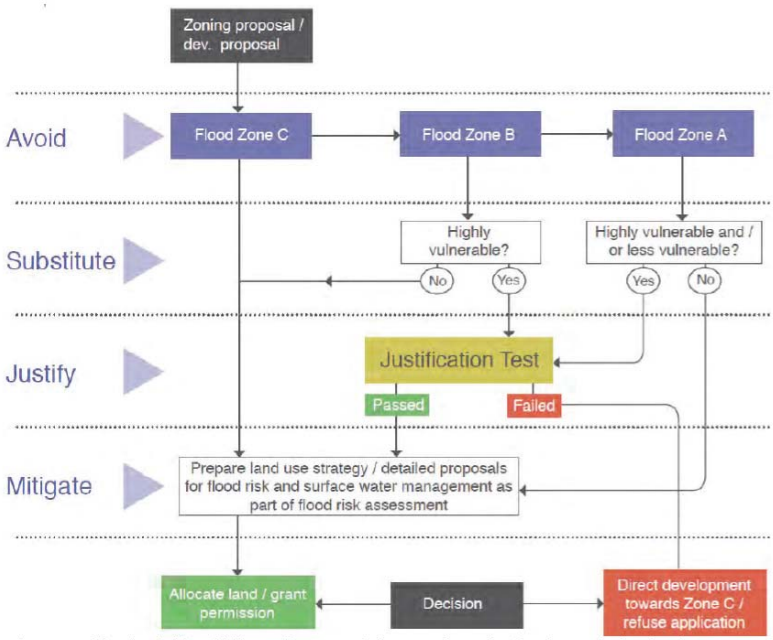


Figure 3.2 of the Flood Risk Guidelines - **The Sequential Approach Mechanism for use in the planning process**

Fig 8 – Sequential Approach

This section identifies the vulnerability class of the development in regards to its use and geographical location. It reviews historic and predictive flood information in order to assess the potential flood risks, to define in which Flood Zone the subject site is located and to identify necessary mitigation measures.

3.1 VULNERABITILY REGARDING USE OF LAND

Table 3.1 of the Guidelines categorises buildings, irrespective of location, based on end use. Note, this is independent of particular risk factors associated with the site. Highly vulnerable developments include dwellings and schools/crèches, so it is clear that this development lies within this category.

3.2 VULNERABILITY REGARDING GEOGRAPHICAL LOCATION

The geographical location of a site affects its vulnerability to flood sources. These sources are wide-ranging as shown in Figure 9.

The OPW document sets out geographical areas within which the likelihood of flooding is within a particular range and this may be used as a key tool in flood risk appraisal for river and coastal flooding:

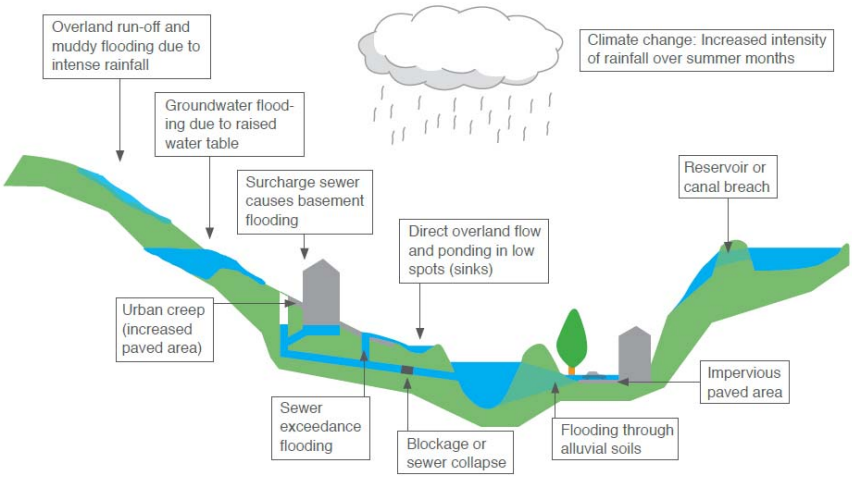


Fig 9 - Potential Sources of flooding

Flood Zone A includes lands where the probability of flooding from coastal or river flooding is highest i.e. greater than 1% or 1 in 100 for stream/river flooding and greater than greater than 0.5% or 1 in 200 for coastal flooding.

Flood Zone B includes lands where the probability of flooding from coastal or river flooding is moderate i.e. between 0.1% or 1 in 1000 and 0.5% or 1 in 200 for coastal and between 0.1% or 1 in 1000 and 1% or 1 in 100 for stream/river flooding.

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.

It is necessary to consider that the flood zones are indicative of coastal and river flooding only. They should not, on their own, be used to suggest that any areas are free from flood risk, since they do not include the effects of other forms of flooding such as from pluvial and groundwater flooding. However, they can be used to gain an appreciation into whether the site is at particular risk of a serious flood event and whether the site is suitable for vulnerable housing development.

3.2.1 Fluvial

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.

Historic flooding information was collected from OPW National Flood Hazard Mapping for the subject development and its immediate surroundings, refer to Figure 10. The nearest flood event happened in October 2002 close to the townland of Meakstown which is located around 650m to the North East of the subject site. See Appendix 5.1 for Flood Report where it is stated that the Dubber Cross pumping station was flooded with surface water from a nearby ditch.

Another flood event was recorded in November 2002 on the M50 at the Ballymun Exit around 2.6km away from the development in question. Appendix 5.1 presents the Report on Flooding in Fingal Area. It is said that severe flooding occurred on this occasion but remedial measures to road drainage have already been undertaken.

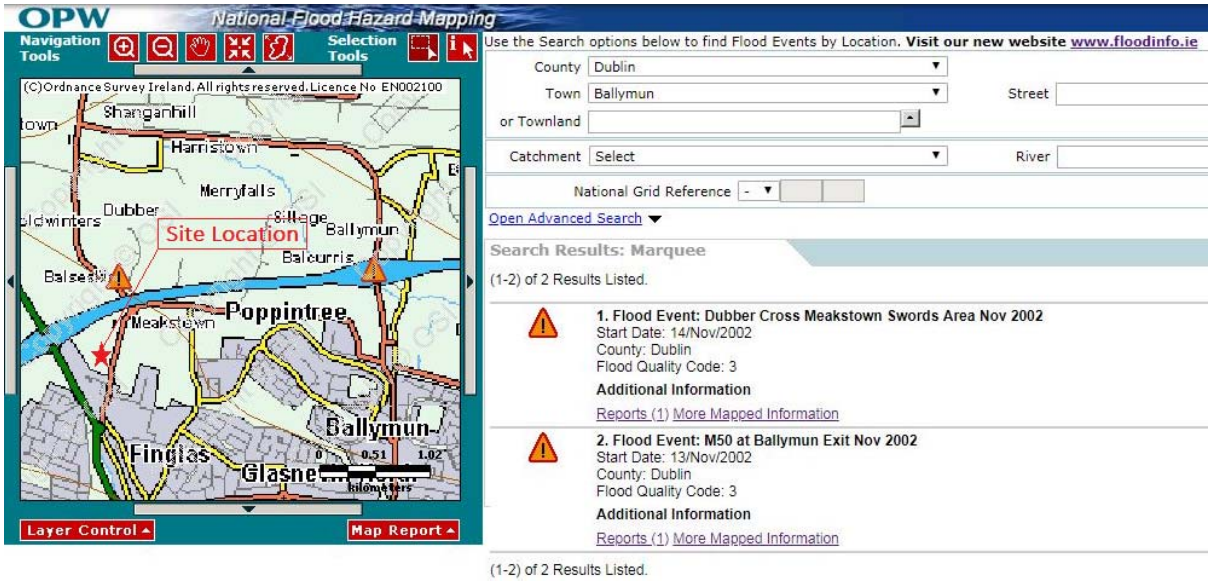


Fig 10 – Recorded Flood Events (Extract from www.floodmaps.ie)

