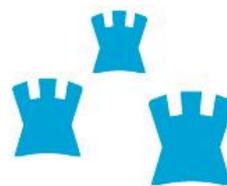


**Flood Risk Assessment**

**for**

**Draft Belmayne – Belcamp Lane Masterplan**

**2020**



Comhairle Cathrach  
Bhaile Átha Cliath  
**Dublin City Council**

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## **Abbreviations:**

<b>AEP</b> .....	<b>Annual Exceedance Probability</b>
<b>AFA</b> .....	<b>Area for Further Assessment</b>
<b>CDP</b> .....	<b>City Development Plan</b>
<b>CFRAM</b> .....	<b>Catchment Flood Risk Assessment and Management</b>
<b>FRA</b> .....	<b>Flood Risk Assessment</b>
<b>FRMP</b> .....	<b>Flood Risk Management Plan</b>
<b>GDSDP</b> .....	<b>Greater Dublin Strategic Drainage Plan</b>
<b>ICPSS</b> .....	<b>Irish Coastal Protection Strategy Study</b>
<b>LAP</b> .....	<b>Local Area Plan</b>
<b>OPW</b> .....	<b>Office of Public Works</b>
<b>PFRA</b> .....	<b>Preliminary Flood Risk Assessment</b>
<b>SFRA</b> .....	<b>Strategic Flood Risk Assessment</b>
<b>SUDS</b> .....	<b>Sustainable Urban Drainage Systems</b>

## 1.0 Introduction

### 1.1 Context

Dublin City Council has prepared a Masterplan for a new Town Centre and housing area at Belmayne and Belcamp Lane located at the Malahide Road Junction R107/R139 (Northern Cross / Clarehall) and along Main Street at Belmayne in Dublin 13 / 17 (Figure 1). The masterplan lands are mostly in Council ownership.



Figure 1. Location of the Belcamp-Belmayne Masterplan lands

These lands form part of a wider strategic development area (200ha) for housing and employment development recognised under the **National Planning Framework**, the **Regional Economic and Spatial Strategy** (EMRA) and at the local level under the **Dublin City Development Plan 2016 – 2022**. A statutory Local Area Plan was made for this wider area in 2012 - the **Clongriffin – Belmayne Local Area Plan 2012 (LAP)**. This LAP sets the statutory development framework / strategy for Clongriffin – Belmayne, including for the masterplan lands. The Local Area Plan seeks the preparation of a masterplan for lands at Belmayne and Belcamp Lane. The life of the Local Area Plan was extended in 2017 for 5 years.

The master plan comprises a non statutory integrated urban design framework for buildings, movement, land use and urban spaces on the masterplan lands. It has been made within the context of the Dublin City Development Plan 2016 – 2022 and the statutory Clongriffin – Belmayne Local Area Plan, 2012. The Local Area Plan has fully considered flood risk in accordance with the Flooding Guidelines ('The Planning System and Flood Risk Management - Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government and Office of Public Works, 2009) and determined the appropriate policies and development framework within which this masterplan should be prepared.

Specifically, the development of the masterplan lands in accordance with the LAP development strategy allows for: the completion of the commercial core (Key District Centre) at Northern Cross / Clarehall) by the development of new town centre nodes at Belmayne and Belcamp Lane; the development of connections to existing communities (crossings and junction upgrades); the provision of a part of the Malahide Road Junction by-pass (Relief Road) and, the development of new residential communities / community facilities, all based around high public transport access (Core Bus Connects Corridor No. 1 Clongriffin to City Centre / Clongriffin Railway Station) .

The flood risk assessment for the masterplan lands is hereby updated to take account of the Final Eastern CFRAM study and the published CFRAM flood extent maps. The making of the masterplan has undergone an appropriate level of Flood Risk Assessment and this report presents the findings

of the FRA which has been undertaken and prepared in accordance with the Flooding Guidelines, 2009. The need for more detailed assessment of flood risk is flagged in the report, where appropriate.

The FRA also contains, in Appendix A, a high level Surface Water Management Strategy for the masterplan lands which focuses on the implementation of Sustainable Urban Drainage to meet the surface water management needs of the masterplan area.

As part of the normal planning process it will be a requirement that proposals for future development of areas within the masterplan lands will include a detailed site specific Flood Risk Assessment to identify and address flood risk issues within the proposed development and elsewhere associated with those proposals, including from surface water runoff sources.

Section 1 of this report gives an overview of the study lands, associated watercourses, existing surface water infrastructure and, masterplan proposals. Section 2 outlines a summary of the relevant sections of the Flood Risk Guidelines. Section 3 identifies flood risk. Section 4 sets out the conclusion of the report.

## **1.2 Description of Lands & Topography**

The masterplan lands comprise mostly undeveloped lands surrounded by urban development – residential development and urban roads at Belmaye and Belcamp.

The Belmayne lands comprise some 15ha of mostly Greenfield lands located at the north eastern quadrant of the Malahide Road Junction. There are allotments on the lands. Planning permission has been granted for the following on these lands and each development has been subject to site specific flood risk assessment:

- Reg. Ref. 4214/18: The construction and completion of the Main Street Boulevard at Belmayne was approved under Part VIII procedures
- Reg Ref. 3238/17: 150 apartment units were approved under Part VIII procedures, on lands at Belmayne and this development is under construction
- Reg. Ref. 3009/19: Permission has been granted for 2 no. Schools – a temporary post primary and primary school at Belmayne Avenue
- Reg. Ref 2600/20: A decision is pending on a proposal for a c.1,000 pupil post primary school at the above site.

The Belcamp Lands comprise c. 9 ha of mostly greenfield lands to the south west of the Malahide Road Junction. There are also houses and a Traveller Halting site(s) on these lands and also the access road to Newtown Court, a residential development located to the north of the lands.

The masterplan lands are generally flat in appearance and grassed (with bunding adjacent to access roads and site boundaries). The lands slope in a north-easterly direction toward the River Mayne (see Figure 2 below). The lands are located between c.20m and 35 m OD Malin.



Figure 2: Physical character of the Masterplan lands (River Mayne indicated in blue) with arrows showing general direction of slope towards the River Mayne

### 1.3 River Mayne

The lands are located in the River Mayne Catchment (see Figure 3). At their closest point the Belmayne lands lie within c.30m of the River Mayne to the north and as mentioned above development for c.150 apartments are currently under construction on the northern side of the Belmayne Lands. The bulk of the masterplan lands lie within 300m to 500m of the river. The Belcamp Lane lands lie between 200m and 500m from this river.

The Mayne River discharges into the estuary at Baldoyle Co. Dublin approximately 0.9 km distance to the east of the Dublin Belfast Railway Corridor. Remnants of land drains are evident on the masterplan lands (see Figure 4 below) with no apparent direct outfall to the River Mayne. The plan area is located within the Eastern River Basin District (ERBD), the Mayne River Catchment, the Santry-Mayne-Sluice Water Management Unit and the Liffey and Dublin Bay Hydrometric Area.

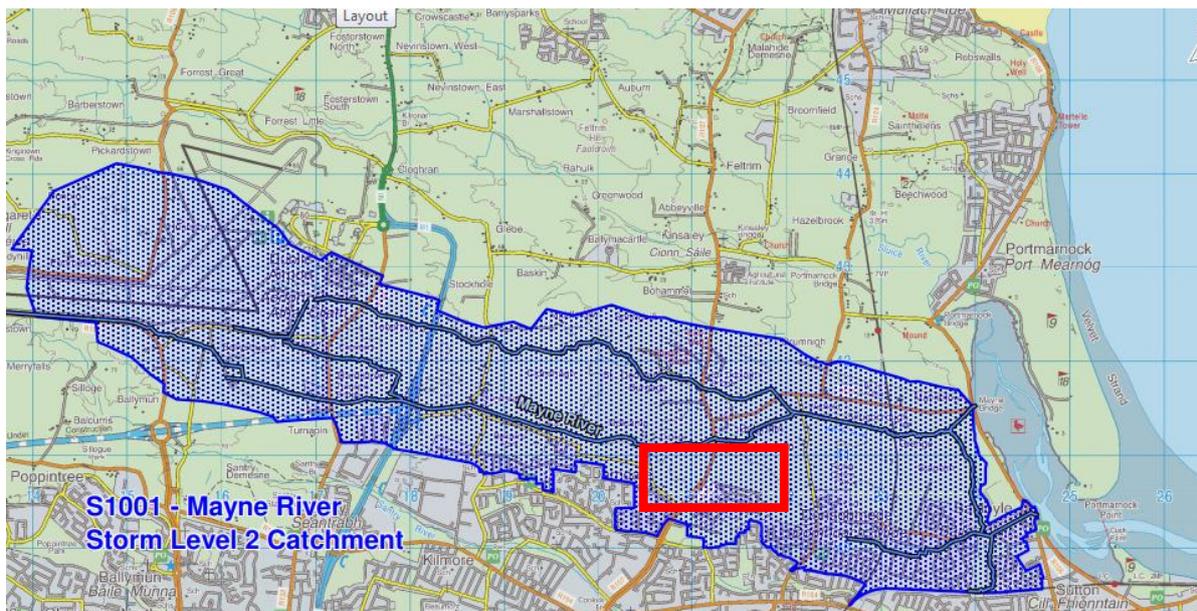


Figure 3: Mayne River River Catchment (GSDP)

