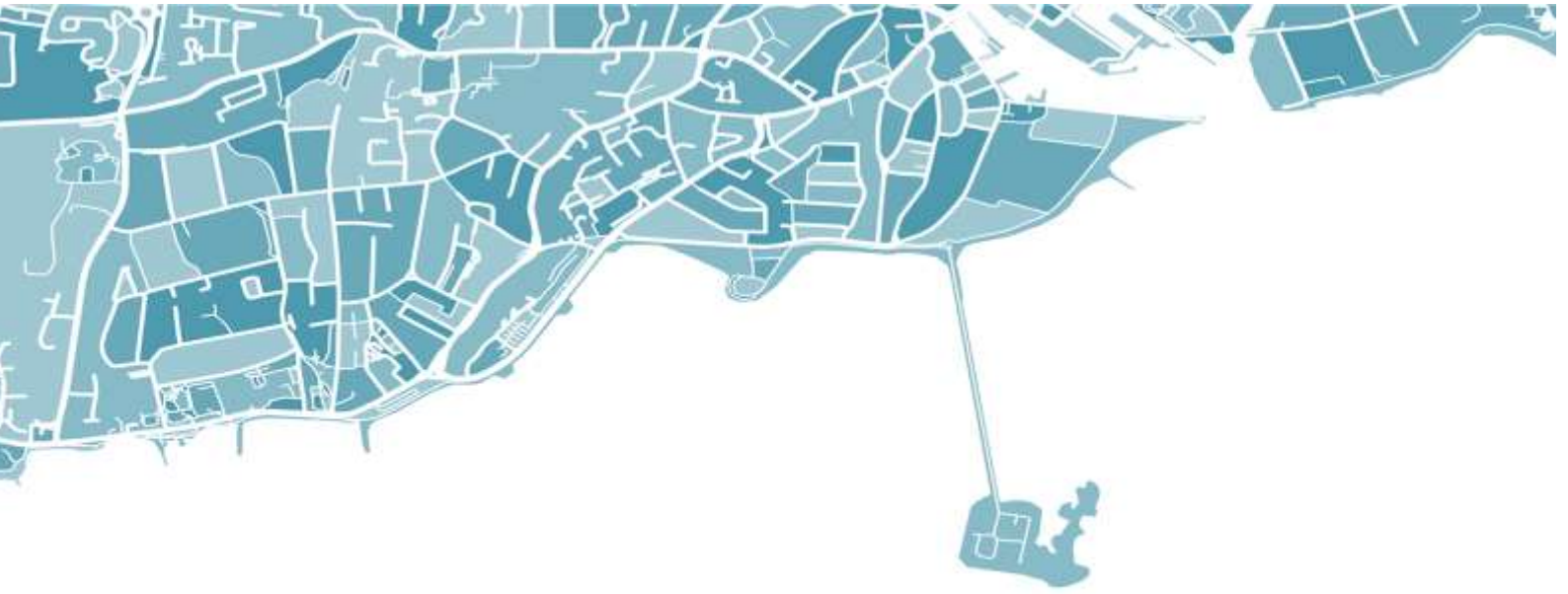

Galway City Council
Draft Development Plan 2023-2029

Comhairle Cathrach na Gaillimhe
Dréachtphlean Forbartha 2023-2029

Environmental Assessments

Updated Draft Strategic Flood Risk Assessment Report

Measúnachtaí Timpeallachta

NuashonraitheDréachtmheasúnú Straitéiseach Riosca I gcás Tuilte

September 2022 | Meán Fómhair 2022

Comhairle Cathrach na Gaillimhe
Galway City Council

2023-2029
CATHAIR NA GAILLIMHE
PLEAN FORBARTHA
GALWAY CITY
DEVELOPMENT PLAN

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Revision History

Revision Ref / Date Issued	Amendments	Issued to
P01 - 29/04/2021	Initial Issue	Galway City Council
P02 - 05/10/2021	Draft SFRA	Galway City Council
P03 - 21/10/2021	Updated draft	Galway City Council
P04 - 02/11/2021	Final Draft	Galway City Council
P05 - 03/11/2021	Minor corrections and inclusion of flow charts to final draft	Galway City Council
P06 - 25/11/2021	Executive Summary	Galway City Council
P07 - 09/06/2022	Updates following public display and response to submissions	Galway City Council

Contract

This report describes work commissioned by the Transportation, Planning & Physical Development Directorate, on behalf of Galway City Council, by a letter dated 3/12/2020. Galway City Council's representative for the contract was Michele Beirne. Elizabeth Russell of JBA Consulting carried out this work.

