

STRATEGIC FLOOD RISK ASSESSMENT

FOR THE

CORK CITY DEVELOPMENT PLAN 2022-2028

for: Cork City Council

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Section 1 Introduction and Policy Background

1.1 Introduction and Terms of Reference

Cork City Council has prepared the Cork City Development Plan 2022-2028 hereafter referred to as the "Plan".

The preparation of the Plan has undergone an appropriate level of Strategic Flood Risk Assessment (SFRA) in accordance with *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 Department of the Environment, Community and Local Government Circular PL 2/2014. The SFRA provides an assessment of flood risk and includes mapped boundaries for Flood Risk Zones.

The SFRA was undertaken alongside the Plan-preparation process and has been updated to take into account of changes made to the original Draft Plan on foot of submissions.

1.2 Summary of Conclusion and Recommendations

The purpose of this document is to detail the findings of the SFRA that has been undertaken alongside the preparation of the Plan.

The SFRA has informed the Plan and enables compliance with the Flood Risk Management Guidelines. Recommendations – including those related to land use zoning and flood risk management provisions – have been integrated into the Plan.

Consistency between the Plan text and the requirements of the Guidelines was prioritised and achieved. Should any conflict arise between the written statement (encompassing the Material Alterations) and the zoning maps, the written statement shall take precedence.

Furthermore, Amendment 2.99 was found to potentially conflict with proper flood risk management and not comply with the Flood Risk Management Guidelines; there would be potential risk to environmental components including human health and material assets. As a result, it was advised that "there is a need to reject this amendment in its current state in order to comply with the Flood Risk Management Guidelines".

Submissions made on the Draft Plan and associated documents, including an earlier version of this SFRA report, while on public display, were taken into account and resulted in various updates being made to both this SFRA report and the Draft Plan.

1.3 Flood Risk and its Relevance as an Issue to the Plan

1.3.1 Flood Risk

Flooding is an environmental phenomenon and can pose a risk to human health as well as causing economic and social effects. Some of the effects of flooding are identified on Table 1 below.

Certain lands within the City have the potential to be vulnerable to flooding and this vulnerability could be exacerbated by changes in both the occurrence of severe rainfall events and associated flooding. Local conditions such as low-lying lands and slow surface water drainage can increase the risk of flooding.

Table 1 Potential effects that may occur as a result of flooding

Tangible Effects	Intangible Human and Other Effects
Damage to buildings (houses)	Loss of life
Damage to contents of buildings	Physical injury
Damage to new infrastructure e.g. roads	Increased stress
Loss of income	Physical and psychological trauma
Disruption of flow of employees to work causing knock on effects	Increase in flood related suicide
Enhanced rate of property deterioration and decay	Increase in ill health
Long term rot and damp	Homelessness
	Loss of uninsured possessions

1.4 Flood Risk Management Policy

1.4.1 EU Floods Directive

The European Directive 2007/60/EC on the assessment and management of flood risk aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. The Directive applies to inland waters as well as all coastal waters across the whole territory of the EU. The Directive requires Member States to:

- Carry out a preliminary assessment by 2011 in order to identify the river basins and associated coastal areas where potential significant flood risk exists (preliminary mapping was prepared and a list of Areas for Further Assessment finalised in 2012).
- Prepare flood extent maps for the identified areas (finalised in 2016 for inclusion in Flood Risk Management Plans – see below).
- Prepare flood risk management plans focused on prevention, protection and preparedness. These plans are to include measures to reduce the probability of flooding and its potential consequences. These Plans were adopted in 2018.

Implementation of the EU Floods Directive is required to be coordinated with the requirements of the EU Water Framework Directive and the current National River Basin Management Plan.

1.4.2 National Flood Policy

Historically, flood risk management focused on land drainage for the benefit of agricultural improvement. With increasing urbanisation, the Arterial Drainage Act, 1945, was amended in 1995 to permit the Office of Public Works (OPW) to implement localised flood relief schemes to provide flood protection for cities, towns and villages.

In line with changing national and international paradigms on how to manage flood risk most effectively and efficiently, a review of national flood policy was undertaken in 2003-2004. The review was undertaken by an Inter-Departmental Review Group, led by the Minister of State at the Department of Finance with special responsibility for the OPW. The Review Group prepared a report that was put to Government, and subsequently approved and published in September 2004 (Report of the Flood Policy Review Group, OPW, 2004).

The scope of the review included a review of the roles and responsibilities of the different bodies with responsibilities for managing flood risk, and to set a new policy for flood risk management in Ireland into the future. The adopted policy was accompanied by many specific recommendations, including:

- Focus on managing flood risk, rather than relying only flood protection measures aimed at reducing flooding;
- Taking a catchment-based approach to assess and manage risks within the whole-catchment context; and

- Being proactive in assessing and managing flood risks, including the preparation of flood maps and flood risk management plans.

1.4.3 National CFRAM Programme

The national Catchment Flood Risk Assessment and Management (CFRAM) programme commenced in Ireland in 2011. The CFRAM Programme is intended to deliver on core components of the National Flood Policy, adopted in 2004, and on the requirements of the EU Floods Directive. The Programme is being implemented through CFRAM studies that have been undertaken for each of the river basin districts in Ireland.

The CFRAM Programme comprises three phases as follows:

- The Preliminary Flood Risk Assessment¹ (PFRA) mapping exercise, which was completed in 2012;
- The CFRAM Studies and parallel activities, with Flood Risk Management Plans finalised in 2018; and
- Implementation and Review.

The Programme provides for three main consultative stages as follows:

- Consultation for the PFRA mapping that was adopted in 2012;
- Consultation for Flood Extent mapping, that was finalised in 2016 for inclusion in Flood Risk Management Plans; and
- Consultation for Flood Risk Management Plans, that were adopted in 2018.

The OPW is the lead agency for flood risk management in Ireland. The coordination and implementation of Government policy on the management of flood risk in Ireland is part of its responsibility. The European Communities (Assessment and Management of Flood Risks) Regulations 2010 (S.I. No. 122) identifies the Commissioners of Public Works as the 'competent authority' with overall responsibility for implementation of the Floods Directive 2007/60/EC. The OPW is the principal agency involved in the preparation of CFRAM Studies.

1.4.4 Flood Risk Management Guidelines

1.4.4.1 Introduction

In 2009, the OPW and the then Department of the Environment and Local Government (DEHLG) published Guidelines on flood risk management for planning authorities entitled *The Planning System and Flood Risk Management - Guidelines for Planning Authorities*. The Guidelines introduce mechanisms for the incorporation of flood risk identification, assessment and management into the planning process. Implementation of the Guidelines is intended to be achieved through actions at the national, regional, local authority and site-specific levels. Planning authorities and An Bord Pleanála are required to have regard to the Guidelines in carrying out their functions under the Planning Acts.

The core objectives of the Guidelines are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface water run-off;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and
- Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

¹ The PFRAs identified areas at risk of significant flooding and includes maps showing areas deemed to be at risk. The areas deemed to be most significant risk, where the flood risk that is of particular concern nationally, are identified as Areas for Further Assessment (AFAs). AFAs were identified within the Plan area include Cork City, Douglas, Glanmire, Togher and Tower.

1.4.4.2 Principles of Flood Risk Management

The key principles of flood risk management set out in the flood Guidelines are to:

- Avoid development that will be at risk of flooding or that will increase the flooding risk elsewhere, where possible;
- Substitute less vulnerable uses, where avoidance is not possible; and
- Mitigate and manage the risk, where avoidance and substitution are not possible.

The Guidelines follow the principle that development should not be permitted in flood risk areas, particularly floodplains, except where there are no alternative and appropriate sites available in lower risk areas that are consistent with the objectives of proper planning and sustainable development.

Development in areas that have the highest flood risk should be avoided and/or only considered in exceptional circumstances (through a prescribed *Justification Test*) if adequate land or sites are not available in areas that have lower flood risk. Most types of development would be considered inappropriate in areas that have the highest flood risk. Only water-compatible development such as docks and marinas, dockside activities that require a waterside location, amenity open space, outdoor sports and recreation and essential transport infrastructure that cannot be located elsewhere would be considered appropriate in areas of highest risk.

1.4.4.3 Stages of SFRA

The Flood Risk Management Guidelines recommend a staged approach to flood risk assessment that covers both the likelihood of flooding and the potential consequences. The stages of appraisal and assessment are:

Stage 1 Flood risk identification – to identify whether there may be any flooding or surface water management issues related to either the area of Regional Spatial and Economic Strategies, Development Plans and Local Area Plans or a proposed development site that may warrant further investigation at the appropriate lower-level plan or planning application levels.

Stage 2 Initial flood risk assessment – to confirm sources of flooding that may affect a Plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing flood zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment are scoped.