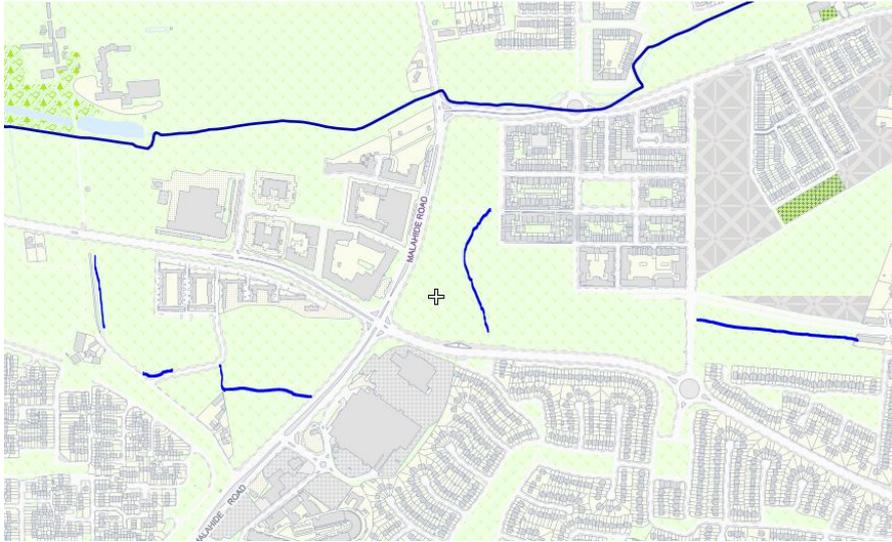


Figure 4: Mayne River and Land drains (Source: DCC Corporate GIS Viewer)

#### 1.4 Description of existing Infrastructure

According to the Clongriffin – Belmayne Local Area Plan 2012, there is a Stormwater (SW) Masterplan in place for the Clongriffin and Belmayne area. In the case of Belmayne, attenuated surface water from the wider Belmayne lands outfalls to the River Mayne to the north of the Masterplan area. Surface water is discharged at a controlled rate to the Mayne and this mitigates the potential for flooding, acting as a reservoir for stormwater. The use of storm water attenuation as well as Sustainable Drainage Systems (SuDS) means that the quality (and quantity) of stormwater run-off is managed and controlled. This has a positive impact on receiving water, i.e. the Mayne River. As part of Reg. Ref. 4214/18 (completion of Belmayne Main Street) approval was given for works to allow the completion of the local drainage network at Belmayne (lands to the north and south of Main Street). There is a 225mm storm water sewer on the Malahide Road to the east of the Belcamp Lane Lands and a 300mm sewer on the R139 to the north of the Belcamp Lane Lands. Surface water at the Belcamp Lane lands drain naturally to the ground / surrounding stormwater drainage system where relevant.

#### 1.5 Description of Masterplan

The purpose of the masterplan is, in accordance with the LAP, to put forward a comprehensive worked up development framework for the subject lands. Specifically, the Masterplan identifies the quantum and location of town centre development achievable on these lands for a range of uses (residential, mixed use commercial, community, civic and open space) along with achievable height, massing and bulk of buildings, grid and block detail, movement, patterns of development, density, and residential and commercial yields as required by the LAP. The Masterplan outlines the following potential development yield on the subject lands (see Table 1) and the proposed masterplan layout is shown in Figure 5 below.

Table 1: Masterplan: Potential Development Yield

	<b>Belmayne District Centre</b>	<b>Belcamp Lane</b>
<b>Residential Units</b>	c. 1,400-1,600 units	c. 800-1,000 units
<b>Retail/café/commercial</b>	c. 10,000 sq. m	c. 2,000 sq. m
<b>Community/ Educational</b>	c. 21,500 sq. m	c. 4,000 sq. m
<b>Public Open Space / Civic Space</b>	c. 20,000 sq. m	c. 6,000 sq. m



Figure 5: Proposed Layout of Belcamp-Belmayne Masterplan land

The lands at Belmayne and Belcamp Lane can be developed independently of each other.

The build out of the Belcamp Lane lands requires the completion of significant infrastructure works - roads and services (including a Relief Road – Malahide Road by Pass) – a Roads Objective in the Dublin City Development Plan 2016 and the Clongriffin Belmayne Local Area Plan 2016. This road is shown in the Masterplan as a link road running to the south west / west of the Belcamp Lane lands with access off same to the lands. The design and function of this road will be subject to further studies.

## 2. FLOOD RISK

### 2.1 Introduction

This report has been prepared in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities', 2009, published by the Department of Environment, Heritage and Local Government (DoHLG).

### 2.2 Identification of Flood Risk

Flood risk is a combination of the likelihood of a flood event occurring and the potential consequences arising from that flood event. To fully assess flood risk an understanding of where the water comes from (i.e. the source), how and where it flows (i.e. the pathways) and the people and assets affected by it (i.e. the receptors) is required. The principal sources of flooding generally are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains. The receptors can include people, their property and the environment. All three elements as well as the vulnerability and exposure of receptors must be examined to determine the potential consequences.

The Guidelines set out a staged approach to the assessment of flood risk with each stage carried out only as needed. The stages are listed below:

- *Stage I Flood Risk Identification* – to identify whether there may be any flooding or surface water management issues.
- *Stage II Initial Flood Risk Assessment* – to confirm sources of flooding that may affect an area or proposed development, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps.
- *Stage III 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 or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

### 2.3 Likelihood of Flooding

The Guidelines define the likelihood of flooding as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is generally expressed as a return period or annual exceedance probability (AEP). A 1% AEP flood indicates a flood event that will be equalled or exceeded on average once every hundred years and has a return period of 1 in 100 years. Annual Exceedance probability is the inverse of return period as shown Table 2 below.

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

Table 2: Correlation between Return Period and AEP

## 2.4 Definition of Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range. These are split into three categories in the Guidelines:

### Flood Zone A

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

### Flood Zone B

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

### Flood Zone C

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/tidal flooding. Flood Zone C covers all plan areas which are not in zones A or B. It is important to note that when determining flood zones the presence of flood protection structures should be ignored. This is because areas protected by flood defences still carry a residual risk from overtopping or breach of defences and the fact that there is no guarantee that the defences will be maintained in perpetuity.

## 2.5 Sequential Approach & Justification Test

The Guidelines outline the sequential approach that is to be applied to all levels of the planning process. This approach should also be used in the design and layout of a development and the broad philosophy is shown in Figure 5 below. In general, development in areas with a high risk of flooding should be avoided as per the sequential approach. However, this is not always possible as many town and city centres are within flood zones and are targeted for development.

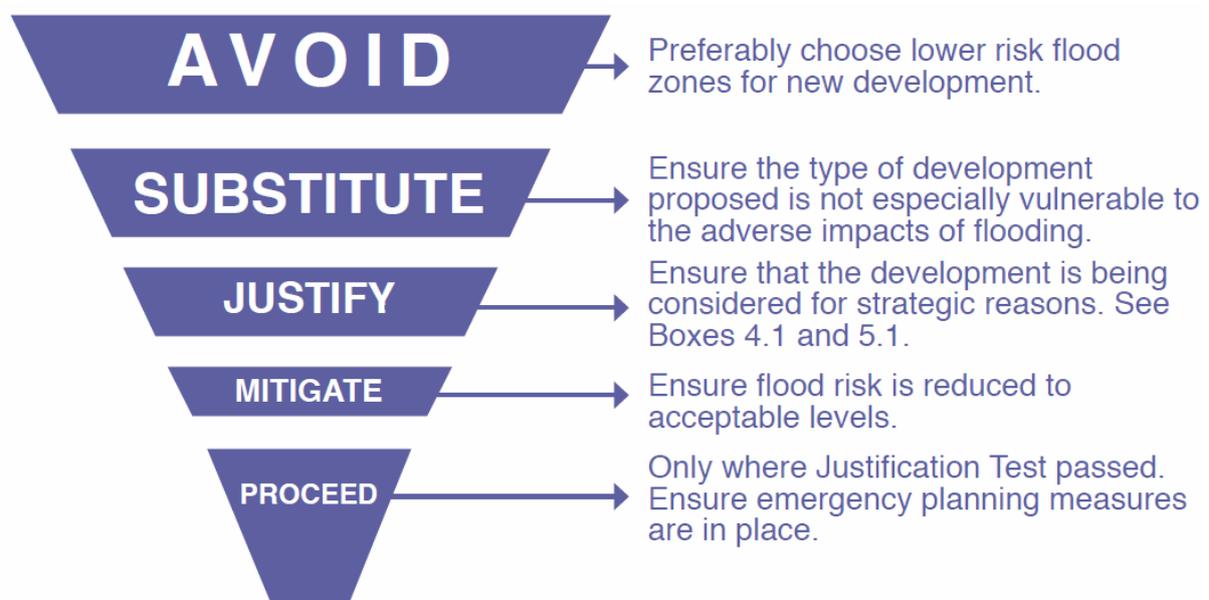


Figure 6: Sequential Approach (Source: The Planning System and Flood Risk Management)

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of developments that are being considered in areas of moderate or high flood risk. The test comprises the following two processes.

- The first is the Plan-making Justification Test and is used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding.
- The second is the Development Management Justification Test and is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land.

	<b>FLOOD ZONE A</b>	<b>FLOOD ZONE B</b>	<b>FLOOD ZONE C</b>
Highly vulnerable development	JUSTIFICATION TEST	JUSTIFICATION TEST	APPROPRIATE
Less vulnerable development	JUSTIFICATION TEST	APPROPRIATE	APPROPRIATE
Water compatible development	APPROPRIATE	APPROPRIATE	APPROPRIATE

**Table 3: Matrix of Vulnerability Versus Flood Zone**

## 3.0 Stage 1 - Flood Risk Identification

### 3.1 General

This Stage 1 Flood Risk Identification includes a review of the existing information and the identification of the potential of flooding or surface water management issues in the study area or on adjacent to these lands that may warrant further investigation.