The Flood Mapping shows the subject site is situated outside the predicted 1:100 flood zone, which means site is in Flood Zone C. See Appendix 5.2 for PFRA Flood Extent mapping. The surroundings of the subject lands were not identified as an area at risk of significant flooding by the OPW, which means it was not included in the Areas for Further Assessment of the CFRAM study. Most up-to-date Fluvial Flood Extents mapping extracted from floodinfo.ie website confirms this information, as per shown in Figure 11.

The SFRA document also endorses the site is located in Flood Zone C, refer to Appendix 5.3 for SFRA Flood Extent mapping. The flood zones contained in this document were derived from FEFRAM study and the Tolka Flooding Study mapping. These maps are the most comprehensive flood maps produced for Fingal since the introduction of the Guidelines and the Flood Directive.

As mentioned at Section 2 of this report, there is only one waterbody within 1km of the site which is the Bachelor's Stream (Finglas River). Because the subject development land is positioned at a higher level than the flood risk, and the predictive flood maps highlight the site is not in the flood extent, it is therefore the opinion of Pat O'Gorman & Associates that the risk of fluvial flooding on this site is low.

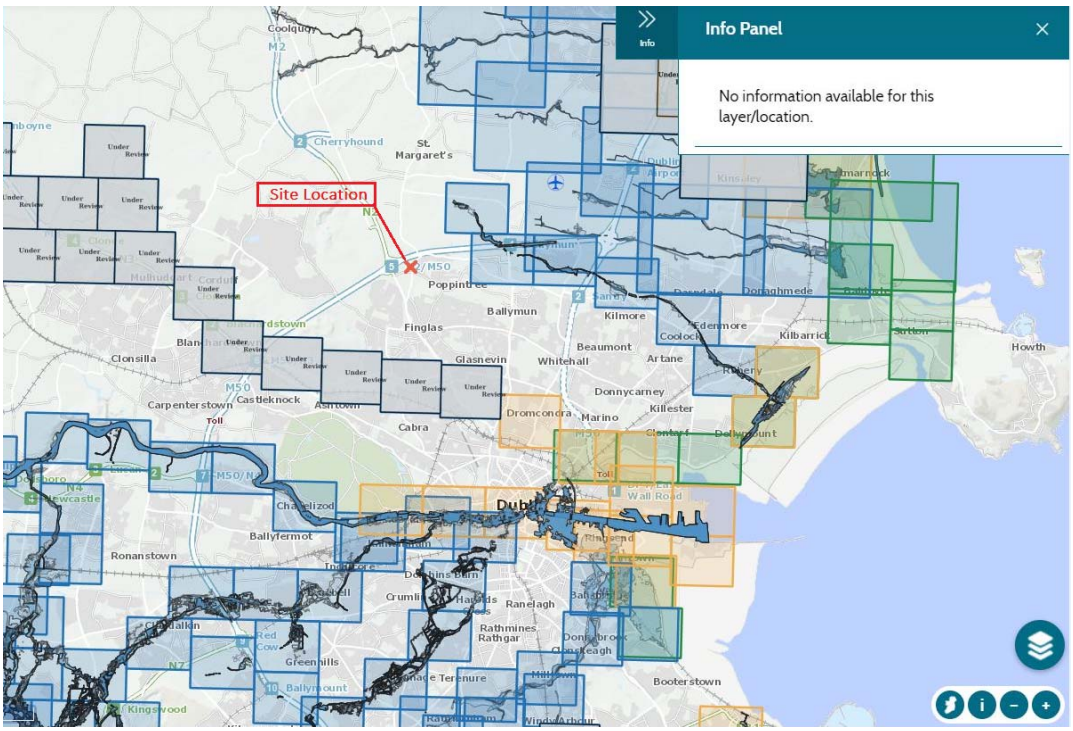


Fig 11 – Fluvial Flood Extents and Areas Further Assessed (Extract from www.floodinfo.ie)

3.2.2 Coastal

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

- High tide level
- Low barometer pressure made worse by high winds
- Wave action dependent on wind speeds and direction, local topography and exposure.

In the case of the subject site however, there have been no reported instances of coastal flooding. The coast is 12.5km to the East of the development and the site level is approximately 70m higher than the sea level.

The PRFA mapping mentioned in Section 3.2.1 and shown in Appendix 5.2 also provides the predicted 0.5% AEP Coastal Flood Extents. It is easily identified that the subject site is located further inland in comparison to the Coastal Flood Extent.

Figure 12 below shows the most recent Coastal Flood mapping extracted from the floodinfo.ie website operated by the OPW. The subject site is situated in Flood Zone C in regards to Coastal Flooding.

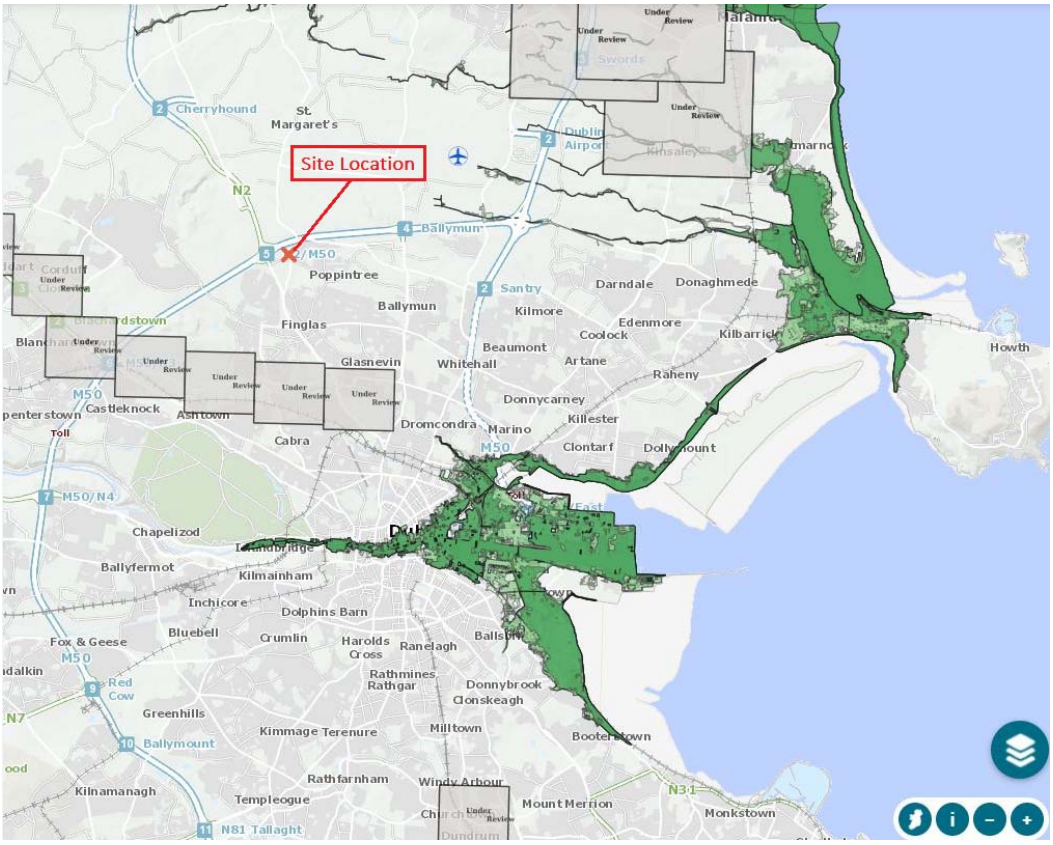


Fig 12 – Coastal Flood Extents (Extract from www.floodinfo.ie)