Stage 3 Detailed flood risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

1.4.4.4 Flood Zones

Flood risk is an expression of the combination of the flood probability or likelihood and the magnitude of the potential consequences of the flood event. It is normally expressed in terms of the following relationship:

$$\text{Flood risk} = \text{Likelihood of flooding} \times \text{Consequences of flooding}$$

Likelihood of flooding is normally defined as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. For example, a 1% Annual Exceedance Probability (AEP) indicates the severity of a flood that is expected to be exceeded on average once in 100 years, i.e. it has a 1 in 100 (1%) chance of occurring in any one year.

Consequences of flooding depend on the hazards associated with the flooding (e.g. depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of people, property and the environment potentially affected by a flood (e.g. the age profile of the population, the type of development and the presence and reliability of mitigation measures).

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning.

There are three types of flood zones defined for the purposes of the Flood Guidelines:

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);
- **Flood Zone B** – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and
- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all other areas that are not in zones A or B.

A summary of the requirements of the Flood Guidelines for land uses across each of the above flood zones is provided at **Appendix I**.

1.5 Emerging Information and Disclaimer

It is important to note that compliance with the requirements of the Flood Risk Management Guidelines is currently based on emerging and best available data at the time of preparing the assessment, including Flood Risk Management Plans, which will be updated on a cyclical basis as part of CFRAM activities.

Following adoption of the Plan, information in relation to flood risk may be altered in light of future data and analysis, by, for example, the OPW, or future flood events. As a result, all landowners and developers are advised that Cork City Council and their agents can accept no responsibility for losses or damages arising due to assessments of the vulnerability to flooding of lands, uses and developments. Owners, users and developers are advised to take all reasonable measures to assess the vulnerability to flooding of lands and buildings (including basements) in which they have an interest prior to making planning or development decisions. Any future SFRAs for the area will integrate other new and emerging data.

1.6 Content of the City Development Plan

The Cork City Development Plan is a land use plan and overall strategy for the proper planning and sustainable development of the functional area of Cork City over the six-year period 2022-2028.

The Plan comprises a series of separate, but closely linked and interrelated elements. The Plan comprises two volumes:

- Volume 1 – Written Statement
- Volume 2 – Mapped Objectives
- Volume 3 – Built Heritage Objectives

The structure of the Written Statement is as follows:

- Chapter 1 – Introduction
- Chapter 2 – Core Strategy
- Chapter 3 – Delivering Homes and Communities
- Chapter 4 – Transport and Mobility
- Chapter 5 – Climate and Environment
- Chapter 6 – Green and Blue Infrastructure, Open Space and Biodiversity
- Chapter 7 – Economy and Employment
- Chapter 8 – Heritage, Arts and Culture
- Chapter 9 – Environmental Infrastructure and Management
- Chapter 10 – Key Growth Areas and Neighbourhood Development Sites
- Chapter 11 – Placemaking and Managing Development
- Chapter 12 – Land Use Zonings
- Chapter 13 – Implementation
- Appendix 1 – Compliance with Ministerial Guidelines

- Appendix 2 – Strategic Environmental Assessment
- Appendix 3 – Appropriate Assessment
- Appendix 4 – Strategic Flood Risk Assessment

The Strategic Vision for Cork City included in the Plan is for Cork City to take its place as a world class city, driving local and regional growth, embracing diversity and inclusiveness and growing as a resilient, healthy, age-friendly and sustainable compact city with placemaking, communities and quality of life at its heart.

This Strategic Vision is based on the following Key Strategic Principles:

- Compact growth: Integrate land-use and transport planning to achieve a compact city with 50% of all new homes delivered within the existing built-up footprint of the City on regenerated brownfield, infill and greenfield sites identified in the Core Strategy, and to achieve higher population densities aligned with strategic infrastructure delivery.
- A city of neighbourhoods and communities: Develop a sustainable, liveable city of neighbourhoods and communities based on the 15-minute city concept, ensuring that placemaking is at the heart of all development.
- Sustainable and active travel: To implement the Cork Metropolitan Area Transport Study (CMATS) and develop a transformed sustainable transport system with a significant shift toward walking, cycling and public transport and to enshrine this principle in all developments across the City.
- Enhanced built and natural heritage: Protect, enhance, support and develop our built and natural heritage, our open spaces and parks, and our green and blue infrastructure, and expand our built heritage with new buildings, townscapes and public spaces achieved through the highest standards of architecture and urban design.
- A strong and diverse economy: Support Cork City's role as the economic driver for the region and the creation of a strong, resilient, diverse and innovative economy.
- A resilient City: Contribute to a framework for the transition to a low-carbon and climate-resilient City, resilient to extreme weather events, pandemics, economic cycles and other potential shocks.
- A healthy, inclusive and diverse city: Build on Cork City's status as a World Health Organisation designated Healthy City, offering an inclusive and vibrant environment for all whilst promoting healthy living and wellbeing.
- A connected city: Cork City will continue to be a highly connected city providing local, regional, national and international connectivity.
- A city of learning and culture: To build on Cork's designation as a UNESCO Learning City and the city's rich cultural heritage and to foster learning, culture, heritage and the arts throughout the City.

The most relevant parts of the Plan for this SFRA relate to land use zoning and provisions relating to flood risk management².

² Flood risk management recommendations made by the SFRA process and integrated into the Plan are provided under Section 4.

Section 2 Stage 1 SFRA - Flood Risk Identification

2.1 Introduction

Stage 1 SFRA (flood risk identification) was undertaken in order to identify whether there may be any flooding or surface water management issues within or adjacent to zoned lands and consequently whether Stage 2 SFRA (flood risk assessment) should be proceeded to.

Cork City is subject to the Flood Risk Management Plan for the Lee, Cork Harbour and Youghal Bay River Basin (UOM19).

Stage 1 SFRA is based on existing information on flood risk indicators based on historical evidence and computational models. **Appendix II** (pages 3-7) show the spatial distribution of City-wide historical and predictive flood risk indicators. **Appendix II** also provides larger scale maps of these historical and predictive indicators for areas within the City.

2.2 Drainage, Defences and Early Warning Systems

With regard to areas benefitting from drainage and defences (flood relief scheme works), there are various measures that have been implemented in Cork City that will contribute towards flood risk management. These include the culverting of various streams and rivers in many urban areas.

Embankments and associated predicted benefitting lands under a number of historical government schemes are mapped in **Appendix II**.

The Flood Risk Management Plan for the Lee, Cork Harbour and Youghal Bay River Basin identifies various general measures under “Measures Applicable for all Areas”, including under the headings of:

- Sustainable Planning and Development Management
- Sustainable Urban Drainage Systems (SUDS)
- Adaptation Planning
- Land Use Management and Natural Flood Risk Management
- Maintenance of Channels not part of a Scheme
- Flood Forecasting and Warning
- Emergency Response Planning
- Promotion of Individual and Community Resilience
- Individual Property Protection
- Flood-Related Data Collection
- Voluntary Home Relocation

With regard to Cork City (the City Centre), the Flood Risk Management Plan identifies two key measures as follow:

- Progress a Flood Relief Scheme for Lower Lee, Cork City (Status: Stage II: Planning Process)

The proposed Lower Lee (Cork City) Flood Relief Scheme was initiated in 2013 following major flooding in 2009 and 2012 and includes flood defences along the River Lee downstream of Inniscarra dam and through Cork city, changes to the operating procedures for the Carrigadrohid and Inniscarra reservoirs for the purposes of flood risk management and a flood forecasting system to help guide decision-making on dam discharges and, if necessary, the erection of temporary / demountable defences downstream and in Cork City. The Scheme is expected to provide protection against the 100-year fluvial flood (1.0% Annual Exceedance Probability) from the River Lee, and against the 200-year tide (0.5% Annual Exceedance Probability) for about 2,100 properties.

- Progress a Flood Relief Scheme for the Bride River, Blackpool (Status: Stage II: Public Exhibition / Confirmation)

The proposed Bride River (Blackpool) Flood Relief Scheme was initiated in 2013 following major flooding in 2012 and includes conveyance improvement, flood defence embankments and walls, and pumping stations. The scheme is expected to provide protection against the 100-Year flood (1% Annual Exceedance Probability) for about 285 properties from the Bride River.

With regard to Douglas and Togher, the Flood Risk Management Plan identifies the following key measure:

- Progress a Flood Relief Scheme for Douglas, including Togher Culvert (Status: Stage IV: Implementation/Construction)

Project is being carried out in 3 Phases:

Phase 1: Main Douglas Project, Construction of direct flood defences and conveyance improvement measures along the Ballybrack Stream, Grange Stream and Tramore River. The direct defences proposed include flood walls with the conveyance improvements consisting of channel widening, channel deepening and the replacement of culverts.

Phase 2: Togher Culvert Service Diversions contract - Diversion of services on the L-2452 Togher prior to final phase.