This stage was based on existing available information supplied from the following sources set out in Table 4:

Source	Data Gathered
OPW National Flood Hazard Mapping	Previous history of flooding on / adjacent the masterplan lands indicated: <a href="http://www.floodmaps.ie">www.floodmaps.ie</a>
OPW Preliminary Flood Risk Assessment (PFRA) maps (2011)	Fluvial, Pluvial and Coastal flooding examined: <a href="http://www.floodinfo.ie">www.floodinfo.ie</a>
Clongriffin – Belmayne Local Area Plan, 2012 - Flood Risk Assessment (FRA)	Draft Fingal East Meath Flood Risk Assessment & Management Study (FEM FRAMS) mapping used to inform FRA.
FloodResilienCity Project, Sept 2012 - <a href="http://www.dublincity.ie/main-menu-services-water-waste-and-environment-drainssewers-and-waste-water/flood-prevention-plans">http://www.dublincity.ie/main-menu-services-water-waste-and-environment-drainssewers-and-waste-water/flood-prevention-plans</a> .	Pluvial Flood Depth and Hazard Maps as they relate to Masterplan lands examined.
Fingal East Meath Flood Risk Assessment & Management Study (FEM FRAMS) (Final Report 2014), Fingal County Council, Meath County Council & Office of Public Works	Recommendations examined.
Dublin City Development Plan 2016-2022 (2016), Dublin City Council - Strategic Flood Risk Assessment (SFRA), Volume 7.	City Wide Composite Flood map; Justification Test for Flood Cell No. 29 Mayne River and Pluvial Flood Depth and Hazard Maps examined.
Final Flood Risk Mapping Eastern CFRAM Study see Flood Maps online, Office of Public Works <a href="http://www.floodinfo.ie">www.floodinfo.ie</a> , 2018	Final Fluvial Flood Extent Mapping. OPW CFRAM Study examined: <a href="http://floodinfo.ie">floodinfo.ie</a>
Flood Risk Management Plan for the Liffey & Dublin Bay River Basin (UOM09) February 2018	Final Flood Risk Management Plan examined. Includes Belcamp and Balgriffen AFA's.
Geological Survey of Ireland (GSI) Maps	GSI groundwater vulnerability map consulted.
The Balgriffin Flood Risk Scheme	Scheme not completed to date.
Consultation with the Council's Flood Project and WFD Division	Increased likelihood of surface water discharge from the site leading to a greater risk of downstream flooding. Mitigation measures outlined.

Table 4: Flood Risk Identification

Specifically, there are several sources of flood mapping data available for these lands and these are shown on Table 5 below:

Source	Relevance
OPW Preliminary Flood Risk Assessment (PFRA) maps 2011	This covers all areas (Fluvial, Pluvial and Coastal). Fluvial maps have been superseded / assimilated by Final CFRAMS Mapping where relevant.
FEM FRAM Flood Mapping 2014	Assimilated into Final CFRAMS
Strategic Flood Risk Assessment (SFRA), Volume 7. Dublin City Development Plan 2016-2022 (2016), Dublin City Council	The City Wide Composite Flood Map and the mapping for Flood Cell No.29 Mayne River (Justification Test) was based on Draft CFRAMS Maps. Final CFrams produced in 2018.
Final Flood Risk Mapping Eastern CFRAM Study see Flood Maps online, Office of Public Works <a href="http://www.floodinfo.ie">www.floodinfo.ie</a> 2018.	Covers the main river catchments including lthe River Mayne Catchment. The mapping represents the most up to date flood extent mapping.
OPW Coastal Flood maps (ICPSS Flood Maps)	Covers the coastal flood zone.

Table 5: Predictive Flood Mapping

Each of these sources (including the mapping) is addressed individually below (where applicable in date order):

**(i) Historic Flooding Hazard**

The OPW National Flood Hazard Mapping Web Site ([www.floodmaps.ie](http://www.floodmaps.ie)) was examined to identify any recorded flood events within and in the vicinity of the lands. Previous flooding has been recorded at Balgriffin Park some 500m to the north / north east of the masterplan lands (see Figure 7 below). A Flood Report is reproduced in Appendix B showing the masterplan lands in relation to the location of local past flood events (single and reoccurring). No recorded historic flood event has impacted upon the masterplan lands.

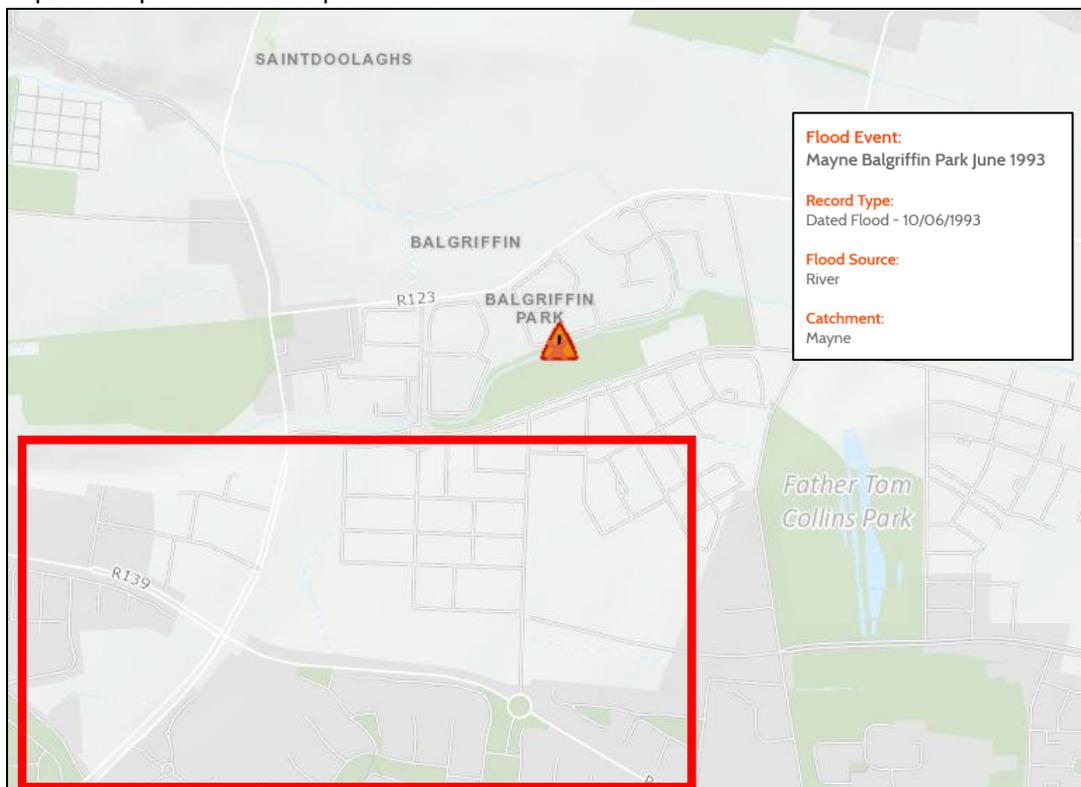


Figure 7: OPW Flood Hazard Map

**(ii) OPW Preliminary Flood Risk Assessment (PFRA) 2011**

The PFRA, as part of the National CFRAM programme (Catchment Flood Risk Assessment and Management), was a national screening exercise based on available and readily derivable information, to identify areas where there may be a significant risk associated with flooding (referred to as **Areas for Further Assessment, or AFA's**). As part of the PFRA study, maps of the country were produced showing the indicative fluvial, coastal, and pluvial flood extents.

The masterplan lands at Belcamp are located in the Belcamp AFA. The masterplan lands at Belmayne are located in the Ballgriffin AFA. Both AFA's (areas wider than the masterplan lands) are identified as being at risk from fluvial flooding associated with the River Mayne. The PFRA map for these lands indicate **fluvial flooding** within the masterplan lands for the less than 0.1% AEP (1000-year event). The PFRA fluvial maps have been superseded by the detailed Eastern CFRAM (Catchment Flood Risk Assessment and Management) and FEM FRAM mapping studies.

**(iii) Clongriffin – Belmayne Local Area Plan 2012**

Flood Risk Assessment was prepared as part of the preparation of the Clongriffin Belmayne Local Area Plan (LAP) in 2012. Mapping from the Draft Fingal and East Meath Area Flood Risk Assessment and Management Study (FEM FRAMS) mapping was used in that FRA. The masterplan lands are shown in Flood Zone C in that FRA. The FRA identifies a number of measures necessary to ensure flood risk management is incorporated into the planning of this area and these are reproduced under Section 14.4.1 of the LAP (see Appendix C).

**(iv) Fingal East Meath Flood Risk Assessment (FEM-FRAMS)**

The Fingal East Meath Flood Risk Assessment & Management study (FEM FRAM) was one of a number of pilot studies for the CFRAM Programme. The study was completed in 2014. Mapping produced as part of the FEM FRAMS (which include masterplan lands) were later incorporated into the Eastern CFRAM Programme (Catchment Flood Risk Assessment and Management).

**(v) Dublin City Development Plan 2016 – 2022: Strategic Flood Risk Assessment Volume 7.**

The Dublin City Development Plan 2016 – 2022 was also reviewed. Strategic Flood Risk Assessment (SFRA) was prepared as part of the Dublin City Development Plan 2016-2022. The SFRA informed the strategic land use planning decisions by providing an assessment on all flood risk within Dublin City. The SFRA contains, inter-alia, a Composite Flood Map, flood management policies and objectives (see Appendix C) and justification Tests. The SFRA was based on the historical information such as floodmaps.ie and predictive flood maps sourced from the CFRAM and FloodResilientCity pluvial programmes.

According to the Composite Flood Map for Dublin City, the master plan lands are within Flood Zone C. The Justification Test for development adjacent the River Mayne (Flood Cell: 29 River Mayne, Appendix 5, Volume 7 of the SFRA of the CDP) is reproduced in Appendix D below. This sets out Storm Water recommendations for development.

Figures 8 and 9 below, show relevant extracts from the CDP, Volume 7, Appendix 6 pluvial flood depth map and pluvial flood hazard map respectively. Flood depth on the lands is shown to be low to moderate and Flood hazard is shown to be mostly low.