Given the distance to the coast and the elevation of the site it is the opinion of Pat O' Gorman and Associates that the risk of coastal flooding is extremely low.

Furthermore, because the subject site is located in Flood Zone C for both Fluvial and Coastal Flooding it is possible to affirm that the Justification Test is not required for the proposed development.

3.2.3 Pluvial

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.

The PFRA mapping mentioned previously and provided in Appendix 5.2 shows the subject site is located in the 1% AEP Pluvial Flood Extent.

Appendix 5.4 presents the most up-to-date Pluvial Flood Extent mapping extracted from floodinfo.ie website in which the subject site is located within the 1% AEP Pluvial Flood Extent (1 in 100 year event) and the 10% AEP Pluvial Flood Event (1 in 10 year event).

Regarding the pluvial water that falls in the surrounding areas, the existing drainage network recorded under the Charlestown Place Road and the St Margaret's Road should be able to cater for the surface water from the public roads. It is thus our opinion that the risk of pluvial flooding on this site is low.

The increase in hard standing area created by the proposal could potentially intensify the surface water run-off from the site and, consequently, the flood risk to neighboring properties. In relation to this, mitigation measures have been proposed following the policies and guidelines of the Greater Dublin Strategic Drainage Study (GDSDS). River Quality Protection and River Regime Protection criteria have been satisfied by providing the required interception and treatment volumes within the Filter Strips. The remaining storm volume is going to be attenuated in a underground storage tank which limits rate of the discharge to greenfield run-off rates.

3.2.4 Flooding from public sewers

Flooding resulting when flow entering a 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 or outfall.

There are no recorded instances of similar flooding within or directly adjacent to the subject site by the Local Authorities.

Additionally, a minimum pipe size of 225mm will be adopted for both foul and surface water in order to help prevent any blockages. The surface water is discharged into the Bachelor's Stream (Finglas River) after having the flow attenuated by an underground storage structure, which reduces the outflow to greenfield runoff. The foul is proposed to connect to an ø 750mm existing network. As with all underground infrastructure, some periodic maintenance is required. In our opinion the residual risk of flooding from public sewers therefore is deemed to be low.

3.2.5 Groundwater

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. Groundwater flooding tends to be very local and results from interactions of site specific factors such as tidal variations.

There is no history of groundwater flooding in the area according to the OPW National Flood Hazard Mapping. The OPW PFRA was also reviewed and did not indicate groundwater flooding at the site or surrounding areas.

In addition, the SFRA document states that a groundwater flood hazard assessment was undertaken as part of the FEMFRAM study. The hydro-geological conditions together with all other available information indicated that the conditions do not exist for groundwater flooding in the subject area.

Geological information was compiled from the Geological Survey Ireland website as presented in Section 2.1 of this report. This shows that groundwater profundity is deeper

than 10m and soil is classified as having moderate to high permeability. This would indicate that surface water run-off would have an easy pathway to the groundwater.

Taking all previous information in consideration, we are of the view that the risk of Groundwater flooding is very low.

4.0 CONCLUSIONS

All sources and predictive maps indicate that the subject site for the proposed development is located in a zone classed as zone C in accordance with the Guidelines on the Planning System and Flood Risk Management 2009. Additionally, historic information was reviewed and no flood events were recorded in the vicinity of the subject development lands, including pluvial, fluvial, and coastal and groundwater. Based on the information available it is our opinion that this site is suitable for development and we would consider the site has an overall low risk of flooding.

APPENDICES

5.1 APPENDIX A

Past flood events

(A

FLOODING IN NORTH COUNTY ON 20TH & 21ST OCT '02

Weather Conditions:

Met Eireann issued a weather warning with the following:

- 30mm – 60mm of rainfall from Sun 20th – Tue 22nd Oct.
- Winds of 55-70 mph.
- Leinster & Munster will worst affected.

Drainage Areas Affected by Surface Water:

Swords Area

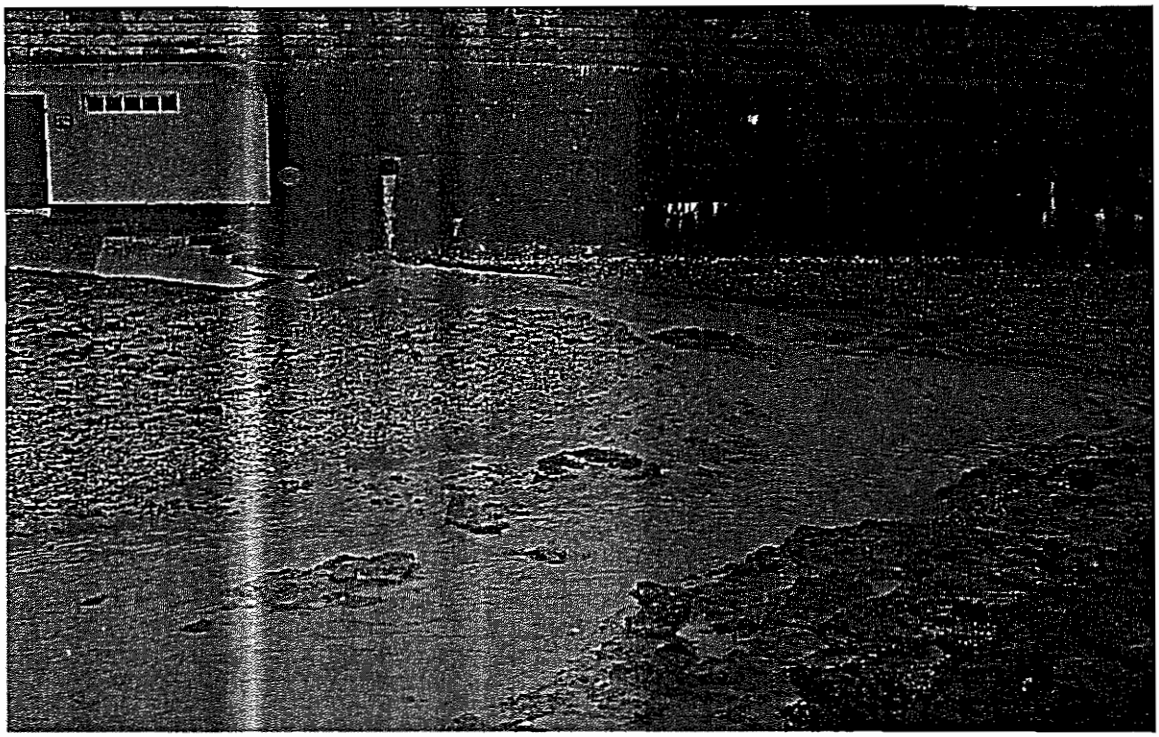
1) Pinnock Hill:
   The surface water screens in property are unable to take the volume of surface water and overflowed (see Area Engineer report 10/2/01), this in turn floods the Little Chef. In order to prevent flooding of Little Chef the surface water is diverted on to Dublin/Belfast Road as can be seen from photographs. The Drainage Section provided sandbags to the Little Chef.