Phase 3: Togher Culvert main project -Construction of conveyance improvement measures, including a flood wall, along the Tramore River and replacement of culverts along the L-2452 Togher.

With regard to Glanmire, the Flood Risk Management Plan identifies the following key measure:

- Progress a Flood Relief Scheme for Glashaboy FRS, Sallybrook/Glanmire (Status: Stage II: Public Exhibition / Confirmation)

The proposed Glashaboy (Sallybrook/Glanmire) Flood Relief Scheme includes construction of new walls, construction of earthen embankments, upgrades and construction of new culvert, replacement of existing bridge with new reinforced bridge at Hazelwood Shopping Centre, clearance of bridge eyes at Riverstown Bridge and associated drainage works. The proposed scheme is expected to provide protection against a 100-Year fluvial flood (1% Annual Exceedance Probability).

With regard to Tower, the Flood Risk Management Plan identifies the following key measure:

- Maintenance of the Existing Defences

Undertake maintenance of the existing flood defences in Tower / Blarney.

The provision of flood protection measures can significantly reduce flood risk. However, the Ministerial Guidelines require that the presence of flood protection structures should be ignored in determining flood zones. This is because of risks relating to failure and severe flood events that exceed design capacity (the risk of severe events is exacerbated with climate change). Notwithstanding this, new development can proceed in areas that are at elevated levels of flood risk subject to the Justification Test provided for by the Guidelines being passed, which takes into account proposals to manage flood risk, such as the development of defences. Although insurance can be challenging to attain in these instances.

Various rivers and their banks and culverts in the City are maintained by the Office of Public Works/Cork City Council.

The Plan provides various provisions for the protection of water courses and riparian zones, for example Development Management Paragraph Nos. 11.218 "Development proposals should incorporate an appropriately-sized buffer zone to maintain natural fluvial processes and to protect the water environment...." and 11.219 "Development proposals should protect watercourses in accordance with Inland Fisheries Ireland's "Planning for Watercourses in the Urban Area" including the protection of riparian sections of rivers and streams, where possible, as set out below. Existing development will be taken into account. (1) Protection of the streamside zone, (within 15m of riverbanks); (2) Utilisation of outer riparian buffer zone (>8m) for treatment and reduction of stormflow runoff; (3) Minimal disturbance of the corridor 15-30m from the river; (4) Explore opportunities for river corridors for access and use as local amenity; and (5) Encourage riparian buffer strips on agricultural land. Such protection will, in combination with the direction of development within the existing footprint of developed areas will help to safeguard flood plains from development throughout the City.

Met Éireann currently issues flood warnings for Cork City. Met Éireann, in collaboration with the OPW, is currently engaged in the establishment of a National Flood Forecasting and Warnings Service to forecast for fluvial and coastal flood events.

2.3 Other Flood Studies

Other Flood Studies considered in the preparation of this assessment include:

- Flood Risk Management Plan (Lee, Cork Harbour and Youghal Bay River Basin), 2018;
- Websites and documentation for the following measures under the Flood Risk Management Plan including:
 - Lower Lee Flood Relief Scheme
 - Douglas Flood Relief Scheme
 - Glashaboy Flood Relief Scheme
- Previous relevant SFRAs in Cork City and County
- Regional Flood Risk Assessment for the Southern Regional Spatial and Economic Strategy.

2.4 Flood Risk Indicators

Indicators of flood risk that are based on historical flooding events are identified and described on Table 2 and mapped in **Appendix II**.

Indicators of flood risk that are based on computational models – predictive flood risk indicators – are identified and described on Table 3 and mapped in **Appendix II**.

Table 2 Historical Flood Risk Indicators

Information Source	Description	Strategic Limitations
Recorded Flood Events from the OPW	A flood event is the occurrence of recorded flooding at a given location on a given date. The flood event is derived from different types of information (reports, photographs etc.).	This dataset only provides a spot location
Recurring Flood Events	A flood event that has occurred more than once at a certain area is named a recurring flood event.	This dataset only provides a spot location
Alluvium Soils	Mineral alluvial soil mapping is indicative of recurrent or significant fluvial flooding at some point in the past and was generated by Teagasc with co-operation of the Forest Service, EPA and GSI. This project was completed May 2006.	Drainage may have changed significantly since these soils were deposited.
Drainage Districts (OPW)	This drainage scheme mapping dataset was prepared on behalf of the Drainage Districts (Local Authorities with statutory responsibility for maintenance under the Arterial Drainage Act, 1925). These maps identify land that might benefit from the implementation of Arterial (Major) Drainage Schemes and indicate areas of land subject to flooding or poor drainage.	Identifies large broad areas - very low resolution for flood risk management
Land Commission (OPW)	This dataset indicates areas of land defended to some degree against flooding that were formerly the responsibility of the Land Commission.	Identifies broad areas - low resolution for flood risk management
Historical groundwater flooding	Historic groundwater flood map: The historic groundwater flood map is a national-scale flood map presenting the maximum historic observed extent of karst groundwater flooding. The map is primarily based on the winter 2015/2016 flood event, which in most areas represented the largest groundwater flood event on record. The map was produced based on the SAR imagery of the 2015/2016 event as well as any available supplementary evidence. The floods were classified by flood type differentiating between floods dominated by groundwater (GW) and floods with significant contribution of groundwater and surface water (GWSW). In addition to the historic groundwater flood map, the flood mapping methodology was also adapted to produce a surface water flood map of the 2015/2016 flood event. This flood map encompasses fluvial and pluvial flooding in non-urban areas and has been developed as a separate product.	-

Table 3 Predictive Flood Risk Indicators

Information Source	Description	Strategic Limitations
CFRAM Study, Flood Extent Mapping, 2016	Following the undertaking of the PFRA, the OPW, through its engineering consultants and working with local authorities and other stakeholders, conducted extensive engineering assessments to better understand and detail the actual risk from flooding for areas that were at highest levels of risk. This was the subject of public consultation. The outcome of that work includes Predicted Flood Extent maps that	Spatial spread is limited, including to the areas that are considered to be at most risk of flooding.

Information Source	Description	Strategic Limitations
	<p>were finalised in 2016. For fluvial flood levels, calibration and verification of the models make use of the best available data including hydrometric records, photographs, videos, press articles and anecdotal information.</p>	
<p>OPW Preliminary Flood Risk Assessment (PFRA) Fluvial, Groundwater and Pluvial flood maps, 2012³</p>	<p>The OPW PFRA mapping dataset has been arrived at by:</p> <ul style="list-style-type: none"> • Reviewing records of floods that have happened in the past; • Undertaking analysis to determine which areas might flood in the future, and what the impacts might be; and • Extensive consultation with each local authorities and other Government departments and agencies. <p>This assessment has considered all types of flooding, including that which can occur from rivers, the sea and estuaries, heavy rain, groundwater, the failure of infrastructure, and so on. It has also considered the impacts flooding can have on people, property, businesses, the environment and cultural assets. Further information on the purpose and development of the OPW PFRA Maps are available on www.floodinfo.ie.</p> <p>National Coastal Protection Strategy Study flood and coastal erosion risk maps: the predicted flood extents that were produced under the Irish Coastal Protection Strategy Study (ICPSS) are based on analysis and modelling. The project included:</p> <ul style="list-style-type: none"> • Analysis of historic recorded sea levels • Numerical modelling and statistical analysis of combined tide levels and storm surges to estimate extreme water levels along the national coastline • for defined probabilities • Calculation of the extent of the predictive flooding, by comparing calculated extreme tide and surge waters levels along the coast with ground level based on a Digital Terrain Model (DTM). <p>These indicative national coastal flood maps are included in the Draft PFRA Maps, provided in a separate volume, for the purposes of consultation on the PFRA.</p>	<p>The PFRA is only a preliminary assessment, based on available or readily derivable information. Analysis has been undertaken to identify areas prone to flooding, and the risks associated with such flooding, but this analysis is purely indicative and undertaken for the purpose of completing the PFRA. The mapping has been developed using simple and cost-effective methods and is based on broad-scale simple analysis and may not be accurate for a specific location/use.</p>
<p>Predictive groundwater flood map</p>	<p>The predictive groundwater flood map presents the probabilistic flood extents for locations of recurrent karst groundwater flooding. It consists of a series of stacked polygons at each site representing the flood extent for specific AEP's mapping floods that are expected to occur every 10, 100 and 1000 years (AEP of 0.1, 0.01, and 0.001 respectively). The map is focussed primarily (but not entirely) on flooding at seasonally inundated wetlands known as turloughs. Sites were chosen for inclusion in the predictive map based on existing turlough databases as well as manual interpretation of SAR imagery.</p> <p>The mapping process tied together the observed and SAR-derived hydrograph data, hydrological modelling, stochastic weather generation and extreme value analysis to generate predictive groundwater flood maps for over 400 qualifying sites.</p>	<p>Not all turloughs are included in the predictive map as some sites could not be successfully monitored with SAR and/or modelled.</p>
<p>National Indicative Fluvial Mapping (NIFM) 2021</p>	<p>The OPW NIFM project has produced second generation indicative fluvial flood spatial data that are of a higher quality and accuracy to those produced for the first cycle PFRA. This project has covered 27,000 km of river reaches, separated into 37 drainage areas, consisting of 509 sub-catchments.</p>	<p>Does not cover smaller sized catchments</p>

2.5 Conclusion of Stage 1 SFRA

The information detailed above indicates elevated levels of flood risk in various locations across the City; therefore, a Stage 2 SFRA has been proceeded to.