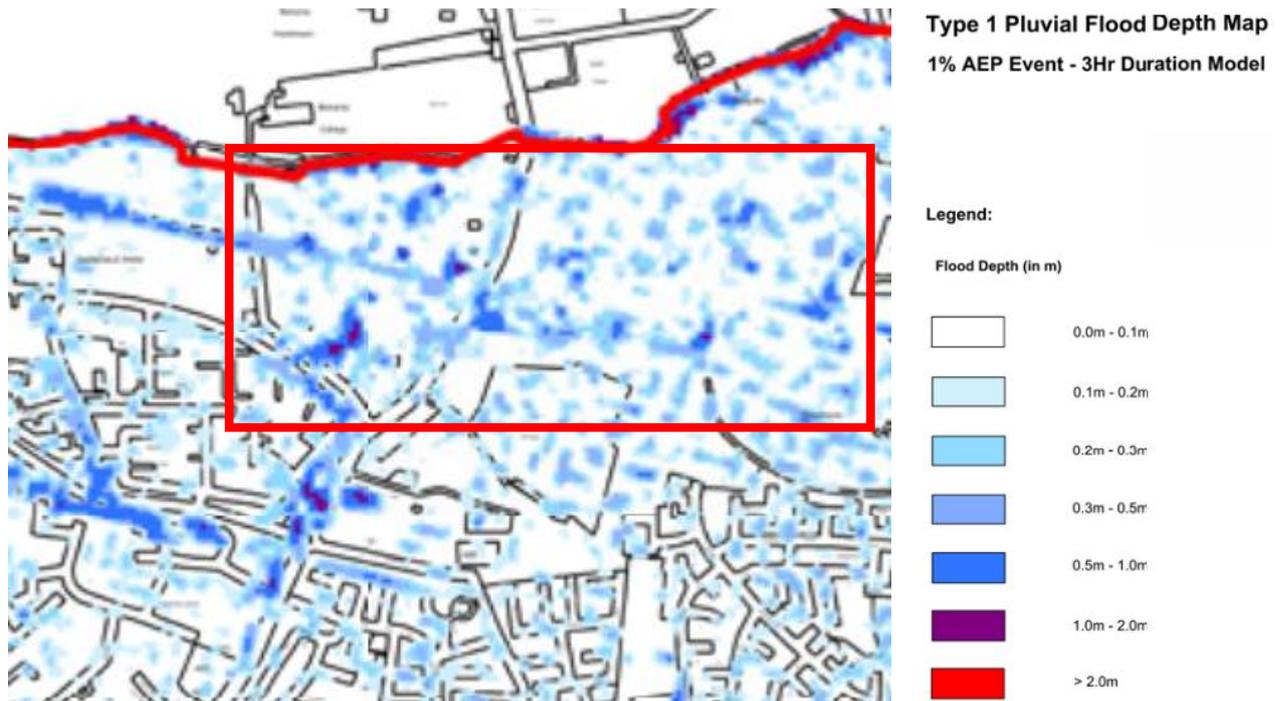


Figure 8: Dublin City Pluvial Flood Depth Map – FloodResilienCity Project (CDP)

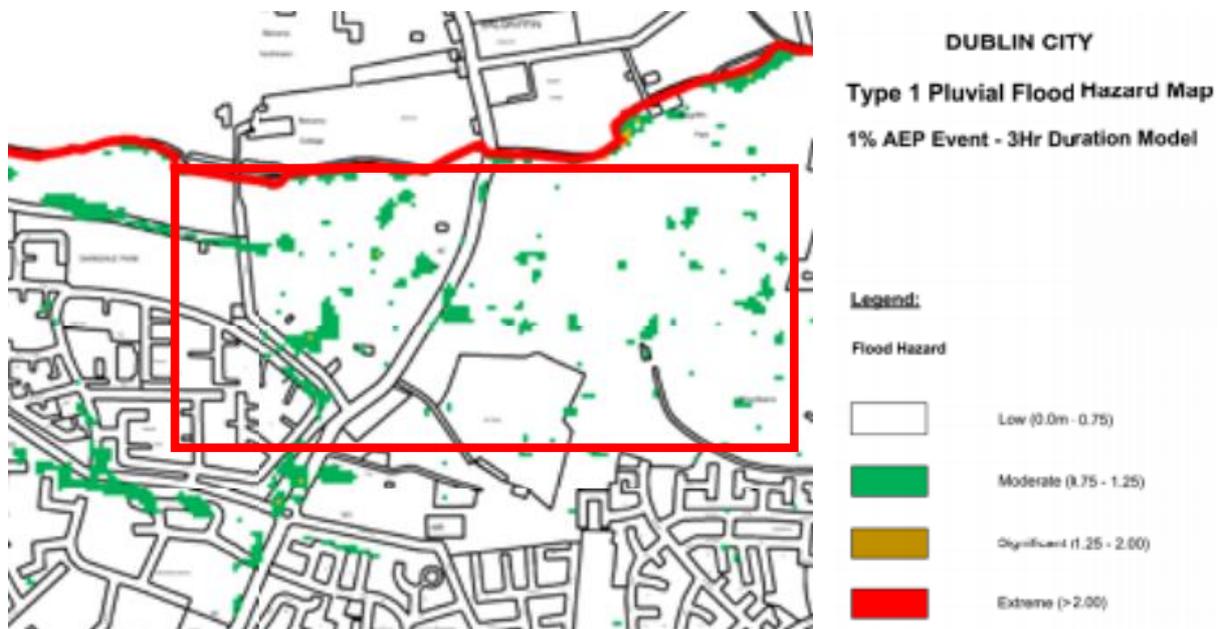


Figure 9: Dublin City Pluvial Flood Hazard Map – FloodResilienCity Project (CDP)

#### (vi) CFRAM Study

The National CFRAM study is a more detailed FRA for the key flood risk areas (AFA's) identified in the PFRA . The master plan lands are covered by the Eastern CFRAM study area. The CFRAM Studies generated several outputs including:

- Flood maps indicating modelled flood extents and flood zones for a range of flood events of annual exceedance probability (AEP).
- Flood Risk Management Plans (FRMPs) to manage flood risk within the relevant river catchment.

The flood maps highlight the 10 %, 1% and 0.1% AEP fluvial flood extents. The flood extent mapping from the CFRAM shows no flooding from the River Mayne on the masterplan lands (less than 0.1% AEP (1000-year event)). The fluvial flood extent map taken from the Final CFRAM Maps is shown in full in Appendix E and an extract from same is shown in Figure 10 below.

The CFRAM Final Flood Risk Management Plan for the Liffey and Dublin Bay River Basin (UOM09) identifies a Flood Relief Scheme proposed or already in design or construction for the Balgriffin - Balgriffin Flood Relief Scheme. This has not been commenced to date.

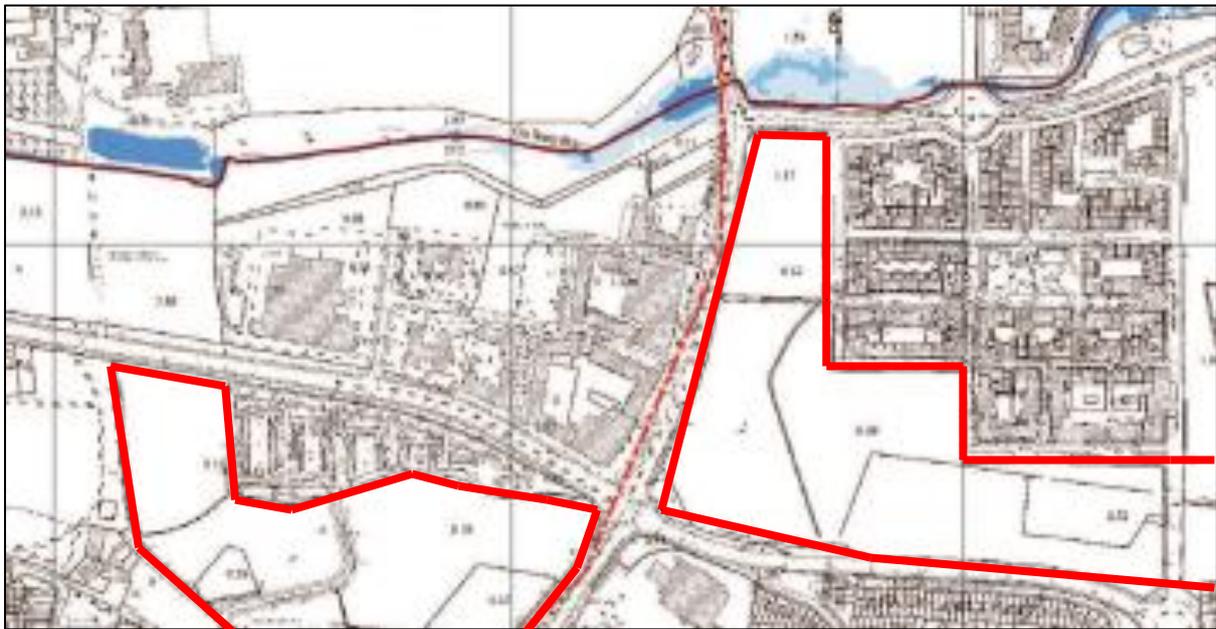


Figure 10: CFRAM MAP showing the Lands in the less than 0.1% AEP (1000-year event) flood area (FEM FRAMS fluvial flood extent map)

### 3.2 Sources of Flooding

Probable sources of flooding (pathways) are described below.

#### (i) Fluvial

The masterplan lands are located within Flood Zone C as defined by the Guidelines, i.e. outside the Indicative 1%AEP (100 year and extreme event fluvial zones), see figure 10 above and the CFRAM - FEM FRAMS fluvial flood extent map in Appendix E . The risk of fluvial flooding on the masterplan

lands is therefore low. The proposed masterplan land uses are appropriate for this flood zone category.

**(ii) Tidal / Coastal**

The masterplan lands are located within some 3.5km distance from the coast. Records on the OPW Coastal Flood maps (ICPSS Flood Maps) show that the masterplan lands are located outside the tidal floodplain which is located to the east of the railway line (see Coastal Flood Extent Map Figure 11 below). The risk from Tidal Flooding on the masterplan lands is therefore low and no mitigation measures are required.