Flooding of Dublin/Belfast Roundabout at Little Chef

2) The Drive, Melrose Park, Swords.
   It appears that the development in Organon has stopped the progress of a surface water ditch. This then overflows and floods wasteland between Organon and Melrose Park and resulted in the flooding of No.18 The Drive.

Malahide Area

1) Biscayne, Coast Road.
   Surface water run off flowed into sea, with large quantities of silt. This also caused the Coast Road to be flooded in areas.



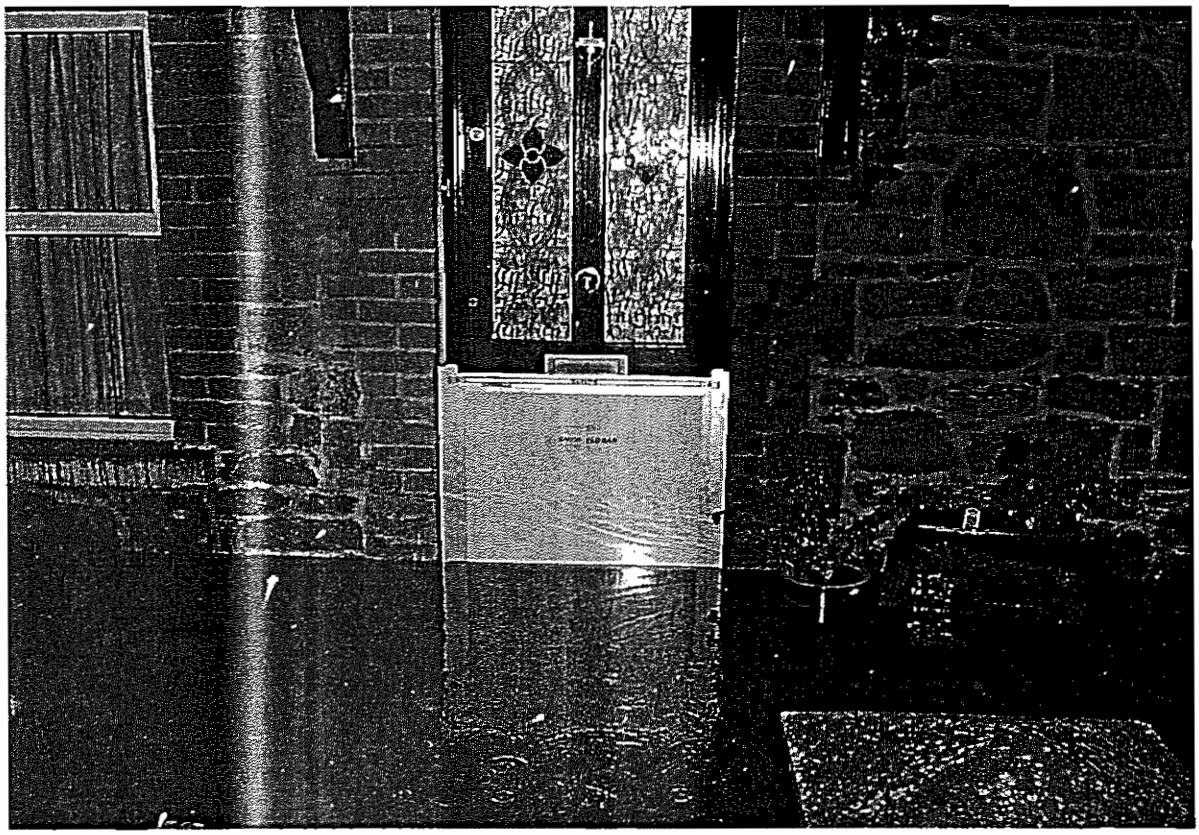
Surface water run-off in vicinity of Biscayne, Coast Road.

Portmarnock Area

1) Strand Road.
   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 become blocked.

Kinsaley Area

1) Cul-de-sac off Kinsaley Lane.
   Two houses on this road were flooded due to the overflowing of the Sluice River. The Drainage Section provided sandbags, but were unable to prevent river water entering the houses.



Flooding of houses just off Kinsaley Lane

The level of the floodwater from the river was over a foot in the houses. The river also flooded the following roads:-

(a) Chapel Road
(b) Kinsaley Lane
(c) Junction of Drimnigh Road/The Hill
(d) Station Road