³ Appendix II of this assessment includes PFRA Fluvial and Coastal mapping. Pluvial and groundwater flood risk is present in the City, however; it is not taken into account in the delineation of flood zones. Nonetheless, it has informed the development of recommendations detailed in Section 4.

Section 3 Stage 2 SFRA - Flood Risk Assessment

3.1 Introduction

Stage 2 SFRA (flood risk assessment) has been undertaken to:

- Confirm the sources of flooding that may affect zoned and adjacent areas;
- Appraise the adequacy of existing information as identified by the Stage 1 SFRA; and
- Scope the extent of the risk of flooding through the preparation of flood zone maps.

3.2 Findings and Adequacy of Existing Information and Delineation of Flood Zones

Desk and in-field studies were undertaken taking into account the following factors:

- OPW's CFRAMS fluvial flood extent mapping and other predictive indicators;
- Historical indicators of flood risk;
- Documented local Council knowledge of flood risk;
- The potential source and direction of flood paths from the sea and rivers and streams;
- Vegetation indicative of flood risk; and
- The locations of topographic/built features that coincide with the flood indicator related boundaries/topographical survey.

Within the annual exceedance probabilities specified by the Flood Guidelines for Flood Zones A and B, there are elevated levels of flood risk throughout the City, as shown in **Appendix II**.

3.3 Flood Risk Zone Mapping

Flood Risk Zone maps have been produced taking into account the findings of the Stage 1 and Stage 2 SFRA desk and in field studies as identified above⁴.

The maps are provided in **Appendix II** and identify Flood Zone A (darker blue) and Flood Zone B⁵ (lighter blue). All other areas fall within Flood Zone C. As per the Guidelines, the flood zones in Cork City are as follows:

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all other areas that are not in zones A or B.

⁴ Including taking into account predictive and historical indicators of flood risk, documented local Council knowledge of flood risk, the potential source and direction of flood paths from rivers and streams, vegetation indicative of flood risk and the locations of topographic/built features that coincide with the flood indicator related boundaries/topographical survey.

⁵ As identified by the Guidelines, in rivers with a well-defined floodplain or where the coastal plain is well defined at its rear, the limits of Zones A and B will virtually coincide. Zone B will only be significantly different in spatial extent from Zone A where there is extensive land with a gentle gradient away from the river or the sea.

3.4 Sensitivity to Climate Change

'The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009' recommends that a precautionary approach to climate change is adopted due to the level of uncertainty involved in the potential effects. In this regard, the Guidelines recommends:

- Recognising that significant changes in the flood extent may result from an increase in rainfall or tide events and accordingly adopting a cautious approach to zoning land in these potential transitional areas;
- Ensuring that the levels of structures designed to protect against flooding such as flood defences⁶, land raising or raised floor levels are sufficient to cope with the effects of climate change over the lifetime of the development they are designed to protect (normally 85-100 years); and
- Ensuring that structures to protect against flooding and the development protected are capable of adaptation to the effects of climate change when there is more certainty about the effects and still time for such adaptation to be effective.

Advice on the expected impacts of climate change and the allowances to be provided for future flood risk management in Ireland is given in the OPW Draft Guidance on Assessment of Potential Future Scenarios for Flood Risk Management (2009). Two climate change scenarios are considered. These are the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). The MRFS is intended to represent a "likely" future scenario based on the wide range of future predictions available. The HEFS represents a more "extreme" future scenario at the upper boundaries of future projections. Based on these two scenarios the OPW recommended allowances for climate change in relation to river flows and sea levels are given in Table 4. These climate change allowances are particularly important at the development management stage of planning, and will ensure that proposed development is designed and constructed to take into account best current knowledge. Climate change allowances have been integrated into the recommendations provided at Section 4 of this report and MRFS and HEFS mapping is available from the OPW for certain areas, including AFAs, and provided in **Appendix II** to this SFRA report.

Table 4 Allowances for Future Scenarios (100-Year Time Horizon)⁷

Criteria	MRFS – to be considered for most development scenarios	HEFS – to be considered in relation to high value, high vulnerability development which cannot be relocated
Extreme Rainfall Depths	+20%	+30%
Flood Flows	+20%	+30%
Mean Sea Level Rise	+500mm	+1000mm

⁶ Defended areas are highly sensitive to climate change as the likelihood of defence failure and resulting flooding increases.

⁷ OPW Draft Guidance on Assessment of Potential Future Scenarios for Flood Risk Management (2009)

3.5 Sustainable Drainage Systems

As provided for by measures integrated into the Plan (including measures reproduced at Section 4 of this report), new developments will be required to incorporate the requirement for Sustainable Urban Drainage Systems where appropriate.

SuDS are effective technologies, which aim to reduce flood risk, improve water quality and enhance biodiversity and amenity.

The systems should aim to mimic the natural drainage of the application site to minimise the effect of a development on flooding and pollution of existing waterways. SuDS include devices such as swales, permeable pavements, filter drains, storage ponds, constructed wetlands, soakways and green roofs. The integration of nature-based solutions, such as amenity areas, ecological corridors and attenuation ponds, into public and private development initiatives, is applicable within the provisions of the Plan and should be encouraged.

In some exceptional cases, and at the discretion of the Council, where it is demonstrated that SuDS devices are not feasible, approval may be given to install underground attenuation tanks or enlarged pipes in conjunction with other devices to achieve the required water quality. Such alternative measures will only be considered as a last resort. Proposals for surface water attenuation systems should include maintenance proposals and procedures.

Urban developments, both within developments and within the public realm, should seek to minimise and limit the extent of hard surfacing and paving and require the use of sustainable drainage techniques for new development or for extensions to existing developments, in order to reduce the potential impact of existing and predicted flood risk. Development proposals should be accompanied by a comprehensive SuDS assessment that addresses run-off rate, run-off quality and its impact on the existing habitat and water quality.

For larger sites (i.e. multiple dwellings or commercial units) master planning should ensure that existing flow routes are maintained, through the use of green infrastructure. In addition, where multiple individual proposals are being made SuDS should be integrated where appropriate and relevant.

All proposed development, should consider the impact of surface water flood risks on drainage design e.g. in the form of a section within the flood risk assessment (for sites in Flood Zone A or B) or part of a surface water management plan.

Areas vulnerable to ponding are indicated on the OPW's PFRA Pluvial mapping. Particular attention should be given to development in low-lying areas which may act as natural ponds for collection of run-off. The drainage design should ensure no increase in flood risk to the site, or the downstream catchment. Where possible, and particularly in areas of new development, floor levels should be at an appropriate height above adjacent roads and hard standing areas to reduce the consequences of any localised flooding. Where this is not possible, an alternative design appropriate to the location may be prepared.

Further to the above, proposals for development should consider Greater Dublin Strategic Drainage Study documents in designing SuDS solutions, including the New Development Policy, the Final Strategy Report, the Code of Practice and "Irish SuDS: guidance on applying the GSDS surface water drainage criteria".

Section 4 Recommendations

4.1 Introduction

In order to comply with *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 Department of the Environment, Community and Local Government Circular (*PL 2/2014*) and contribute towards flood risk management within the Plan area, the recommendations below have been made by the SFRA process and integrated into the Plan.

4.2 Land Use Zoning

Text integrated into Chapter 11 “Placemaking and Managing Development”

Flood Risk Assessment and Land Use Zoning

Paragraph No. 11.259

The Flood Zones identified by the Strategic Flood Risk Assessment (refer to the SFRA report that accompanies the Plan) should be used in line with the requirements provided for by the Flood Guidelines for land uses in Flood Zones A and B.