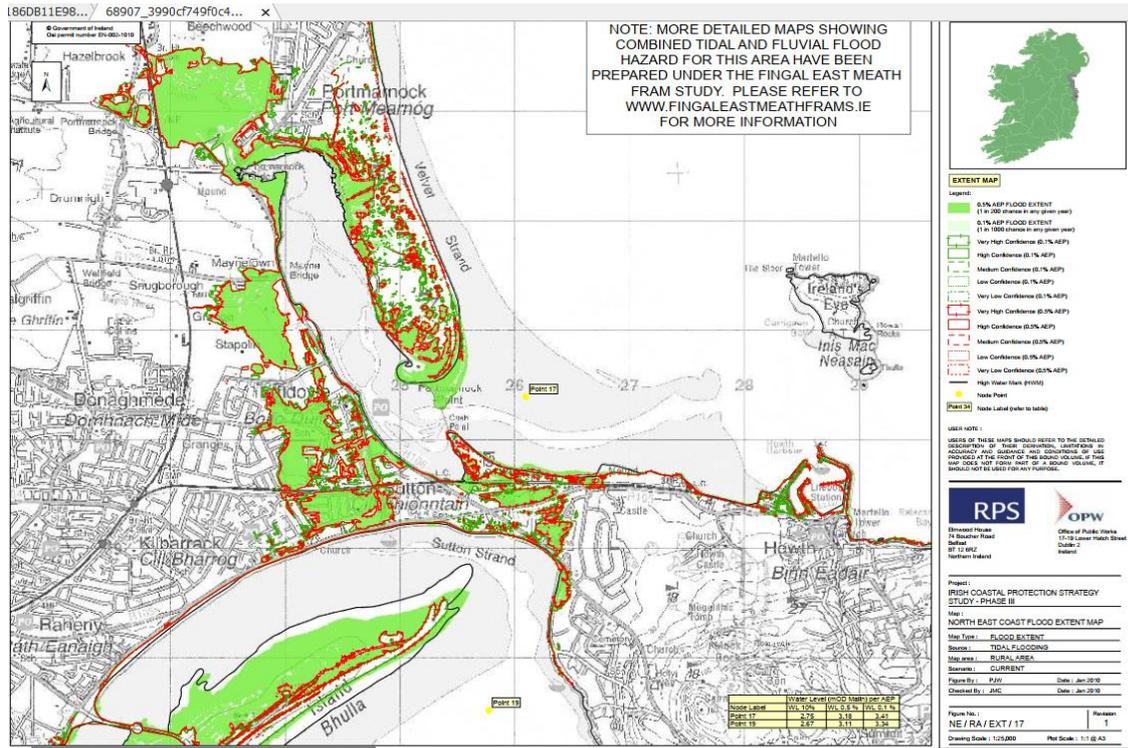


Figure 11: ICPSS Coastal Flood Extent Map (Masterplan Lands not shown)

**(iii) Groundwater**

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. The Geological Survey of Ireland (GSI) groundwater vulnerability mapping shows the masterplan area is located in an area of low groundwater vulnerability - see Figure 12 below. There is therefore a low risk from groundwater flooding on the masterplan lands.

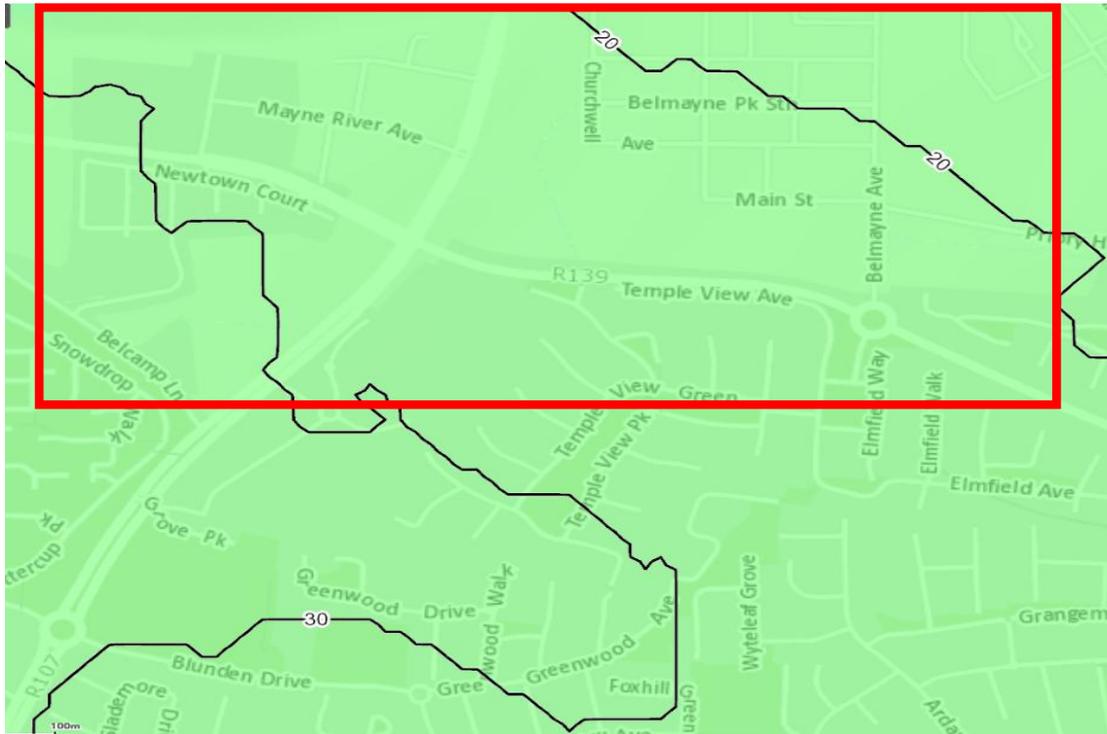


Figure 12 – GSI Groundwater Vulnerability Map: Green = Low Vulnerability

The OPW PFRA carried out a national scale a Groundwater Flooding Report which concludes that ground water flooding is largely confined to the West Coast of Ireland due to the hydrogeology of the area.

**(iv) Pluvial**

Pluvial flooding occurs when the capacity of the local urban drainage network (or ground infiltration) is exceeded during periods of intense rainfall. At these times, water can collect at low points in the topography and cause flooding. Other related pluvial flooding issues arise from the failure of local sewer networks, and surface water flooding from the surrounding area into the lands. Finally, pluvial flooding can also arise from increased surface water discharging from a site, as a result of new development, to the existing drainage network which can lead to downstream flooding. These issues are discussed below.

According to the pluvial flood maps of Dublin produced as part of the Flood Resilient City Project (Appendix 6 of the CDP, SFRA, Volume 7) the **pluvial flood hazard** for Belmayne and Belcamp Lane is low (with spots of moderate). Areas identified with moderate flood hazard are associated with areas of hardstanding / site topography. Flood hazard as it relates to current conditions on the lands is therefore low.

The Historic Flood Events OPW map (OPW National Flood Hazard Mapping Report - Appendix B) indicates that there are no recent records of overland flooding on / immediately adjacent the masterplan lands. The likelihood of flooding from the surrounding area onto the site is therefore low.

Surface water from these lands will be discharged to the existing surface water drainage network as described in Section 1.4 above. Surcharging of onsite and of the adjacent existing drainage system will have to be assessed as part of any site specific flood risk assessment for a proposed development. Mitigation measures may include an appropriately sized surface water network,

appropriate finished floor levels and appropriate SUDS devices to intercept and slow down the rate of runoff from the site to the existing surface water sewer system.

The development of these lands will increase the hardstanding of the site. There is an increased likelihood of surface water discharge from the site leading to a greater risk of downstream flooding. Any risk of surface water/pluvial flooding to the site will be mitigated by the design of the surface water drainage network and the incorporation of new SuDs features as set out in Appendix A.

### **3.3 Climate Change**

Consideration needs to be given to global warming and an increased 20% in rainfall intensity. Also a change in rainfall patterns from low intensity to more intensive rainfalls is likely. It is recognised that best practice approaches will include nature based water retention measure using a sustainable urban design approach.

## **4.0 Flood Risk Conclusion**

### **4.1 General**

The Flood Risk Assessment for the Belmayne / Belcamp Lane Masterplan has been undertaken in accordance with the requirements of Flood Risk Management Policy, namely the OPW's Guidelines for Planning Authorities: 'The Planning System and Flood Risk Management, published in 2009.

Having carried out flood risk assessment in accordance with the above Guidelines the following has been determined:

#### ***Fluvial Flood Risk***

The masterplan lands are located within Flood Zone C as defined by the Guidelines. The risk of fluvial flooding on the masterplan lands is therefore low and the proposed land uses are appropriate for this flood zone category.

#### ***Tidal Flood Risk***

The lands are located within some 3.5km distance from the coast and outside of the coastal flood zone. On this basis, the risk from Tidal Flooding on the masterplan lands is considered to be low.

#### ***Groundwater Flood Risk***

The masterplan area is located in an area of low groundwater vulnerability and therefore is at a low risk of groundwater flooding.

#### ***Pluvial Flood Risk***

As further infrastructure and hardstanding is to be provided on the lands, there is a risk of surface water discharge from the site leading to downstream flooding and potential for surcharging of the drainage system. The risk of pluvial / surface water flooding at this location will be managed as part of the design of the surface water drainage works including through the implementation of SuDs measures in accordance with the requirements of the Dublin City Development Plan 2016 – 2022, the Clongriffin – Belmayne Local Area Plan 2012 and the High Level Surface Water Management Strategy as set out in Appendix A. The drainage design should ensure no increase in flood risk to the site, or the downstream catchment.

#### **Mitigation measures for New Development:**

- Comprehensive surface water management measures required including green roofs and green infrastructure, to reduce outflows and improve water quality.
- Reduce outflows,
- Only clean, uncontaminated surface waters to discharge to the network
- Link to existing green areas
- Tree planting recommended
- Green roofs and green infrastructure required to improve water quality and flood flows.
- Potential for Biodiversity / green strip beside transport links

# Appendix A – High Level Surface Water Management Strategy for Belcamp-Belmayne Masterplan Lands

## 1. Vision for the integration of Sustainable Urban Drainage Systems (SuDs) into Masterplan

The development of this masterplan provides the opportunity to create great places whilst managing surface water for the proposed development through the use of SuDs.

Well designed SuDs can deliver increased property value, mitigate local flood risk, benefit ecology and create valuable amenity spaces for communities.

The **SuDS strategy** as set out below will meet the water management needs of the Masterplan area while delivering green infrastructure and supporting high quality development.

## 2. Sustainable Urban Drainage Systems (SuDS) Strategy

Dublin City Development Plan 2016 -2022, Chapter 9 identifies the need for Sustainable Environmental Infrastructure as part of any development in the city. The criteria listed in Chapter 9 are linked to the other major environmental themes within the Plan specifically, in relation to Climate Change, Green Infrastructure, Open Space and Recreation, and Sustainable communities. Therefore, the Developer is expected to integrate the principles of Sustainable Urban Drainage Systems (SuDs) in the management of surface water, using best practice solutions.