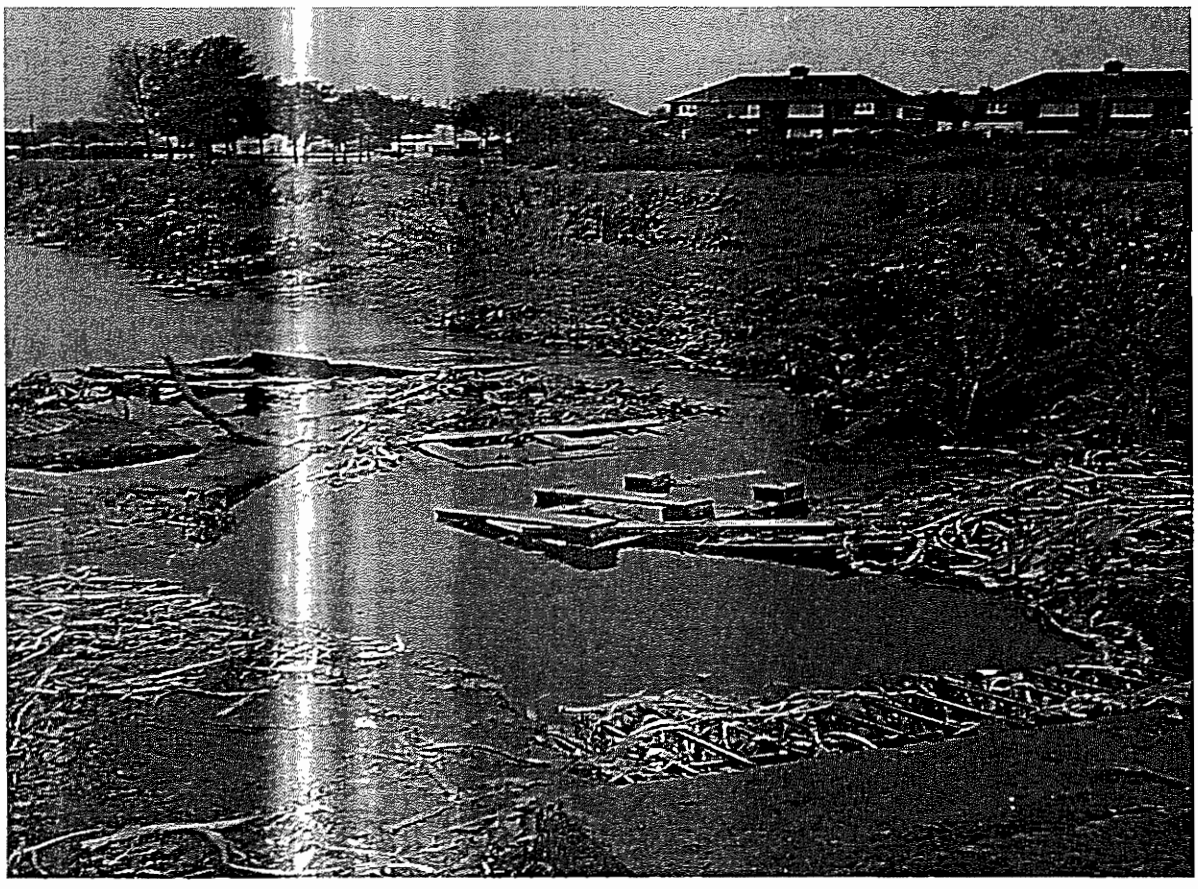
Howth Area

1) The Bloody Stream Pub.
   The pub is built over a culvert with a manhole at ground floor level. The culvert is blocked solid with material (silt, debris, etc.) to the outfall, some 200meters. There does not appear to be any manholes other than the one under the pub. For this reason it is extremely difficult to clean or even identify the line of the culvert. The Drainage Section tried, with sandbags and a 6" pump, but were unable to prevent surface water from the manhole entering the pub on the night of Monday the 21st Oct.

2) Techcrete
This is located close to The Bloody Stream Pub and the surface water line surcharged and flooded the entire yard. S.W entered the building, but the Drainage Section provided sandbags to prevent water from entering offices. The Drainage Section are carrying out an investigation as to the cause of surcharging, but as records of drainage layout are poor it maybe sometime before we have results.

Baldoyle Area

1) The Grange Road
The surface water screens in Seagrange Park were obstructed with material, which contributed to the flooding of the Grange Road. The main cause of the flooding was blocked gullies. The Drainage Section provided sandbags to some houses on Brookstone Road to prevent surface water from the road entering the house.



Surface Water Screen at Seagrange Park, Baldoyle.

Drainage Areas Affected by Foul Sewer:

Swords Area

1) Dubber Cross, Meakstown
   The pumping Station in Dubber Cross was flooded with surface water from a nearby ditch. The S.W. entered the sump via the overflow and flooded the garden and around house with foul sewer. The Drainage Section provided a tanker to remove loads from the sump in an effort to lower the level.

Malahide Area

1) The Coast Road.
   Manhole covers lifted due to the surcharging of the foul sewer. The Coast Road was flooded and due to the fact that the gullies were blocked. The Drainage Section used a 6" pump in an effort to reduce F.S. from the system and pumped into the sea. They also unblocked gullies, which eliminated the flooding on the road.

2) Seabank Court.
   The gardens of 3 No. houses (in gardens) were flooded with F.S. as a result of the surcharging of the Coast Road. A clean up was carried out on all premises.

3) 14A Parnell Cottages.
   The F.S. in this area became surcharged. The manhole from this house is at a low point and was a release for the F.S. The Drainage Section carried out a clean up of the flooding around the house.

4) The Bawn.
   This is upstream of Parnell Cottages and the rising mains from Connelly Ave. & Castlefield Manor. The lines surcharge and cause F.S. flooding around a number of houses, the Draiange Section carries out clean ups.

Howth Area

1) The Gem Shop, Harbour Road.
   The F.S. became surcharged and caused flooding around the outside of shop. The Drainage Section provided sandbags. The flooding may have been prevented if an overflow on the F.S. was in operation outside the St. Laurence Hotel. This overflow has been damaged for a number of months, by a private contractor and the Drainage Section are to carry out a repair immediately.

Skerries Area

1) Hoar Rock

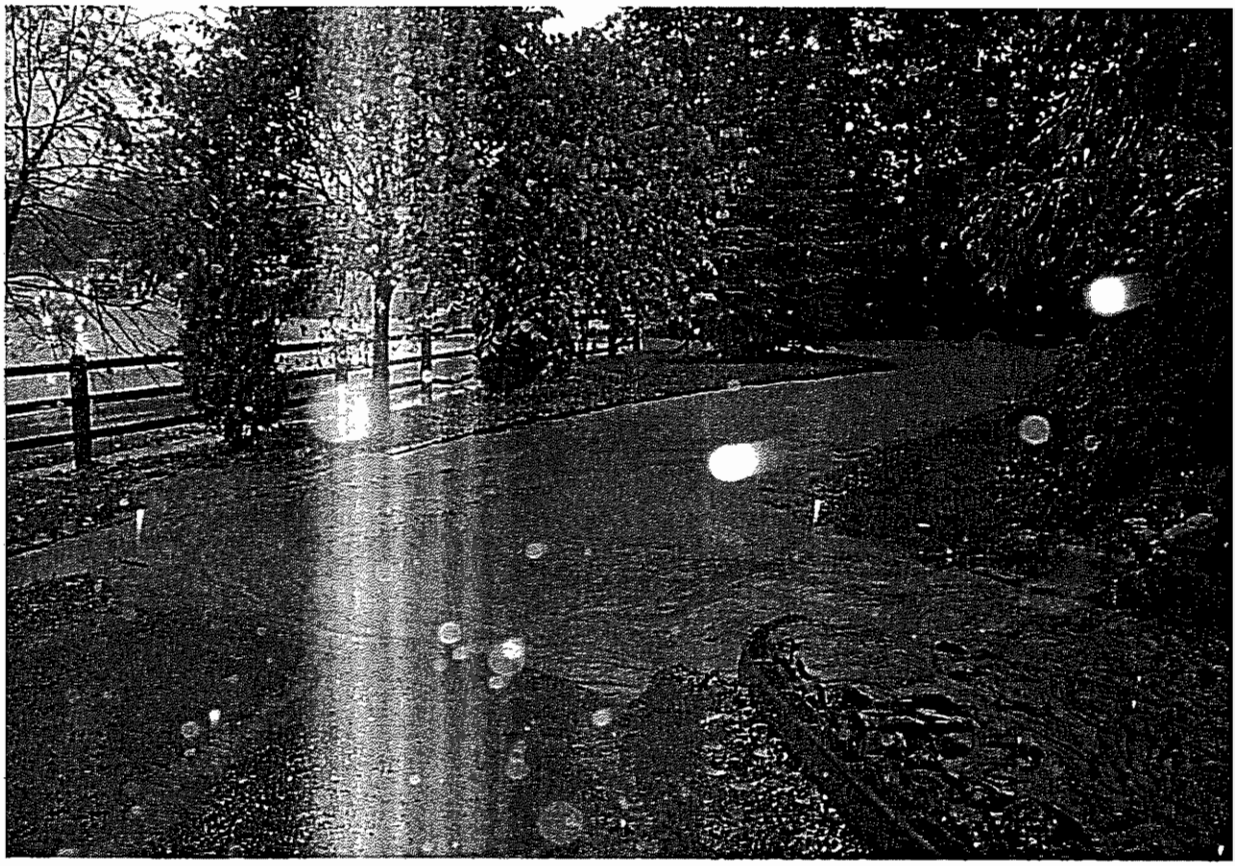
   Due to the volume of F.S. being pumped from the pumping station in Kelly's Bay, a section of the gravity line in Hoar Rock surcharged. This caused flooding around a house, which is located at the low point. The Fire Brigade pumped the F.S. from around the house and the Drainage Section provided sandbags.