Paragraph No. 11.260

Land use zoning objectives provided by this Plan are subject to the following conditions:

- (1) Undeveloped land in Flood Zone A that is the subject of any zoning objective are only zoned for and shall only be developed for water compatible uses as identified in the Guidelines.
- (2) Undeveloped land in Flood Zone B that is the subject of any zoning objective are only zoned for and shall only be developed for water compatible or less vulnerable uses as identified in the Guidelines.
- (3) With respect to lands that have already been developed in Flood Zone A or B the potential conflict (between zoning and highly or less vulnerable development in Flood Zone A and between zoning and highly vulnerable development in Flood Zone B) will be avoided by applying the following zoning approach, subject to the exception areas set out in (iii) below:
 - (i) Cork City Council will facilitate the appropriate management and sustainable use of these areas. This will mean generally limiting new development, but facilitating existing development uses that may require small scale development such as small extensions. Development proposals within these areas shall be accompanied by a detailed Flood Risk Assessment, carried out in accordance with The Planning System and Flood Risk Assessment Guidelines and Circular PL 2/2014 (or as updated), which shall assess the risks of flooding associated with the proposed development. Where development proposals submitted to the Planning Authority relate to existing buildings or developed areas, the sequential approach cannot be used to locate them in lower-risk areas and the Justification Test will not therefore apply. Proposals seeking to change the use of existing buildings from a less vulnerable use to a use that would be more vulnerable to the effects of flooding may not be permissible in areas of elevated flood risk, whilst some change of use proposals not increasing the vulnerability to the effects of flooding or small scale extensions to such buildings will be considered on their individual merits but are acceptable in principle. An existing dwelling or building that is not located within an area at risk of flooding but has a large rear garden / curtilage that is located within Flood Zone A or B would not be suitable for a more in-depth residential development proposal which would propose a residential use within Flood Zone A or B.
 - (ii) Proposals shall only be considered favourably where it is demonstrated to the satisfaction of the Planning Authority that they would not have adverse impacts or impede access to a watercourse, floodplain or flood protection and management facilities, or increase the risk of flooding to other locations and be in accordance with the proper planning and sustainable development of the area. The nature and design of structural and non-structural flood risk management measures required for development in such areas (see relevant Flood Risk Assessments - section below) will also be required to be demonstrated, to ensure that flood hazard and risk will not be increased. Measures proposed shall follow best practice in the management of health and safety for users and residents of the development.
 - (iii) Exceptional areas are the already developed City Centre and Docklands areas, which have undergone Justification Tests and have been zoned for development, and established built-up areas of Cork City including suburban areas such as Model Farm Road / Carrigrohane Road area and Douglas. Future development in these areas will:
 - be subject to site-specific flood risk assessments;

- comply with the flood risk management provisions of this Plan, including the structural and non-structural risk management measures outlined under Flood Risk Assessments below, and relevant measures contained in the Council's 2020 South Docks Drainage Strategy; and
- will benefit from Flood Relief Schemes being progressed by the OPW.

Flood hazard and flood risk information is an emerging dataset of information. The flood risk mapping used by the Council may be altered in light of future data and analysis. Therefore, all landowners and developers are advised that Cork City Council accept no responsibility for losses or damages arising due to assessments of vulnerability to flooding of lands, uses and developments. Owners, users and developers are advised to take all reasonable measures to assess the vulnerability to flooding in a particular area, prior to submitting a planning application.

Flood Risk Assessments

Paragraph No. 11.261

The Council will have regard to the Planning System and Flood Risk Management Guidelines for Local Authorities (DEHLG and OPW 2009) when assessing planning applications. All significant proposals for development identified as being vulnerable to flooding will be required to provide a site-specific Flood Risk Assessment (FRA) in accordance with the Guidelines. A detailed site-specific FRA should quantify the risks, the effects of selected mitigation and the management of any residual risks.

Paragraph No. 11.262

Assessments shall consider and provide information on the implications of climate change with regard to flood risk in relevant locations. The 2009 OPW Draft Guidance on Assessment of Potential Future Scenarios for Flood Risk Management (or any superseding document) and available information from the CFRAM Studies shall be consulted to this effect.

Paragraph No. 11.263

In Flood Zone C, where the probability of flooding is low (less than 0.1%, Flood Zone C), site-specific Flood Risk Assessment may be required and the developer should satisfy themselves that the probability of flooding is appropriate to the development being proposed. This Development Plan's SFRA datasets and the most up to date CFRAM Programme mapping should be consulted by prospective applicants for developments in this regard and will be made available to Development Management processes in the Council.

Paragraph No. 11.264

Further details are also included in Chapter 9 Environmental Infrastructure and Management.

Paragraph No. 11.265

Applications for vulnerable development in flood risk zones, including within Flood Zones A and B in the City Centre and the Dockland areas and in areas at risk under the OPW's Mid-Range Future Scenario, shall provide details of structural and non-structural risk management measures to include, but not be limited to specifications of the following:

(1) Floor Levels

In areas of limited flood depth, the specification of the threshold and floor levels of new structures shall be raised above expected flood levels to reduce the risk of flood losses to a building, by raising floor heights within the building structure using a suspended floor arrangement or raised internal concrete platforms.

When designing an extension or modification to an existing building, an appropriate flood risk reduction measure shall be specified to ensure the threshold levels into the building are above the design flood level. However, care must also be taken to ensure access for all is provided in compliance with Part M of the Building Regulations.

Where threshold levels cannot be raised to the street for streetscape, conservation or other reasons, the design shall specify a mixing of uses vertically in buildings - with less vulnerable uses located at ground floor level, along with other measures for dealing with residual flood risk.

(2) Internal Layout

Internal layout shall be designed and specified to reduce the impact of flooding (e.g. living accommodation, essential services, storage space for provisions and equipment shall be designed to be located above the predicted flood level). In addition, designs and specifications shall ensure that, wherever reasonably practicable, the siting of living accommodation (particularly sleeping areas) shall be above flood level.

With the exception of single storey extensions to existing properties, new single storey accommodation shall not be deemed appropriate where predicted flood levels are above design floor levels. In all cases, specifications for safe access, refuge and evacuation shall be incorporated into the design of the development.

(3) Flood-Resistant Construction

Developments in flood vulnerable zones should specify the use of flood-resistant construction aimed at preventing water from entering buildings - to mitigate the damage floodwater caused to buildings.

Developments should specify the use of flood resistant construction prepared using specialist technical input to the design and specification of the external building envelope - with measures to resist hydrostatic pressure (commonly referred to as "tanking") specified for the outside of the building fabric.

The design of the flood resistant construction shall specify the need to protect the main entry points for floodwater into buildings - including doors and windows (including gaps in sealant around frames), vents, air-bricks and gaps around conduits or pipes passing through external building fabric.

The design of the flood resistant construction should also specify the need to protect against flood water entry through sanitary appliances as a result of backflow through the drainage system.

Developments in flood vulnerable zones that are at risk of occasional inundation should incorporate design and specification for flood resilient construction which accepts that floodwater will enter buildings and provides for this in the design and specification of internal building services and finishes. These measures limit damage caused by floodwater and allow relatively quick recovery. This can be achieved by specifying wall and floor materials such as ceramic tiling that can be cleaned and dried relatively easily, provided that the substrate materials (e.g. blockwork) are also resilient. Electrics, appliances and kitchen fittings should also be specified to be raised above floor level, and one-way valves shall be incorporated into drainage pipes.

(4) Emergency Response Planning

In addition to considering physical design issues for developments in flood vulnerable zones, the developer shall specify that the planning of new development also takes account of the need for effective emergency response planning for flood events in areas of new development.

Applications for developments in flood vulnerable zones shall provide details that the following measures will be put in place and maintained:

- Provision of flood warnings, evacuation plans and ensuring public awareness of flood risks to people where they live and work;
- Coordination of responses and discussion with relevant emergency services i.e. Local Authorities, Fire and Rescue, Civil Defence and An Garda Síochána through the SFRA; and
- Awareness of risks and evacuation procedures and the need for family flood plans.

(5) Access and Egress During Flood Events

Applications for development in flood vulnerable zones shall include details of arrangements for access and egress during flood events. Such details shall specify that:

- Flood escape routes have been kept to publicly accessible land;
- Such routes will have signage and other flood awareness measures in place, to inform local communities what to do in case of flooding; and
- This information will be provided in a welcome pack to new occupants.

Paragraph No. 11.266

Further and more detailed guidance and advice can be found at <http://www.flooding.ie> and in the Building Regulations.

Text integrated into Chapter 12 “Land Use Zoning” of the Plan:

Chapter 12 text:

Further to Plan provisions relating to flood risk management under other parts of this Plan (including Paragraph No’s. 11.259 to 11.266 and Paragraph No’s. 12.20 to 12.22, Permissible Uses within Flood Zones A or B in areas that have not passed the Justification Test (i.e. those areas outside of Cork City Centre and the North and South Docklands shall be constrained to those “water compatible” and “less vulnerable” uses as appropriate to the particular Flood Zone (please refer to the accompanying Strategic Flood Risk Assessment document). Development proposals within these zones shall be accompanied by a detailed Flood Risk Assessment, carried out in accordance with The Planning System and Flood Risk Assessment Guidelines and Circular PL 2/2014 (or as updated), which shall assess the risks of flooding associated with the proposed development, thereby helping to ensure an evidence based approach to development is carried out.