Dublin City Council (DCC) requires a softer engineered approach to be used to manage surface water at source as it is a greener, more environmentally effective approach for managing stormwater on developed lands. Over ground soft engineering solutions integrated with the landscaping plan are necessary and alongside a ‘treatment train’ approach in accordance with best SuDs practice is required.

The concept of a ‘treatment train’ should be implemented. By passing water through several stages of treatment, sediment and other pollutants can be removed more effectively and maintenance costs can be reduced as downstream SuDs features are less likely to get blocked. The use of a treatment train will further enhance the green corridors and links proposed and add opportunities for engagement and education.

Management of surface water at source is the priority and ideally, only overflow in extreme weather events shall be directed to main surface water infrastructure.

Good management of rainwater is vital. The comprehensive SuDs strategy as set out below will meet the city’s water management needs while delivering green infrastructure and supporting high quality development. There is a range of opportunities for SuDs to complement the local environment and type of development.

Delivery of SuDs schemes in areas of development can manage surface water, reduce pressure on the existing infrastructure and reduce localised surface water flooding. SuDs as an integrated system across the masterplan will also support ecosystems by regulating flows, delivering habitat and filtering out sediment and pollutants that harm our watercourses.

**(a) Specific Surface Water Management Requirements**

Surface water runoff from all proposed developments within the masterplan shall be managed by providing a minimum 2/3 staged treatment process at or near source before conveying flows to the appropriate Discharge Point – which will need to be agreed in consultation with the Council’s Drainage Department.

**(b) Recommended SuDS Systems for Future Developments within the Masterplan area**

On this basis, Table 5 below sets out suitable SuDS devices for each type of development within the Masterplan area. Alternative options (i.e. traditional attenuation tank) would be considered by the Council, provided they form part of a ‘treatment train’. The minimum requirement for each development type would be 2-staged treatment train to manage runoff prior to draining flows to the most appropriate Discharge Point

<b>TRADITIONAL HOUSING DEVELOPMENTS WITH GARDENS</b>	<b>COMMERCIAL / APARTMENT DEVELOPMENTS</b>
<ul style="list-style-type: none"> <li>• Filter drains</li> <li>• Infiltration systems</li> <li>• Permeable paving</li> <li>• Soakways</li> <li>• Green gardens</li> <li>• Green roofs</li> <li>• Rainwater butts – May be used but are not considered as SuDS</li> </ul>	<ul style="list-style-type: none"> <li>• Filter drains</li> <li>• Infiltration systems</li> <li>• Green roofs</li> <li>• Soakways</li> <li>• Green gardens</li> <li>• Swales</li> <li>• Rainwater harvesting (as part of a more complex SuDS design)</li> <li>• Detention Basins</li> </ul>
<b>PUBLIC REALM AREAS THAT ARE TO BE FULLY/ PARTIALLY PAVED, INCL. CAR PARKING AREAS, BUS BAYS ETC.</b>	<b>PUBLIC ROADWAYS AND FOOTPATHS (TO BE TAKEN IN CHARGE)</b>
<ul style="list-style-type: none"> <li>• Permeable paving</li> <li>• Tree pits with infiltration system</li> <li>• SuDS components such as filter drains, swales or other surface channel designed to run adjacent to impermeable surfacing to take runoff directly.</li> </ul>	<ul style="list-style-type: none"> <li>• SuDS components such as filter drains, swales or other surface channel designed to run alongside the impermeable surface to take runoff directly.</li> <li>• Impermeable surfacing draining to tree pit infiltration system</li> </ul>

**Table 1: Recommended SuDS Devices per development type**

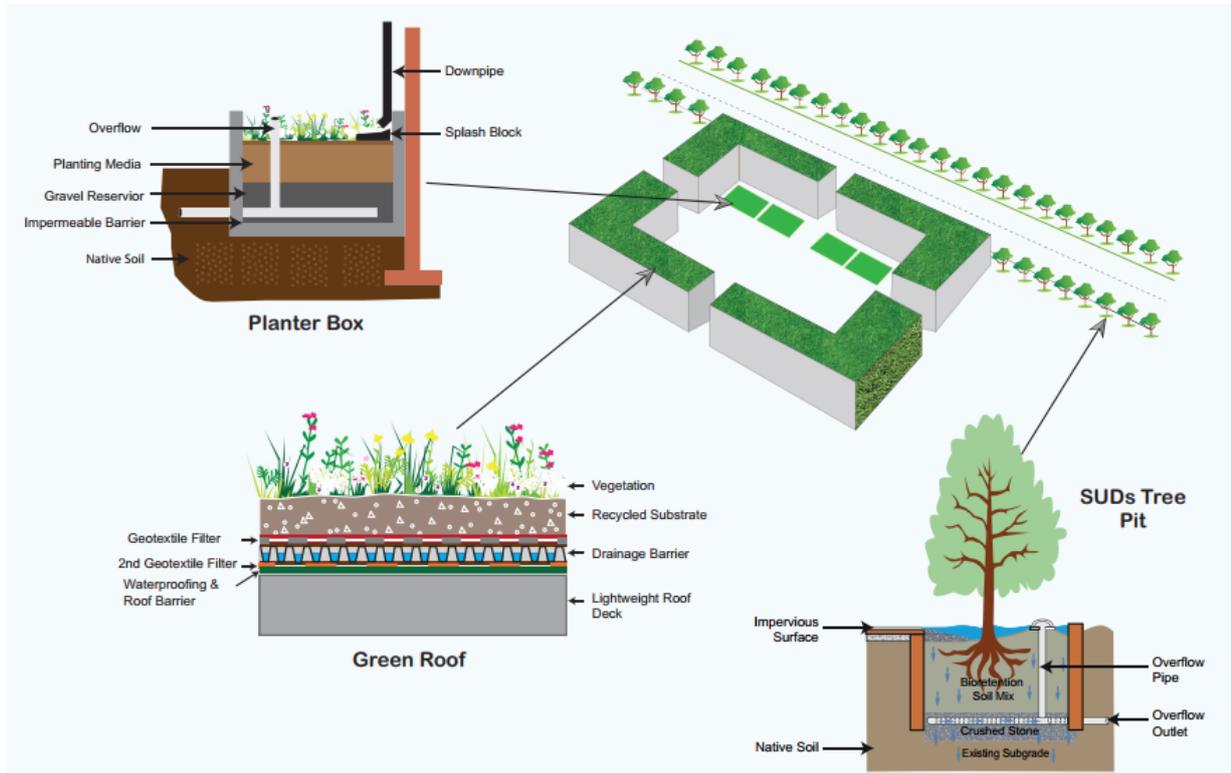


Figure 6. Examples of Nature Based Water Retention Measures using SUDS

The Hierarchy of Discharge Options are:

1. Water reuse
2. Infiltration
3. Discharge to water body (subject to agreement with Council's Drainage Department / WFD Group)
4. Discharge to surface water drain

The use of nature based water retention measures using SUDS will have the dual effect of reducing the rate of surface water runoff into sewers, thus reducing the risk of downstream flooding, as well as improving the water quality of that runoff through percolating the runoff through natural media with a green infrastructure approach.

### 3. Sustainable Urban Drainage Deliverables for individual developments

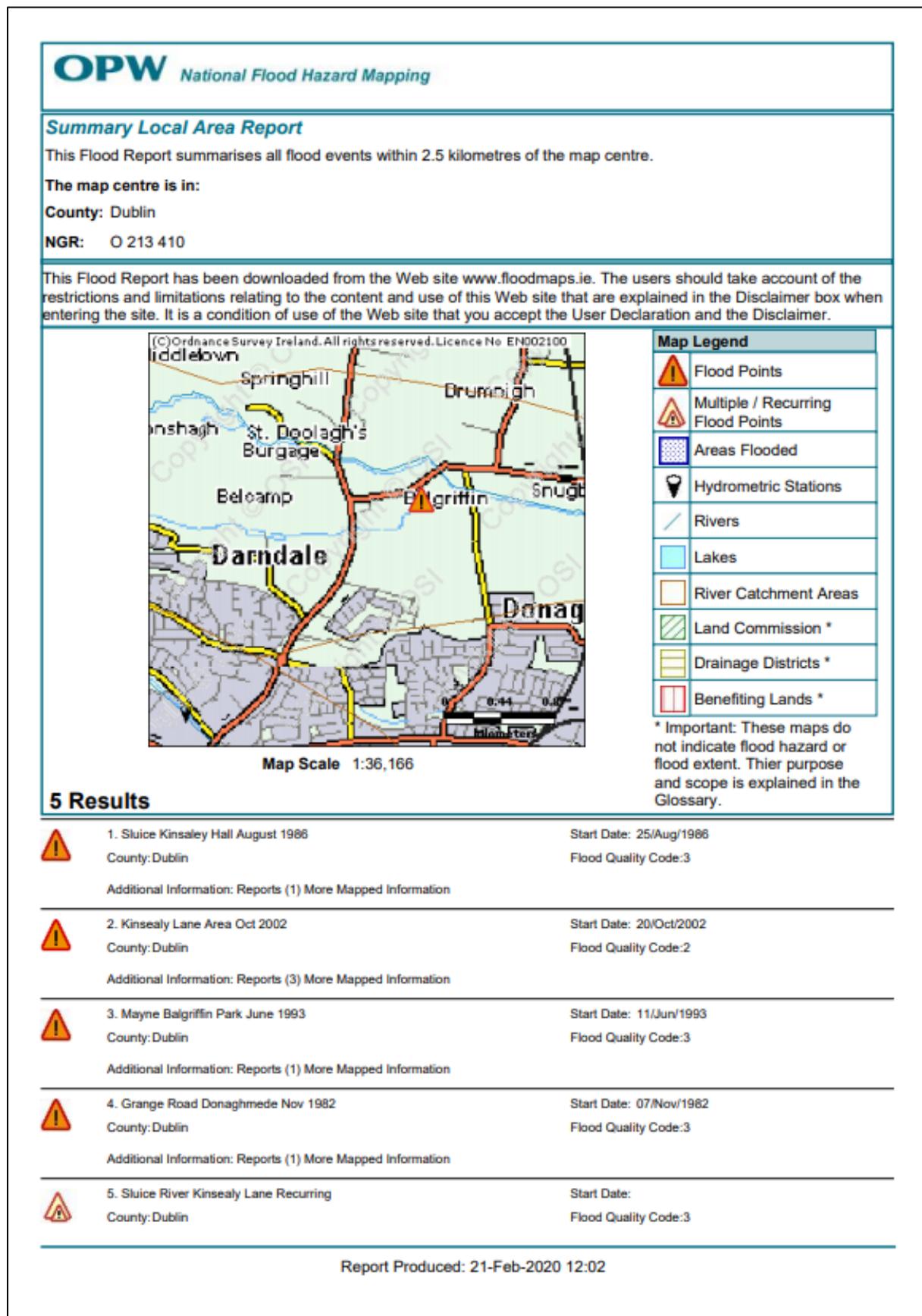
Proposals for all developments will be required to address the following:

- **Surface Water Management Plan (SWMP)** incorporating the proposals for sustainable drainage for this area. This shall include a report, a proposed surface water layout drawing and layout clearly indicating integration with proposed landscape plan.
- **Section Drawings** to include section details of proposed SuDS devices
- **Site Specific Flood Risk Assessment (SSFRA)**

- A detailed report shall be submitted in accordance with the Strategic Flood Risk Assessment which forms part of the Development Plan. The SSFRA shall identify the key areas of the site that may or may not be suitable for SuDs components and will identify any flood hazards for the operation and maintenance of the drainage system. The preferred approach would ensure any flood mitigation measures are incorporated into the overall surface water management approach
- A modified flow route analysis drawing
- Details on any proposed basement structure and associated groundwater issues shall be discussed in SSFRA

**Phased development** – Where development under a development proposal/ planning permission is phased or under various contract arrangements, coordination of the overall surface water management strategy shall be implemented at the first phase in order to ensure the overall integrated design is implemented

## Appendix B - OPW National Flood Hazard Mapping Report



## Appendix C –Planning Policy

### 1.1 Dublin City Development Plan (CDP) 2016-2022

In order to prevent flooding and to improve water quality, all development in the City Council’s administrative area is required to comply with the policies and objectives of the Dublin City Development Plan 2016 – 2022 in relation to surface-water and flood risk management, the Strategic Flood Risk Assessment of the CDP, Volume 7, the Greater Dublin Strategic Drainage Study and the Greater Dublin Regional Code of Practice for Drainage Works. Flood risk must be considered as part of a development proposal and where required an assessment must be carried out in accordance with the provisions of the Section 28 Guidelines ‘The Planning System and Flood Risk Management, Guidelines’ for Planning Authorities, Department of the Environment, Community and Local Government, November 2009.

Listed below are the policies and objectives in relation to surface water and flood management as set out in the Dublin City Development Plan 2016 – 2022.

<b>GENERAL WATER COURSES &amp; WATER QUALITY / FLOOD RISK MANAGEMENT</b>	
<b>POLICIES</b>	<b>OBJECTIVES</b>
<b><i>Water Courses &amp; Water Quality</i></b>	<b><i>Water Supply / Water Courses &amp; Water Quality</i></b>
<i>SI4: To promote and maintain the achievement of at least good status in all water bodies in the city.</i>	<i>SIO3: To require all new development to provide a separate foul and surface water drainage system and to incorporate sustainable urban drainage systems</i>
<i>SI5: To promote the enhancement of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems.</i>	<i>SIO4: To minimise wastage of water supply by requiring new developments to incorporate water conservation measures, and to promote water conservation by all water users.</i>
<i>SI6: To promote the protection and improvement of the aquatic environment, including through specific measures for the progressive reduction or cessation of discharges and emissions.</i>	<i>SIO6: To implement the European Union Water Framework Directive through the implementation of the appropriate River Basin Management Plan and Programme of Measures</i>
<i>SI7: To promote the progressive reduction of pollution of groundwater and prevent its further pollution.</i>	<i>SIO7: To take into consideration the relevant River Basin Management Plan and Programme of Measures when considering new development proposals.</i>
<i>SI8: To mitigate the effects of floods and droughts subject to environmental assessments</i>	
<b>Flooding Policies</b>	<b>Flooding Objectives</b>
<i>SI10: To have regard to the Guidelines for Planning Authorities on the Planning System and Flood Risk Management, and Technical Appendices, November 2009, published by the Department of the Environment, Community, and Local Government as may be revised/updated when assessing planning applications and in the preparation of plans both statutory and non-statutory.</i>	<p><i>SIO8: All development proposals shall carry out, to an appropriate level of detail, a Site-Specific Flood Risk Assessment (SSFRA) that shall demonstrate compliance with:</i></p> <ul style="list-style-type: none"> <li><i>• The Planning System and Flood Risk Management, Guidelines for Planning Authorities, Department of the Environment, Community and Local Government, November</i></li> </ul>

	<p>2009, as may be revised/updated and the Strategic Flood Risk Assessment (SFRA) as prepared by this Development Plan.</p> <ul style="list-style-type: none"> <li>• The site-specific flood risk assessment (SSFRA) shall pay particular emphasis to residual flood risks, site-specific mitigation measures, flood-resilient design and construction, and any necessary management measures (the SFRA and Appendix B4 of the above mentioned national guidelines refer). Attention shall be given in the site-specific flood risk assessment to building design and creating a successful interface with the public realm through good design that addresses flood concerns but also maintains appealing functional streetscapes. All potential sources of flood risk must be addressed in the SSFRA.</li> </ul>
SI11: To put in place adequate measures to protect the integrity of the existing Flood Defence Infrastructure in Dublin City Council's ownership and identified in the Strategic Flood Risk Assessment and to ensure that the new developments do not have the effect of reducing the effectiveness or integrity of any existing or new flood defence infrastructure and that flood defence infrastructure has regard also to nature conservation, open space and amenity issues	SIO10: That recommendations and flood maps arising from the Fingal-East Meath CFRAM Study, the Dodder CFRAM Study and the Eastern CFRAM Study are taken into account in relation to the preparation of statutory plans and development proposals. This will include undertaking a review of the Strategic Flood Risk Assessment for Dublin city following the publication of the Final Eastern CFRAM Study, currently being produced by the OPW.
<i>Flooding: SI12:</i> To implement and comply fully with the recommendations of the Strategic Flood Risk Assessment prepared as part of the Dublin City Development Plan.	SIO11: To work with neighbouring local authorities when developing cross-boundary flood management work programmes and when considering cross-boundary development.
Flooding SI14: To protect the Dublin City coastline from flooding as far as reasonably practicable, by implementing the recommendations of the Dublin Coastal Flood Protection Project and the Dublin Safer Project.	SIO12: To ensure each flood risk management activity is examined to determine actions required to embed and provide for effective climate change adaptation as set out in the Dublin City Council climate change adaption policy and in the OPW Climate Change Sectoral Adaptation Plan Flood Risk Management applicable at the time.
<i>Flooding: SI15:</i> To minimise the risk of pluvial (intense rainfall) flooding in the city as far as is reasonably practicable and not to allow any development which would increase this risk.	
Flooding: SI16: To minimise the flood risk in Dublin City from all other sources of flooding, including fluvial, reservoirs and dams and the piped water system.	

Table 1. CDP Water/ Flood Risk Management Policies and Objectives

The CDP addresses the issue of surface water drainage in new development through Sustainable Urban Drainage Systems (SUDS) which comprises a series of management practices and control structures that aim to mimic natural drainage and to slow down and reduce the urban run-off at source in order to manage for example, flood risk further downstream, whilst also reducing the risk of environmental pollution. In practice, SuDS function to reduce flood risk, improve water quality and provide amenity through the use of permeable paving, swales, green roofs, rain water harvesting, detention basins, ponds and wetlands. Furthermore, SUDS are an integral part of green infrastructure and offer the opportunity to combine water management with green space, which can increase amenity and biodiversity.

<b>STORM (SURFACE) WATER MANAGEMENT</b>	
<b>POLICIES</b>	<b>OBJECTIVES</b>
<p><i>SI18:</i> To require the use of Sustainable Urban Drainage Systems in all new developments, where appropriate, as set out in the Greater Dublin Regional Code of Practice for Drainage Works. The following measures will apply:</p> <ul style="list-style-type: none"> <li>• The infiltration into the ground through the development of porous pavement such as permeable paving, swales, and detention basins</li> <li>• The holding of water in storage areas through the construction of green roofs, rainwater harvesting, detention basins, ponds, and wetlands</li> <li>• The slow-down of the movement of water.</li> </ul>	<p><i>SIO13:</i> To provide additional and improved surface water networks to both reduce pollution and allow for sustainable development.</p> <p><i>SIO14:</i> To require that any new paving of driveways or other grassed areas is carried out in a sustainable manner so that there is no increase in storm water run-off to the drainage network.</p>

**Table 2: CDP Stormwater Management Policies and Objectives**

In noting the implications of Climate Change, the CDP further requires that proposed developments be future-proofed meaning that design-criteria for the management of urban run-off may continue to be revised in order to address increasing water levels and extreme weather events.

## 1.2 Clongriffin-Belmayne Local Area Plan (LAP) 2012

This Local Area Plan sets out policies and objectives in respect to flooding, managing surface water run off and improving water quality and these are set out below:

### 1.2.1

<b>WATER &amp; FLOODING OBJECTIVES</b>	<b>FLOODING POLICIES</b>
<p><i>ISO2:</i> To seek the rehabilitation of the Mayne River to good water status, it's restoration as a natural amenity and protection of the riparian corridor through the LAP area.</p>	<p><i>ISP5:</i> To require adherence to Flood Risk Management Policies for all future developments through the development management process in accordance with the guidance set out under Section 14.4.1 LAP Policies for the Local Area Plan for Flood Risk Assessment and Appendix 6 Flood Risk</p>

	Assessment of the LAP
ISO3: To seek the achievement of good water quality in line with the Water Framework Directive requirements and the Eastern River Basin District Management Plan for all water courses in the LAP area including the River Mayne.	<div style="background-color: #709238; color: white; padding: 5px;"><b>CHAPTER 10</b> <b>Environment &amp; Open Space Strategy</b></div> <div style="background-color: #e1f5fe; padding: 5px;"><b>EOSO1</b> To achieve best practice and innovations in SUDS design as part of development schemes including the successful co-ordination of surface water management with ecology and amenity functions of open space and landscaped areas.</div>
ISO4: All planning applications shall be required to submit a surface water drainage plan which will include proposals for the management of surface water within sites, and runoff rates from sites, protecting the water quality of the River Mayne and retrofitting best practice SuDS techniques on existing sites where possible.	
ISO6: To require all proposed developments to carry out a detailed Flood Risk Assessment in accordance with the Departmental Guidelines on Flood Risk Management	
ISO7: All new developments shall be required to comply with the standards set out in the Greater Dublin Strategic Drainage Study (GSDSDS).	