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Purpose

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Executive Summary

Flood Policy, Legislation and Flood Mapping

Galway City Council has undertaken a Strategic Flood Risk Assessment (SFRA) to inform the Galway City Development Plan 2023-2029. The purpose of this work is to provide a broad assessment of flood risk to inform strategic land-use planning decisions, in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009; these Guidelines were issued under the Planning and Development Act 2000 and recognise the significance of proper planning to manage flood risk.

Under the EU 'Floods' Directive, the national Catchment Flood Risk Assessment and Management (CFRAM) programme was carried out. It included a review flood risk across the country and produced flood hazard mapping and flood risk management plans for tidal and main rivers. Galway City is covered by the Western CFRAM study, which included the Corrib and some of its various tributaries and mill races as well as the City coastal zones.

As a result of the findings of the Western CFRAM Study, the Coirib go Cósta flood relief scheme has progressed as a partnership project between OPW and Galway City. When completed, the scheme aims to provide protection against various combinations of tidal and fluvial flooding.

The information provided by the above, and other local studies, is a useful source of data for the SFRA.

Definition of Flood Zones and Flood Risk

Within Galway City, the main sources of flood risk have been identified as follows:

- Coastal and estuarine flooding of areas adjacent to the coast or tidal estuaries.
- Fluvial or riverine flooding due to the river banks overtopping.
- Fluvial or riverine flooding due to embankment collapse or overtopping, particularly along the Dyke Road embankment.
- Pluvial flooding resulting from water run-off and ponding in low spots following intense rainfall.
- Drainage flooding due to failure or inadequacies of the sewerage system.

Flood Zones are used to indicate the likelihood of a flood occurring. Based on the definitions in "The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009", Flood Zone A indicates a high probability of flooding, Flood Zone B a moderate probability and Flood Zone C a low probability of flooding from fluvial or tidal sources. The Flood Zones are based on an undefended scenario and do not take into account the presence of flood protection structures such as flood walls or embankments. This is to allow for the fact that there is a residual risk of flooding behind the defences due to overtopping or breach and that there may be no guarantee that the defences will be maintained in perpetuity.

Flood risk is a product of the likelihood (or probability) of a flood occurring and the potential consequences. Therefore, the assessment of flood risk requires an understanding of the sources, the flow path of floodwater and the people and property that can be affected. This has been reviewed in relation to each watercourse within Galway City and in the context of tidal/ coastal flooding.

The Flood Zone maps have been developed as composite datasets, drawing on the best available information across the city. This has ranged from the Western CFRAM study flood extents, the OPW's National Indicative Fluvial Map (NIFM), engineering knowledge and historical records.

Climate change is one of the biggest potential risks over the lifetime of the defences. The Flood Zones do not take the impact of climate change into account directly, although an indication of the scale of likely changes is gained from a comparison of the extents of Flood Zone A and B, with Flood Zone B being an indication of the future extent of Flood Zone A. The CFRAM Study and NIFM also included climate change flood extents for two scenarios, the Medium Range Future Scenario (MRFS) and the High End Future Scenario (HEFS).

Flood Management Policies

This SFRA of the Galway City Development Plan 2023-2029 includes a review of the land-use zonings in relation to flood risk and also recommends flood risk management policies and objectives. The Planning Guidelines recommend a sequential approach to the management of flood risk where the preferred option is the avoidance of development in areas of flood risk; where this is not possible development type should be substituted to a less vulnerable or water compatible land use. Land Use Zoning in an area of flood risk has been subject to the Justification Test for Plan Making to demonstrate that development is necessary for strategic growth of the area and that flood risk can be mitigated and managed appropriately.

The SFRA provides details of flood risk to the city, and where required includes the Justification Test for Plan Making. In some locations, the proposed land uses are water compatible, so justification is not required. In others, the level of risk present has required specific direction to be provided. This direction guides the need for further study (either site-specific FRA or the appraisal of a wider scale flood management solution) and the scope and scale of mitigation works that will be required for development to proceed in accordance with the Justification Test for Development Management.