Objective 12.1 Land Uses and Flooding Objective

To Facilitate the appropriate management and sustainable use of Flood Zones A and B identified by the Strategic Flood Risk Assessment.

4.3 Integration of other provisions relating to flood risk management into the Plan

Other provisions relating to flood risk management, including the following, have also been integrated into the Plan.

Plan Ref.	Provision
Strategic Objective 4: Climate and Environment	To support transition to a low-carbon, climate-resilient and environmentally sustainable future. To support the circular economy. Cork City Council is committed to the implementation of measures to support the achievement of national policies and targets for climate mitigation, including the Government’s policy under Ireland’s Transition to a Low Carbon Energy Future 2015-30 and Climate Action Plan 2019, National Mitigation Plan, National Adaptation Framework: Planning for a Climate Resilient Ireland. At the time of preparation of this Plan, the Government agreed to advance the Climate Action and Low Carbon Development (Amendment) Bill 2021 to support Ireland’s transition to Net Zero and achieve a climate neutral economy by 2050. Proposals for new development in Cork City will strive to reduce carbon footprints by carbon emission reductions, sustainable energy consumption, sustainable transport, use of renewable energy sources, green

Plan Ref.	Provision
	<p>construction methods including passive solar design, and flood risk mitigation and adaptation and use of nature-based solutions, through design, layout, implementation and operation.</p> <p>A statement commensurate with the nature and scale of the development proposal will be required to accompany planning applications demonstrating how climate resilience has been considered and implemented at all stages in the development process.</p>
<p>9.5 Flood Risk</p>	<p>Assessment of Development in Areas of Flood Risk:</p> <p>The Planning System and Flood Risk Management: Guidelines for Planning Authorities (2009) , subsequently amended under Department of Environment, Community and Local Government Circular PL2/2014 , outline how the aim of flood risk management is to minimise the level of flood risk to people, business, infrastructure and the environment through the identification and management of existing and potential future flood risks. The Guidelines recommend a sequential approach to spatial planning, promoting avoidance rather than justification and subsequent mitigation of risk. The guidelines define the Justification Test as an assessment of whether a development proposal within an area at risk of flooding meets specific criteria for proper planning and sustainable development and demonstrates that it will not be subject to unacceptable risk nor increase flood risk elsewhere. The Justification Test should be applied only where development is within flood risk areas that would be defined as inappropriate under the screening test of the sequential risk-based approach. Cork City Council will adopt a precautionary approach, namely to avoid development in floodplains, wetlands and coastal areas prone to flooding and so preserve these natural defences that hold excess water until it can be released slowly back into river systems, the sea or seep into the ground. Where flood risk is an issue, applicants will generally be required to carry out a site specific Flood Risk Assessment (apart from minor developments, where such an approach would not be justified). Policy in relation to the incorporation of measures such as Sustainable Urban Drainage Systems (SUDS) to reduce surface runoff is outlined above and should be incorporated in so far as possible to reduce risks.</p> <p>Coastal Change</p> <p>A National Coastal Change Management Strategy Steering Group was set up in 2020 to scope out an approach for the development of a national coordinated and integrated strategy to manage the projected impact of coastal change to our coastal communities, economies, heritage, culture and environment. Cork City Council supports the preparation of the strategy and will consider its findings when published and how it may impact its functional area. In the interim consideration will be given to areas that may be at risk or vulnerable to coastal erosion or coastal change, including change associated with climate change.</p>
<p>Objective 9.6 Storm Water</p>	<p>To provide adequate storm water infrastructure in order to accommodate the planned levels of growth within the plan area and to ensure that appropriate flood management measures are implemented to protect property and infrastructure.</p>
<p>Objective 9.8 Flood Protection</p>	<p>To protect, enhance and manage the City's floodplains, wetlands and coastal habitat areas that are subject to flooding as vital 'green infrastructure' which provides space for storage and conveyance of floodwater, enabling flood risk to be more effectively managed and reduce the need to provide flood defence infrastructures. Cork Council will also require that all proposed flood protection or alleviation works will be subject to Appropriate Assessment to ensure there are no likely significant effects on the integrity, defined by the structure and function, of any European Sites and that the requirements of Article 6 of the EU Habitats Directive are met.</p>
<p>Objective 9.9 Flood Protection Schemes</p>	<p>To work with the Office of Public Works (OPW) in the progression and completion of Flood Risk Management Plans and flood relief schemes including the Lower Lee Flood Relief Scheme (LLFRS), schemes in Blackpool, Glanmire / Glashaboy, Douglas / Togher and other schemes that may be developed during the period of the plan.</p>
<p>Objective 9.10 Development in Flood Risk Areas</p>	<p>(a) To restrict development in identified flood risk areas, in particular flood plains. All new development proposals shall comply with the requirements of the Planning System and Flood Risk Management – Guidelines for Planning Authorities (2009) and Department of Environment, Community and Local Government Circular PL2/2014, in particular through the application of the sequential approach and the Development Management Justification Test.</p> <p>(b) All significant proposals for development identified as being vulnerable to flooding will be required to provide a site specific Flood Risk Assessment to identify potential loss of floodplain storage and proposals for the storage or attenuation (e.g. SUDS) of run-off discharges (including foul drains) to ensure development does not increase the flood risk in the relevant catchment.</p> <p>(c) Adopt a river catchment approach to rivers entering the City, practicing natural flood management wherever practical and appropriate.</p>
<p>Paragraph 10.108</p>	<p>The Strategy provides the following:</p> <ul style="list-style-type: none"> • An infrastructure strategy to ensure that the South Docks is resilient to flood risk and climate change; • Drainage catchments that provide for the capacity of the network to deal with pluvial (rainfall) runoff; • A surface water drainage network based upon SuDS / nature-based solutions, storage and conveyance solutions, including conveyance by grey infrastructure (see Figure 10.10a); • A perimeter flood protection from tidal and fluvial (river) flood risks, in accordance with the Drainage and Flood Strategy, including a transition from the standard perimeter defence of 4.35m OD at the proposed Kent Station Bridge to the proposed Flood protection levels at Albert Quay. • Minimum ground (public realm and streets) level and building finished floor levels (FFLs) with proposed ground levels as close to existing ground levels as possible, while mitigating against pluvial (cloudburst) flood risk. • Public strategic (regional) flood storage will need to be provided across a number of locations in the

Plan Ref.	Provision
	<p>South Docks, as set out above.</p> <ul style="list-style-type: none"> • Site acquisition is likely to be required to deliver elements of this green storage infrastructure, which are in private ownership. A key location for the preferred additional storage location will be • The proposed public open space to the south of the Atlantic Pond and within the Ardfoyle Convent lands, which would form part of the Marina Park. <p>The Strategy indicates that there may be a requirement for a surface water pumping station in the vicinity of the proposed extension to the Atlantic Pond area to meet the challenge presented by climate change, with a site of a total c.250sqm being required to accommodate this infrastructure. The Strategy identifies a possible locations for this facility on the proposed extension to the Atlantic Pond area. The suitability of these, or other, locations for the pumping station will need to be identified during the life of the Plan.</p>
<p>Paragraph 10.110</p>	<p>The Strategy provides the following (see Map D, Volume 2: Mapped Objectives “Summary of Proposed Infrastructure Measures in the South Docks Drainage and Levels Strategy”):</p> <ul style="list-style-type: none"> • An infrastructure strategy to ensure that the South Docks is resilient to flood risk and climate change; • Drainage catchments that provide for the capacity of the network to deal with pluvial (rainfall) runoff; • A surface water drainage network based upon SuDS / nature-based solutions, storage and conveyance solutions, including conveyance by grey infrastructure (see Figure 10.10a); • A perimeter flood protection from tidal and fluvial (river) flood risks, in accordance with the Drainage and Flood Strategy, including a transition from the standard perimeter defence of 4.35m OD at the proposed Kent Station Bridge to the proposed Flood protection levels at Albert Quay. • Minimum ground (public realm and streets) level and building finished floor levels (FFLs) with proposed ground levels as close to existing ground levels as possible, while mitigating against pluvial (cloudburst) flood risk. • Public strategic (regional) flood storage will need to be provided across a number of locations in the South Docks, as set out above. • Site acquisition is likely to be required to deliver elements of this green storage infrastructure, which are in private ownership. A key location for the preferred additional storage location will be identified. • The proposed public open space to the south of the Atlantic Pond and within the Ardfoyle Convent lands, which would form part of the Marina Park. <p>The Strategy indicates that there may be a requirement for a surface water pumping station in the vicinity of the proposed extension to the Atlantic Pond area to meet the challenge presented by climate change, with a site of a total c.250sqm being required to accommodate this infrastructure. The Strategy identifies possible locations for this facility on the proposed extension to the Atlantic Pond area. The suitability of these, or other, locations for the pumping station will need to be identified during the life of the Plan.</p>
<p>Paragraph 10.112</p>	<p>It is necessary to marginally increase localised ground (public realm and roads) levels at low points to between 0.85m OD and 1.0m OD to facilitate an effective gravity system and achievable storage volumes for scenarios up to Medium Risk Future Scenario (MRFS).</p>
<p>Paragraph 10.113</p>	<p>To ensure that proposed buildings are at acceptably low levels of risk of surface water flooding, it is proposed to set minimum finished floor levels (FFL) at least 300mm above the predicted 1 in 100 year (= +40% climate change) pluvial flood level and the residual inundation risk, which varies across the docks, as shown above.</p>
<p>Paragraph 10.114</p>	<p>It is recommended that this minimum level apply only to Water Compatible Development and Less Vulnerable Development as defined by the Flood Risk Planning Guidelines³, and subject to site specific flood risk assessment demonstrating appropriate flood mitigation strategy. Within the polder, finished floor levels for less vulnerable uses do not strictly need to be above the residual risk level but will need defences up to that level through building flood resilience measures. Planning applications for development will demonstrate compliance with the provisions of the Guidelines by means of Site Specific Flood Risk Assessment.</p>
<p>Paragraph 10.115</p>	<p>Within the defended polder, a general minimum FFL for <u>Highly Vulnerable Development</u> shall be +1.9mOD to mitigate the residual risk of breach of the polder defence based on 1 in 200 year tidal flood level, including appropriate allowances for climate change, residual risk (breach and overtopping) and freeboard. It is envisaged that minimum FFL along the quayside would be set at or above the proposed polder defence level of +3.8m to +4.35m OD, except for the western transition from Albert Quay where a minimum FFL of +3.8m OD can be accommodated due to constraints imposed by existing streetscapes.</p>
<p>Development Management Paragraph 11.216</p>	<p>11.216 Development proposals should integrate green and blue infrastructure measures to offset peak flood flows including the following options:</p> <ol style="list-style-type: none"> (1) Nature-based solutions and “slow-the-flow” initiatives. (2) Incorporation of SUDS to limit runoff from existing and new development. (3) Wetland enhancement on floodplains. (4) Native tree planting and landscaping schemes. (5) Green roofs and green walls (6) Rainwater harvesting and rainwater boxes. (7) Natural banks, water dykes and water squares. (8) Natural flood management techniques.