**Table 3: LAP Relevant Water Management / Flooding Policies and Objectives**

### 1.2.2 Policies for the Local Area Plan for Flood Risk Assessment

Section 14.4.1 of the LAP outlines policies and measures that are applicable to all development within the Local Area Plan.

These are contained below:

*P1) All planning applications, for proposed development within the LAP area should include a site specific flood risk assessment (FRA)*

*P1a) Risk to other development*

- *If the development does not result in increased discharge to foul or surface-water sewers, then it can be confirmed in the FRA that the development does not cause an increased flood risk to other areas. Note that since the publication of the GSDSDS, it has been a requirement that surface-water discharge rates are limited to green-field rates for the development, so compliance with this requirement for all pluvial event results is required for all flood risk management guidelines relating to surface-water discharge. This requirement is best achieved by properly incorporating SUDS techniques into the development.*
- *If the development does result in increased discharge rates to sewers, then the developer may be required either to confirm that there is adequate capacity in the local network to cater for the increased flows without surcharge of the system or to propose a flood management solution to cater for the additional flows.*

*P1b) Risk to the development itself*

- *The FRA should address risks from all sources, including but not limited to coastal, fluvial and pluvial sources, possible flooding from sewer surcharging and flooding from groundwater.*
  - i. Incorporating storage within the development to cater for surface-water falling within the development for up to the 100-year pluvial (with a minimum climate change factor of 10% applied as appropriate).*
  - ii. Designing floor levels. A precautionary approach should be taken of 100 year fluvial level plus 10% increase in rainfall intensity plus 300mm freeboard for fluvial and pluvial levels and 200 year tidal level plus 1m for global warming and freeboard.*
  - iii. Designing basements and basement access to prevent ingress of water from groundwater sources or pluvial or fluvial flood events. Reference should be made to the DCC policy on basements as set out in the GDSDS Regional Drainage policy – Volume 6 – Basements. In particular, internal drainage must discharge from a level that is no deeper than 1.5m below ground level. This may require pumping in some cases. Dublin City Council's Basement Policy leaflet should also be consulted.*
  - iv. Designing outfall manholes and connections to sewers such that the risk of flooding from backup from sewers is minimised. This may require the installation of non-return valves.*

*For small-scale development such as change of use, or small scale refurbishments, existing risks from all sources need to be identified and controlled where possible:*

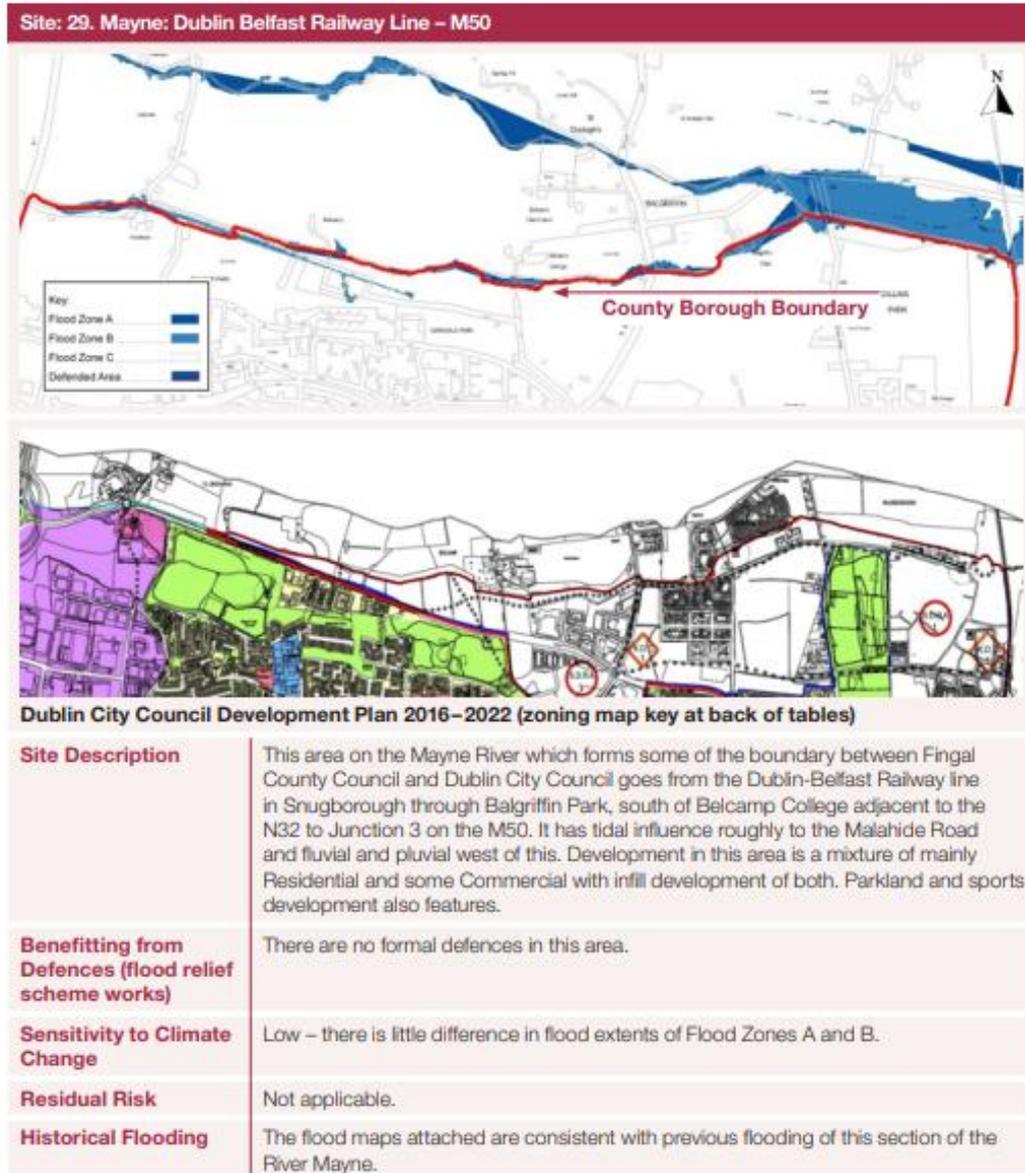
- v. Demountable flood barriers might be proposed at ground floor entrances.*
- vi. Existing outfall manholes and connections to sewers should be raised such that the risk of flooding from sewer surcharge is minimised. This may require the installation of non-return valves, or reconstruction of existing outfall manholes.*

*P2) Permission will not be granted for development where it is deemed that an inappropriate level of flood protection has been provided for.*

*P3) Provision for safe, dry emergency access/egress routes should be made from all development, both new and existing. These routes should enable pedestrians to safely evacuate properties during flood events.*

*P4) Consideration should be given to the appropriate use of flood warning and flood evacuation procedures for all development sites at risk from flooding and this should be discussed with the Major Emergency Management Section of Dublin City Council.*

# Appendix D – Dublin City Development Plan 2016-2022 - Site 29, Appendix 3, Volume 7



## Appendix D – Dublin City Development Plan 2016-2022 - Site 29, Appendix 3, Volume 7

### Site: 29. Mayne: Dublin Belfast Railway Line – M50

#### Storm (surface) water

All storm (surface) water in this area needs to be carefully managed and provision made for significant rainfall events during high river flows. Should development be permitted, best practice with regards to storm (surface) water management should be implemented across the development area, to limit storm (surface) water runoff to current values. Separation of storm (surface) water and foul sewage flows should be carried out where possible.

All Developments shall have regard to the Pluvial Flood Maps in their Site Specific Flood Risk Assessment, see Flood Resilient City Project, Volume 2 City Wide Pluvial Flood Risk Assessment at <http://www.dublincity.ie/main-menu-services-water-waste-and-environment-drains-sewers-and-waste-water/flood-prevention-plans>

#### Commentary on Flood Risk:

The flood extents indicate flow paths generally coming directly out of the river and re-entering the river downstream either directly or through the drainage network. These can be compounded with local pluvial flooding if heavy rainfall coincides with high river flows and high tides.

The flood maps were produced based on the OPW CFRAM Study for Fingal East Meath Catchments and they have been checked against historic flooding in the area.

#### Development Options:

The River Mayne flows along the boundary with Dublin City Council and Fingal County Council. Most of the Flood Risk Areas would be located outside of the DCC boundary. Part of the River that would be within DCC's boundary would be covered by the Clongriffin - Belymayne (North Fringe) LAP 2012. Please refer to this for Development Options.

#### Justification Test for Development Plans

- The land to the south of the River Mayne which forms the boundary with Fingal County Council is one of the areas identified as a Key Development Areas in the current plan. These represent significant areas of the inner and outer city with substantial development capacity and the potential to deliver the residential, employment and recreational needs of the city. The River Mayne runs along the boundary of Dublin City Council and Fingal County Council. Part of the area to the south of the River is covered by the Clongriffin- Belymayne Local Area Plan, 2012.
- The areas located in Flood Zones A and B are primarily open space, which is water compatible and should be retained. The Justification Test confirms that development in most of these areas is not justified. This should be consolidated through future revisions to the local area plans.
- Fingal County Council Planning should be consulted of any development close to its border which might have current or future flooding implications in Fingal.

# Appendix E: FEM-FRAMS Map (From CFAMS Mapping)