Sutton Area

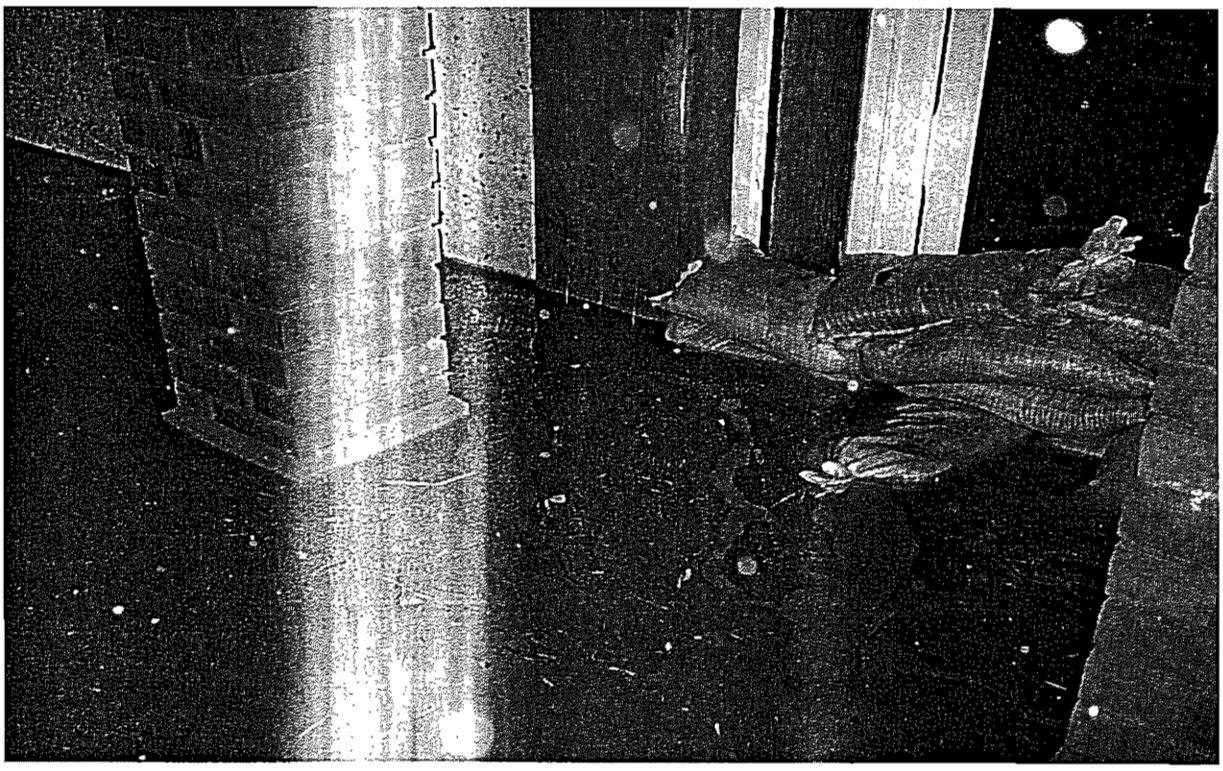
1) No.17 Dublin Road.

   There appears to have been some F.S. flooding in the drive of this premises and the Drainage Section are carrying out an investigation as to its cause.

ADDITIONAL PHOTOGRAPHS OF FLOODED AREAS

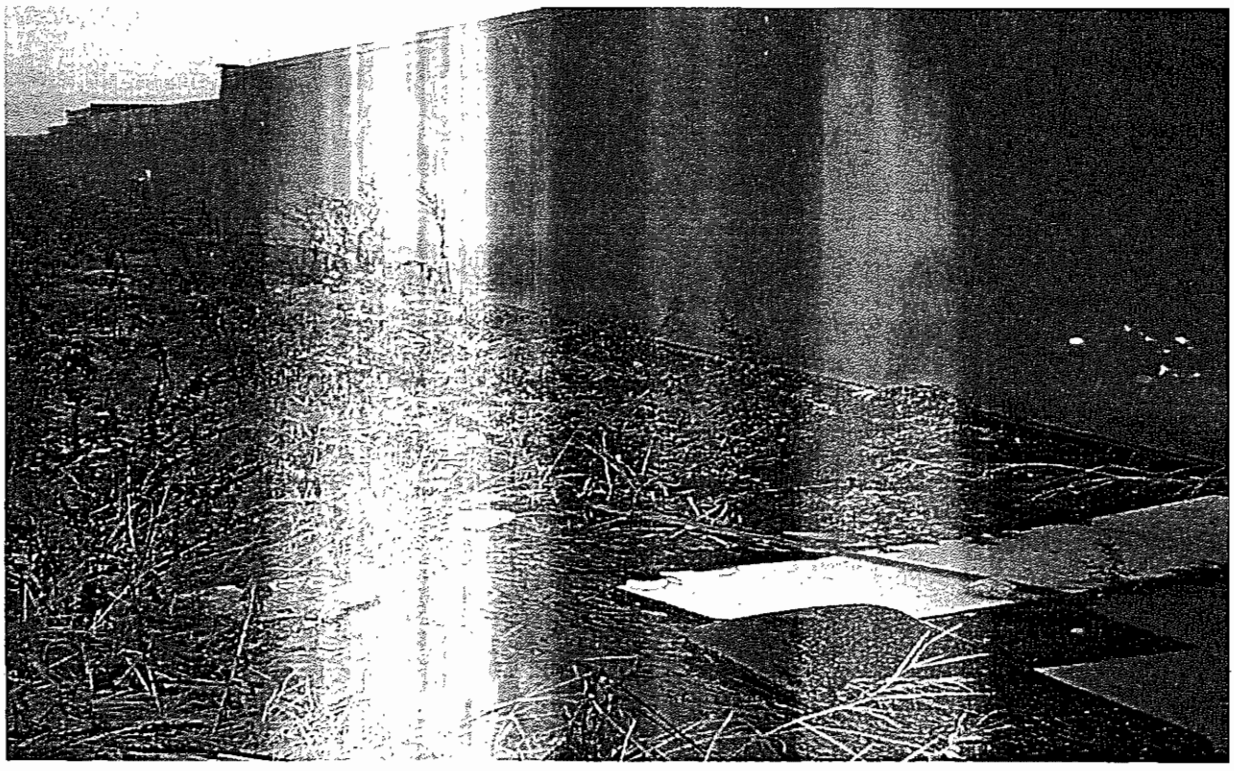


Flooding at Little Chef



Flooding at house off Kinsaley Lane

Flooding at Wasteland between Organon & Melrose Drive



Flooding at Wasteland to Rear of No.18 The Drive, Melrose Park

MEETING OF COUNTY COUNCIL 9/12/2002

Item No. 22

Report on Flooding in Fingal Area

In 2000 and 2002

A report was presented to the Council meeting on 29th January 2001 on flooding which occurred in the Fingal area over the period 5th - 7th November 2000 and 7 - 8th November 2000. The report identified 12 key areas for attention and the up to date position is set out hereunder:-

1. N1 at Blakes Cross and Turvey Avenue - both flooded

2. N2 at Coolquay/Ward Road - road and property flooding

3. Balbriggan/Boranstown - property flooding.

   Note: remedial work has been carried out at all three locations and flooding did not re-occur over the period 13th - 15th November 2002.