4.4 Justification Tests

The levels of flood risk identified by the SFRA were a key informant of land uses in undeveloped areas in Flood Zones A and B. The Justification Test (including its various criteria – see **Appendix I**) is required to be passed whereby *highly vulnerable*⁸ land uses are being proposed on lands in Flood Zone A or whereby *highly* and/or *less vulnerable* land uses are being proposed on lands in Flood Zone B.

Table 5 provides Justification Tests for areas within the City Centre and North and South Docklands that are situated within Flood Zones A and/or B and are zoned for development that would otherwise be considered inappropriate.

Regarding all other areas, areas other than those included under Table 5, attention is drawn towards text that has been integrated into Chapter 12 “Land Use Zoning” of the Plan that provides for the meaning of the land use zoning objectives included within the Plan. This text is as follows:

“Further to Plan provisions relating to flood risk management under other parts of this Plan (including Paragraph No’s. 11.259 to 11.266 and Paragraph No’s. 12.20 to 12.22, Permissible Uses within Flood Zones A or B in areas that have not passed the Justification Test (i.e. those areas outside of Cork City Centre and the North and South Docklands shall be constrained to those “water compatible” and “less vulnerable” uses as appropriate to the particular Flood Zone (please refer to the accompanying Strategic Flood Risk Assessment document). Development proposals within these zones shall be accompanied by a detailed Flood Risk Assessment, carried out in accordance with The Planning System and Flood Risk Assessment Guidelines and Circular PL 2/2014 (or as updated), which shall assess the risks of flooding associated with the proposed development, thereby helping to ensure an evidence based approach to development is carried out.”

Consistency between the Plan text and the requirements of the Guidelines was prioritised and achieved. Should any conflict arise between the written statement and the zoning maps, the written statement shall take precedence.

⁸ For details on what types of development are considered highly vulnerable, less vulnerable or water compatible please refer to Table 6 in **Appendix I**.

Table 5 Justification Tests for City Centre and North and South Docklands Areas

Area	Zoning in Plan	Justification Test (Fails, if one of the following fails; All must be passed for the test to be passed)			Overall Result
		Criteria 1 (see SFRA Appendix I Figure 2) Is the settlement targeted for growth under the RSES, 2015 CDP and emerging 2022 CDP?	Criteria 2 (see SFRA Appendix I Figure 2) Is the zoning of the lands required to achieve the proper planning and sustainable development of the settlement? All sub-criteria ¹² must be satisfied	Criteria 3 (see SFRA Appendix I Figure 2) A FRA to an appropriate level of detail has been carried out as part of the SEA as part of the development plan preparation process, which demonstrates that flood risk to the development can be adequately managed and the use or development of the lands will not cause unacceptable adverse impacts elsewhere	
City Centre	<p>Various – refer to land use zoning maps, the written statement and the mapping that accompanies this report in (the mapping that accompanies this report overlays Flood Zones A and B throughout the City Centre on land use zoning).</p> <p>Note that the meaning of zoning objectives has been influenced by the SFRA process and these meanings are explained in the Plan, including through the provisions repeated under Sections 4.2 and 4.3 of this SFRA report.</p>	Yes	<p>Yes to all of the following:</p> <p>(i) Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement;</p> <p>(ii) Comprises significant previously developed and/or under-utilised lands;</p> <p>(iii) Is within or adjoining the core of an established or designated urban settlement;</p> <p>(iv) Will be essential in achieving compact and sustainable urban growth; and</p> <p>(v) There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement</p>	<p>Yes. Future development will: be subject to site-specific flood risk assessments; comply with the flood risk management provisions of the Plan (see Section 4 of SFRA), including the structural and non-structural risk management measures outlined at Paragraph 11.265 and relevant measures contained in the Council's 2020 South Docks Drainage Strategy; and benefit from Flood Relief Schemes being progressed by the OPW (see Section 3 of SFRA).</p> <p>The potential conflict between zonings and <i>highly</i> and <i>less vulnerable</i> development will be avoided by applying the measures which have been integrated into the Plan, including those at Development Management Paragraphs 11.261-11.266 and other Plan provisions repeated under Sections 4.2 and 4.3 of this SFRA report.</p>	Pass
North and South Docklands¹³	<p>Various – refer to land use zoning maps, the written statement and the mapping that accompanies this report in (the mapping that accompanies this report overlays Flood Zones A and B throughout the North and South Docklands on land use zoning).</p> <p>Note that the meaning of zoning objectives has been influenced by the SFRA process and these meanings are explained in the Plan, including through the provisions repeated under Sections 4.2 and 4.3 of this SFRA report.</p>	Yes	<p>Yes to all of the following:</p> <p>(i) Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement;</p> <p>(ii) Comprises significant previously developed and/or under-utilised lands;</p> <p>(iii) Is within or adjoining the core of an established or designated urban settlement;</p> <p>(iv) Will be essential in achieving compact and sustainable urban growth; and</p> <p>(v) There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement</p>	<p>Yes. Future development will: be subject to site-specific flood risk assessments; comply with the flood risk management provisions of the Plan (see Section 4 of SFRA), including the structural and non-structural risk management measures outlined at Paragraph 11.265 and relevant measures contained in the Council's 2020 South Docks Drainage Strategy; and benefit from Flood Relief Schemes being progressed by the OPW (see Section 3 of SFRA).</p> <p>The potential conflict between zonings and <i>highly</i> and <i>less vulnerable</i> development will be avoided by applying the measures which have been integrated into the Plan, including those at Development Management Paragraphs 11.261-11.266 and other Plan provisions repeated under Sections 4.2 and 4.3 of this SFRA report.</p>	Pass

¹² (i) Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement; (ii) Comprises significant previously developed and/or under-utilised lands; (iii) Is within or adjoining the core of an established or designated urban settlement; (iv) Will be essential in achieving compact and sustainable urban growth; and (v) There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.

¹³ Note that the Tivoli Docks are not proposed to be developed over the lifetime of the Plan – they are included in Tier 3 Residential Neighbourhoods and designated as longer-term zoned lands.

Section 5 Conclusion

Stage 2 SFRA has been undertaken as part of the Plan-preparation process and the SFRA has informed the preparation of the Plan.

The SFRA has mapped boundaries for Flood Risk Zones, taking into account factors including: predictive and historical indicators of flood risk; documented local Council knowledge of flood risk; the potential source and direction of flood paths from rivers and streams; vegetation indicative of flood risk; and the locations of topographic/built features that coincide with the flood indicator related boundaries/topographical survey.

SFRA recommendations have been integrated into the Plan.