At site specific level, all development proposals, regardless of location, will require an appropriately detailed flood risk assessment. As a minimum this will be a 'Stage 1 – Identification of Flood Risk'; where flood risk is identified, a 'Stage 2 – Initial FRA' will be required and depending on the scale and nature of the risk, a 'Stage 3 – Detailed FRA' may be required. The requirement for all applications to have an accompanying Stage 1 assessment is important, as, for example, a large site located in Flood Zone C may be appropriate in terms of vulnerability but might be at potential risk of surface water flooding or a risk from climate change impacts or may cause flooding to neighbouring lands by increasing run off or blocking an overland flow route.

Any proposal that is considered acceptable in principle shall demonstrate the use of the sequential approach in terms of the site layout and design, and where flood risk is identified, in satisfying the Justification Test for Development Management, the proposal will demonstrate that appropriate mitigation and management measures are put in place.

Conclusion

This SFRA has been developed to inform the preparation of land-use zoning, policies and objectives for the Galway City Development Plan 2023-2029, which have been reviewed against the recommendations set out in The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009. The land-use zoning allocations aim to avoid areas of high flood risk and where this is not achieved, but the proposed zoning has passed parts 1 and 2 of the Justification Test, recommendations have been made in part 3 of the Justification Test, relating to flood risk. It is noted the Flood Zones are based on best currently available data, but that a more detailed, site specific, flood risk assessment may produce locally varying flood outlines.

There are a number of triggers which may prompt a review of the SFRA or will require a slight change in specification for site specific flood risk assessments, including the completion of various ongoing schemes.

Contents

List of Figures

List of Tables

Abbreviations

AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
CFRAM	Catchment Flood Risk Assessment and Management
CFRAMS	Catchment-Based Flood Risk Assessment and Management Study
DoEHLG	Department of the Environment, Heritage and Local Government
DTM	Digital Terrain Model
FRA	Flood Risk Assessment
GSI	Geological Survey of Ireland
HEFS	High End Future Scenario
ICPSS	Irish Coastal Protection Strategy Study
LA	Local Authority
LAP	Local Area Plan
MRFS	Medium Range Future Scenario
OPW	Office of Public Works
OS	Ordnance Survey
PFRA	Preliminary Flood Risk Assessment
SFRA	Strategic Flood Risk Assessment
SPR	Standard percentage runoff
SSFRA	Site Specific Flood Risk Assessment
SUDS	Sustainable Urban Drainage Systems
WFD	Water Framework Directive

1 Study Background

JBA Consulting was appointed by Galway City Council to carry out the Strategic Flood Risk Assessment for the Galway City Development Plan 2023-2028.

This report details the SFRA for this area and has been prepared in accordance with the requirements of the DoEHLG and OPW Planning Guidelines, The Planning System and Flood Risk Management[1]; these guidelines were issued under the Planning and Development Act 2000 and recognise the significance of proper planning to manage flood risk.

1.1 Scope of Study

Under the "Planning System and Flood Risk Management" guidelines, the purpose for the FRA is detailed as being *"to provide a broad (wide area) assessment of all types of flood risk to inform strategic land-use planning decisions. SFRAs enable the LA to undertake the sequential approach, including the Justification Test, allocate appropriate sites for development and identify how flood risk can be reduced as part of the development plan process".*

The Galway City Development Plan 2023-2028 (GCDP) will be the key document for setting out a vision for the development of Galway during the plan period.

It is important that the GCDP fulfils the requirements of the document "The Planning System and Flood Risk Management Guidelines for Planning Authorities" (OPW/DoEHLG, 2009) which states that flood risk management should be integrated into spatial planning policies at all levels to enhance certainty and clarity in the overall planning process.

In order to ensure that flood risk is integrated into the GCDP, the main requirements of the SFRA are to:

- Review and update as necessary the Flood Zone Mapping produced under the 2017-2023 plan
- Prepare a Stage 2 - Flood Risk Assessment of Galway City in particular in relation to location and type of zoning and land-use proposals, with a focus on new or changed zoning compared with the current plan.
- Review and update the policy guidance within the SFRA in compliance with OPW/DoEHLG – "The Planning System and Flood Risk Management –Guidelines for Planning Authorities (OPW/DoEHLG, 2009)".
- Take cognizance of the Galway City Council Climate Adaptation Strategy 2019-2024, the National Climate Adaptation Framework and the various environmental and visual designations applicable to Galway City.
- Advise on zonings/land use-proposals and appropriate mitigation measures, assess and report on any submissions received as part of both the preparation and the public consultation stage of the plan, as they relate to flood risk.