4. Newcourt, Swords - property flooded. Work on the new treatment works in Swords has now solved this issue and no flooding occurred over the period 13th - 15th November 2002.

5. Bremore Court - property flooded. A contract to construct new surface water culvert under the N1 is to commence in early 2003. Some flooding occurred at this location over the period 13th - 15th November 2002 but it is not considered as extensive as that which occurred in 2000.

6. R132 - Cloghran, Old Airport Road. This road flooded at 2 locations within 300 metres of the M50 in 2000. At the first location close to the M50 the section of culvert underneath the Old Airport Road was fully cleared out by Fingal County Council after events in 2000 however it is considered that additional work is necessary on sections of this culvert downstream of the location on land in private ownership.

   The other section of road 300m approximately to the North of the M50 contains 300mm diameter culvert which requires regular maintenance. Replacement of this culvert at the larger size is severely hampered by the extent of services for other utilities already present in the road. Both locations referred to flooded over the period 13th - 15th November 2002.

7. Portersgate, Clonsilla - (property) houses and gardens. The problem at this location is being considered as part of the Greater Dublin Strategic Drainage Study being undertaken at present. The results of this study are expected in May 2003. Fingal County Council in consultation with the Consultant on this study are proposing a series of interim measures to alleviate the situation. These measures are expected to be installed early in 2003 and address the issue of the possible effects of surcharging in the foul sewerage system in the area on low lying properties in the Portersgate area.

No properties were flooded 13th - 15th November 2002 as a result of the prompt action of Drainage Maintenance, Fingal County Council.

The estate has been threatened with flooding on a previous occasion since the events in 2000.

8. Pinebrook/Hartstown - flooding (property) houses and gardens.

Flooding occurred again at this location in 2000 and again in the period 13th - 15th November 2002. Action has been taken to clean the culvert since and a detailed assessment of the capacity of the culvert is underway at present.

9. R109 - Lucan (Strawberry Beds) - road and houses flooded. This problem relates to the Liffey. The Greater Drainage Strategic Study is considering issues in relation to the Liffey at present and the Consultants will be asked to address specifically the problems of flooding which are occurring in this location with a view to identifying interim measures which can be undertaken to alleviate the issue. The road was flooded at this location over the period 13th - 15th November 2002.

10. N3 - Near Blanchardstown Town Centre - road flooding. Flooding related directly to the level of flows in the Tolka. Consultants on the Greater Dublin Drainage Study have been asked to consider this issue specifically with a view to recommending interim measures that may be provided pending completion of their report in May 2003. Road flooded again at this location over the period 13th - 15th November 2002.

11. R128 - Lusk/Rush - road flooding. A full cleaning of the downstream channel was undertaken in early 2000 in addition to full cleaning of the road culverts at the location. The road was subject to severe flooding at this location over the period 13th - 15th November 2002 and was impassable to cars. A nearby location at Whitestown was also flooded but remained passable to vehicular traffic. Fingal County Council as an urgent interim measure are arranging for the replacement of the existing culverts at the Spout Road location with a larger capacity culvert. This work is expected to commence in early January 2003 and more careful consideration will be given to the possibility of phasing the levels of the road to help avoid extreme ponding at that location.

12. Rush/Loughshinny - road flooded. The problem here relates to the capacity of the existing culvert under the road where flooding has taken place. It is exacerbated by the presence of a foul sewer on the down stream outlet of the culvert which further constricts flows. Measures to relocate the foul sewer and improve the road crossing at that location are identified as an objective in the Area Action Plan for Rush which is presently before the members for consideration.

Areas flooded in November 2002 (not previously flooded)

A total rainfall of 86.8mm fell in the 3 day period 13th - 15th November 2002. An interim report on these events has been presented to the members of each Area Committee and a report is attached - Appendix A.

The principal areas affected severely which had not been flooded in 2002 were:

Littlepace, Castaheany	-	Houses flooded
Castlecurragh	-	Houses flooded

The Consultants on the Greater Dublin Drainage Study, MC O'Sullivan Consulting Engineers have been requested to examine these locations specifically to identify interim measures that may be possible to alleviate the risk of future flooding.

Severe flooding also occurred on this occasion on

(i) M50 at the N3 Interchange
(ii) M50 at Ballymun Exit

Remedial measures to road drainage have been undertaken at these locations.

(iii) N2 at Kilshane Cross

Preliminary investigations indicate that flooding on the N2 arose from surface water run off from adjacent grasslands.

Landowners are required to undertake necessary steps to prevent run off onto roads. In this instance the matter is being taken up with the landowners concerned.

(iv) N1 at Roundabout at Fingallions

Flooding occurred due to the high water level in the Ward River. A temporary contraflow emergency measure operated successfully and ensured that the N1 remained open to traffic.

(v) Swords/Ashbourne Road

Flooding occurred at Rathbeale Cross and Rowlestown. A new culvert is being installed at present at Rathbeale Cross and drainage alleviation works are underway at Rowlestown.

(vi) Santry Close

Flooding occurred on the Old Airport Road at this location arising from high water levels in the Santry River. Interim alleviation measures are being undertaken by the developer at Santry Demesne to prevent a recurrence.

Other locations where flooding occurred are listed in Appendix B.

5.2 APPENDIX B

PFRA Fluvial, Coastal, Pluvial and Groundwater Flood mapping

STAFFORDSTOWN TURVEY

No Fluvial Data Available For Area

SWORDS

SWORDS (SOUTH)

1SCH_KILBRIDE

Site Location

No Fluvial Data Available For Area

BELCAMP PARK

SANTRY DEMESNE

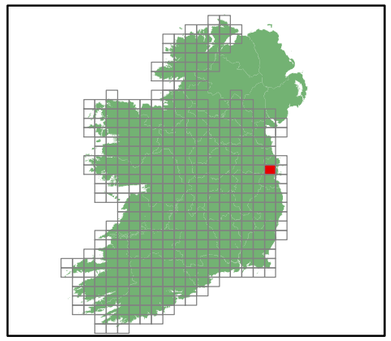
SANTRY

MULHUDDART

FINGLAS, GLASNEVIN

0.5 0.25 0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 Kilometers

Location Plan :



Legend:

Flood Extents

- Fluvial - Indicative 1% AEP (100-yr) Event
- Fluvial - Extreme Event
- Coastal - Indicative 0.5% AEP (200-yr) Event
- Coastal - Extreme Event
- Pluvial - Indicative 1% AEP (100-yr) Event
- Pluvial - Extreme Event
- Groundwater Flood Extents
- Lakes / Turloughs

PFRA Outcomes

- Probable Area for Further Assesment
- Possible Area for Further Assesment

Important User Note:

The flood extents shown on these maps are based on broad-scale simple analysis and may not be accurate for a specific location. Information on the purpose, development and limitations of these maps is available in the relevant reports (see www.cfram.ie). Users should seek professional advice if they intend to rely on the maps in any way.