Consistency between the Plan text and the requirements of the Guidelines was prioritised and achieved. Should any conflict arise between the written statement (encompassing the Material Alterations) and the zoning maps, the written statement shall take precedence.

Appendix I: Summary of the requirements of the Flood Guidelines for land uses in Flood Zones

Requirements relating to land uses in Flood Zones as set out in the Department of Environment, Heritage and Local Government (DEHLG) and Office of Public Works (OPW) 2009 Flood Guidelines (including at Chapter 3 Principles and Key Mechanisms and Chapter 5 Flooding and Development Management) and Departmental Circular PL2/2014 should be adhered to.

- The Sequential Approach, including the Justification test -

The key principles of the Guidelines' risk-based sequential approach (see Figure 1) are:

- Avoid development in areas at risk of flooding. If this is not possible, consider substituting a land use that is less vulnerable to flooding. Only when both avoidance and substitution cannot take place should consideration be given to mitigation and management of risks.
- Inappropriate types of development that would create unacceptable risks from flooding should not be planned for or permitted.
- Exceptions to the restriction of development due to potential flood risks are provided for through the use of a Justification Test, where the planning need and the sustainable management of flood risk to an acceptable level must be demonstrated.

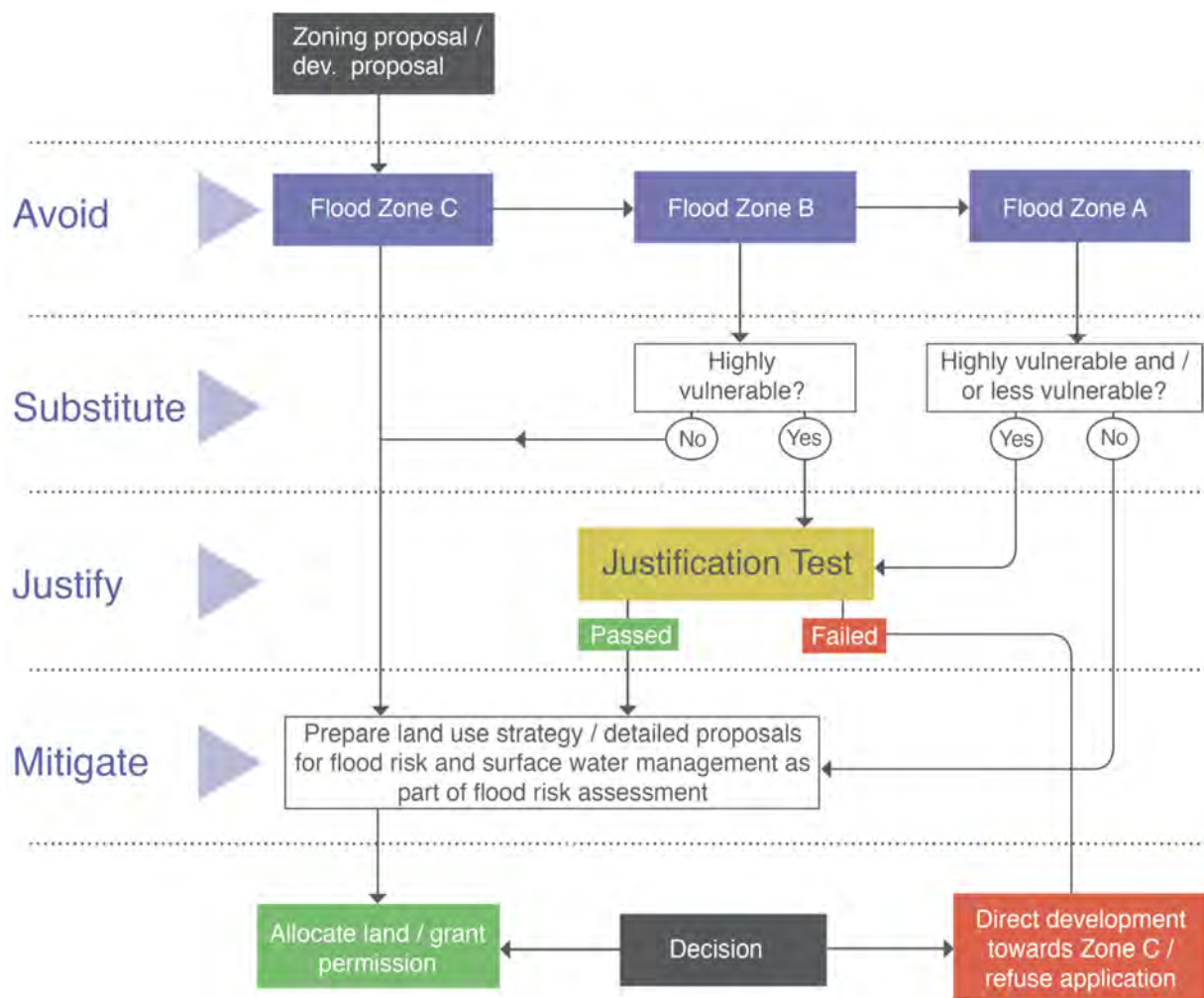


Figure 1 Sequential Approach Process¹⁴

In summary, the **planning implications** for each of the flood zones are:

Zone A - High probability of flooding. Most types of development would be considered inappropriate in this zone. Development in this zone should be avoided and/or only considered in exceptional circumstances, such as in city and town centres, or in the case of essential infrastructure that cannot be located elsewhere, and where the Justification Test has been applied. Only water-compatible development, such as docks and marinas, dockside activities that require a waterside location, amenity open space, outdoor sports and recreation, would be considered appropriate in this zone.

Zone B - Moderate probability of flooding. Highly vulnerable development, such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses and primary strategic transport and utilities infrastructure, would generally be considered inappropriate in this zone, unless the requirements of the Justification Test can be met. Less vulnerable development, such as retail, commercial and industrial uses, sites used for short-let for caravans and camping and secondary strategic transport and utilities infrastructure, and water-compatible development might be considered appropriate in this zone. In general however, less vulnerable development should only be considered in this zone if adequate lands or sites are not available in Zone C and subject to a flood risk assessment to the appropriate level of detail to demonstrate that flood risk to and from the development can or will adequately be managed.

Zone C - Low probability of flooding. Development in this zone is appropriate from a flood risk perspective (subject to assessment of flood hazard from sources other than rivers and the coast) but would need to meet the normal range of other proper planning and sustainable development considerations.

¹⁴ Flood Zone C covers all areas outside of Zones A and B

Table 6 overleaf classifies the vulnerability of different types of development while Table 7 identifies the appropriateness of development belonging to each vulnerability class within each of the flood zones as well as identifying what instances in which the Justification Test should be undertaken. Inappropriate development that does not meet the criteria of the Justification Test should not be considered at the plan-making stage or approved within the development management process.

Table 6 Classification of vulnerability of different types of development

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

Table 7 Vulnerability Classes and Flood Zones

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

The **Justification Test** which is referred to as part of the Sequential Approach is an assessment of whether a development proposal within an area at risk of flooding meets specific criteria for proper planning and sustainable development and demonstrates that it will not be subject to unacceptable risk nor increase flood risk elsewhere. The Justification Test should be applied only where development is within flood risk areas that would be defined as inappropriate under the screening test of the sequential risk based approach outlined above. This Justification Test is shown below.

Where, as part of the preparation and adoption or variation and amendment of a development/local area plan¹, a planning authority is considering the future development of areas in an urban settlement that are at moderate or high risk of flooding, for uses or development vulnerable to flooding that would generally be inappropriate as set out in Table 3.2, all of the following criteria must be satisfied:

- 1 The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans as defined above or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act, 2000, as amended.
- 2 The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular:
 - (i) Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement²;
 - (ii) Comprises significant previously developed and/or under-utilised lands;
 - (iii) Is within or adjoining the core³ of an established or designated urban settlement;
 - (iv) Will be essential in achieving compact and sustainable urban growth; and
 - (v) There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement⁴.
- 3 A flood risk assessment to an appropriate level of detail has been carried out as part of the Strategic Environmental Assessment as part of the development plan preparation process, which demonstrates that flood risk to the development can be adequately managed and the use or development of the lands will not cause unacceptable adverse impacts elsewhere.
 N.B. The acceptability or otherwise of levels of any residual risk should be made with consideration for the proposed development and the local context and should be described in the relevant flood risk assessment.

Figure 2 Justification Test ¹⁵

¹⁵ Footnotes: ¹ Including Strategic Development Zones and Section 25 Schemes in the area of the Dublin Docklands Development Authority ²In the case of Gateway planning authorities, where a number of strategic growth centres have been identified within the overall area of the authority, the Justification Test may be applied for vulnerable development within each centre. ³ See definition of the core of an urban settlement in Glossary of Terms. ⁴ This criterion may be set aside where section 4.27b applies.

Appendix II: Flood Mapping