1.2 Report Structure

This study considers the development strategy that will form part of the Development Plan for Galway City. The context of flood risk in Galway is considered with specific reference to a range of flood sources, including fluvial, tidal, pluvial, groundwater, sewer and canals.

A two stage assessment of flood risk was undertaken, as recommended in 'The Planning System and Flood Risk Management' guidelines, for the area that lies within the development boundary of the Development Plan. The first stage is to review the SFRA for the 2017-2023 plan and make updates based on the finalised CFRAM outputs[2]. Historical records and recent events demonstrate that Galway City has a history of flooding and confirms that a proportion of zoned lands are at flood risk. The second stage and the main purpose of this SFRA report is to appraise the adequacy of existing information, to prepare an indicative flood zone map, based on available data, and to highlight potential development areas that require more detailed assessment on a site specific level. The SFRA also provides guidelines for development within areas at potential risk

[1] DoHELG and OPW (2009) The Planning System and Flood Risk Management: Guidelines for Planning Authorities

[2] The WCFRAM Study was commissioned by the OPW in 2011 and covers the majority of watercourses within the Galway City plan area.

of flooding, and specifically looks at flood risk and the potential for development within a number of key regeneration and opportunity sites in Galway City.

Section 2 of this report provides an introduction to the study area and Section 3 discusses the concepts of flooding, Flood Zones and flood risk as they are incorporated into the Planning System and Flood Risk Management.

In Section 4 the available data related to flooding is summarised and appraised and outlines the sources of flooding to be considered, based on the review of available data. This section also considers the flood management assets that are in place, including the various flood relief scheme which have been constructed, or are underway.

Following this, Section 5 provides guidance and suggested approaches to managing flood risk to development; the contents of this section will be of particular use in informing the policies and objectives within the Development Plan. In Section 6 the Justification Test is reviewed and applied across the city, with specific responses to flood risk in relation to a number of key development sites within Galway City discussed in Section 7.

Finally, triggers for the ongoing monitoring and future review of the SFRA are detailed in Section 8.

2 Galway City Study Area

2.1 Introduction

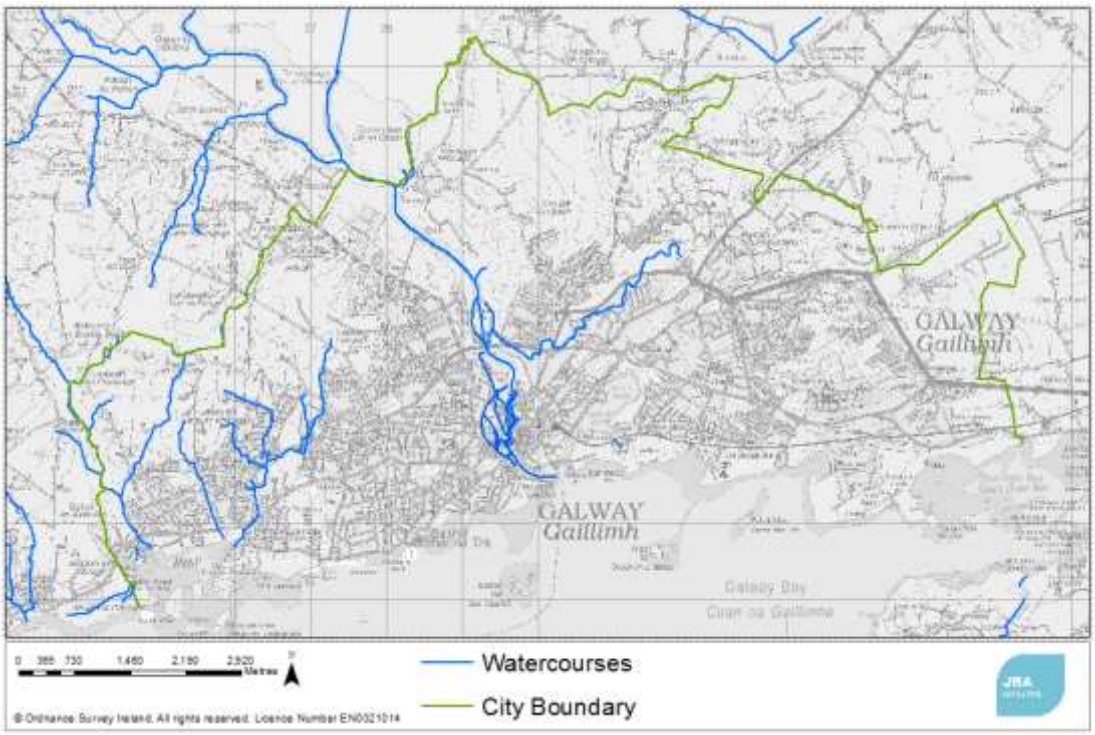
The plan area comprises the full extent of Galway City and is located in the Corrib catchment. Galway City is bounded to the south by Galway Bay, and on the other three sides by Galway County.