If you believe that the maps are inaccurate in some way please forward full details by contacting the OPW (refer to PFRA Information leaflets or 'Have Your Say' on www.cfram.ie).

Office of Public Works
Jonathon Swift Street
Trim
Co Meath
Ireland

Project :
PRELIMINARY FLOOD RISK ASSESMENT (PFRA)

Map :
PFRA Indicative extents and outcomes
- Draft for Consultation

Figure By :	PJW	Date :	July2011
Checked By :	MA	Date :	July 2011

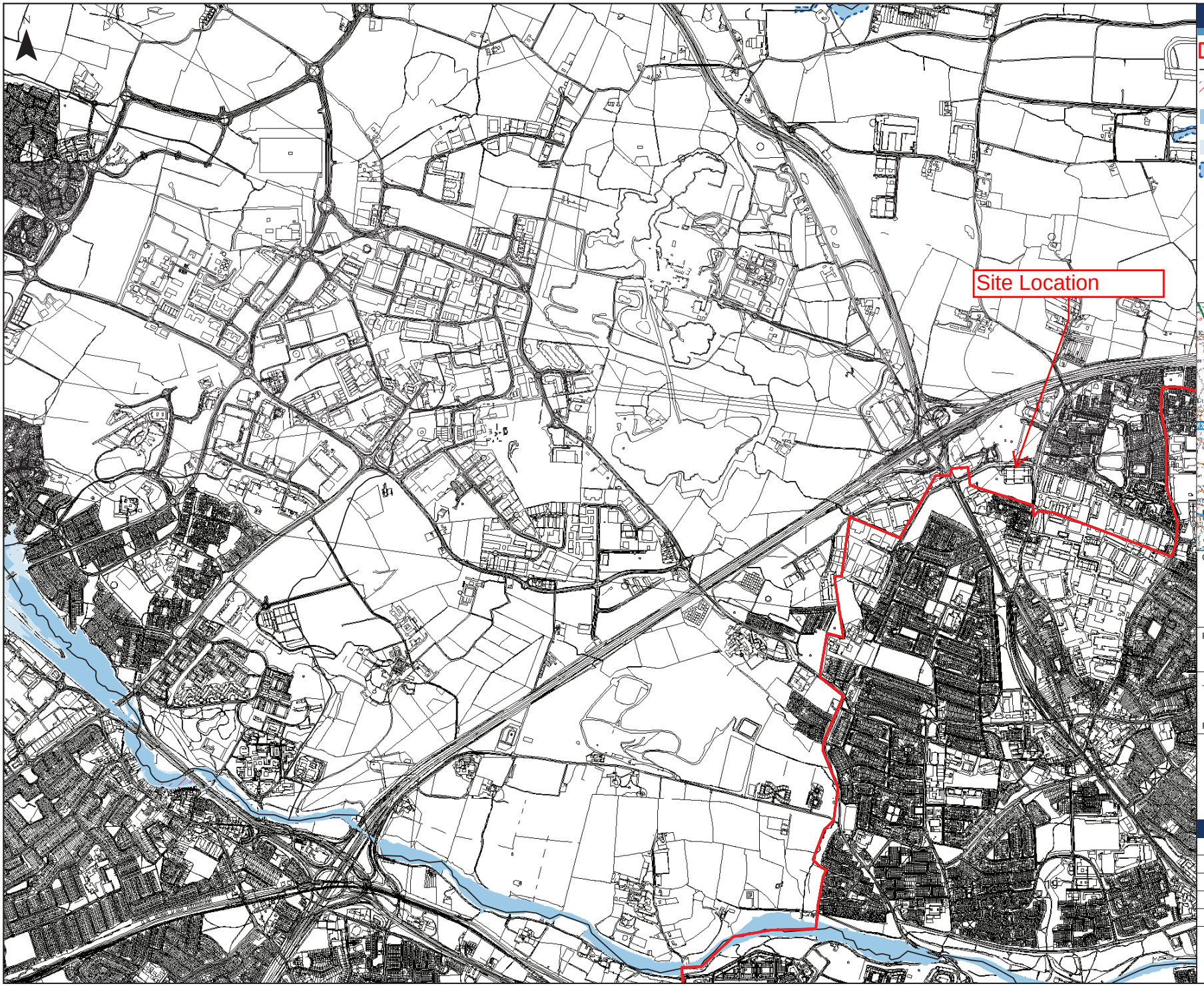
Figure No. : 2019 / MAP / 256 / A

Revision 0

Drawing Scale : 1:50,000 Plot Scale : 1:1 @ A3

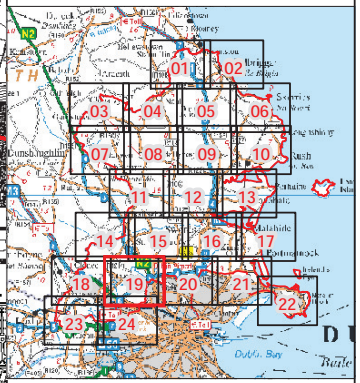
5.3 APPENDIX C

SFRA Fluvial Flood Zone mapping



Legend

- Fingal County Boundary
- Watercourse Centreline
- Defended Area
- Flood Zone A - 1% AEP Flood Extent (1 in 100 chance in any given year)
- Flood Zone B - 1% AEP Flood Extent (1 in 1000 chance in any given year)
- Indicative Flood Extents



Client

Comhairle Contae Fhine Gall
Fingal County Council

Project

Strategic Flood Risk Assessment

Title

Fluvial Flood Zone Mapping

Figure

Map 19 of 24

RPS

West Pier Business Campus,
Dun Laoghaire,
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Ireland.

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Fax: +353 (0) 1 2835676
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Web Page: rpsgroup.com/ireland

Issue Details

Drawn By: HF	Project No. MDW0716
Checked By: BT	File Ref: MDW0716arc0001D02
Approved By: SK	
Scale: 1: 20,000 @ A3	Drawing No. Rev:
Date: 02/12/2015	Arc0001 D01

5.4 APPENDIX D

OPW Dublin Pluvial Study mapping

306000 309000 312000 315000 318000

246000 243000 240000 237000 234000

Site Location

Location Plan:

LEGEND

- 10% AEP Pluvial
- 1% AEP Pluvial
- 0.5% AEP Pluvial

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

OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

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

Comhairle Cathrach Bhaile Átha Cliath
Dublin City Council

Dublin City Council
Civic Offices
Wood Quay
Dublin 8

Project:

DUBLIN PLUVIAL STUDY (FloodResilienCity)

Map: **DUBLIN CITY - PLUVIAL FLOOD EXTENT MAP**

Map Type:	EXTENT - 180min Rainfall		
Source:	PLUVIAL		
Map Area:	URBAN		
Scenario:	CURRENT		
Drawn by:	IH	Date:	Aug - 2016
Checked by:	MC	Date:	Aug - 2016
Approved by:	JM	Date:	Aug - 2016

Map No.:
E09DCC_EXPCD_F0_01

Revision: F0

Map Scale: 1:50,000 Plot Scale: 1:1 @ A3

1000 0 1000 2000 3000 4000 Meters