2.2 Watercourses

The Corrib catchment covers an area of 3,140 km^2 square kilometres to its outfall and is predominantly within County Galway but there are also areas of County Mayo and Roscommon included. The Corrib catchment drains out to Galway Bay through Galway City.

The Corrib flows along a short channel through Galway City which links the outlet of Lough Corrib to the sea. Loughs Corrib and Mask form a dividing line between two quite different portions of the catchment. To the east of the Loughs, where the bulk of the catchment lies, the land is low-lying with moderate rainfall and karst limestone geology. The smaller tributaries flowing into the Loughs from the west are much steeper, draining impermeable mountainous catchments with high rainfall.

Figure 2-1: Watercourse flowing through Galway City



The management of Lough Corrib has changed over the years. In the 12th century, the Friars Cut was built to provide another outlet from the Lough into the River Corrib in an attempt to allow boats to access the lough from the sea. Between 1846 and 1850 the lake was lowered to reduce flooding of surrounding farm land (Freeman, 1957)[3]. Between 1848 and 1857, the Eglinton canal was built, connecting the River Corrib to the sea. It allowed boats to access the lough via a single lock and also made provision for improved operation of over 30 mills[4].

In 1959, the weir constructed in the 1850s was replaced with a sluice barrage (the Salmon Weir) consisting of 16 gates. The barrage is close to the centre of Galway, 800m upstream of Wolfe Tone Bridge, immediately downstream of the point where the Eglinton Canal leaves the river. This

[3] T. W. Freeman (1957): Galway—the key to west Connacht, Irish Geography, 3:4, 194-205

[4] Eamon de Buitlear (1985) Irish Rivers.

is 7.8km downstream of the main outlet from Lough Corrib. A small amount of flow can bypass this structure via various canals and mill races[5].

There are also two smaller watercourses to the west of the city, both of which are independent of the River Corrib.

The extent of the rivers within the city is shown in Figure 2-1.

2.3 Planning Policy

2.3.1 Northern and Western Regional Assembly Regional Spatial and Economic Strategy (RSES) 2020-2032

As part of the preparation of the Northern and Western Regional Assembly Regional Spatial and Economic Strategy (RSES), a Regional Flood Risk Assessment was undertaken so that the high-level impact of the proposed Policy Objectives on the environment could be evaluated and used to inform the direction of the RSES.

The Regional Flood Risk Appraisal (RFRA) has been prepared in accordance with national and EU legislation including the Planning System and Flood Risk Assessment Guidelines for Planning Authorities (2009) and Circular PL02/2014 (August 2014).

The RFRA found that *"generally, lands within Flood Zone A & B comprise of existing development or water compatible uses however areas zoned for mixed/general community services and strategic reserve are at risk of flooding and encroach into Flood Zones A & B (tidal flooding). The CFRAM study has identified that defences along the Dyke Road are critical and should be raised and strengthened in order to support intensification of land use behind it. Land identified for flood risk management measures should be protected as such, so that future flood risk schemes can be maintained. The CFRAM flood maps for Galway provide the full flood extents for fluvial and tidal flooding in the town."*

One of the key Regional Policy Objectives in the RSES is RPO 3.10 which is of relevance to this SFRA is to "*Ensure flood risk management informs development by avoiding inappropriate development in areas at risk of flooding and integrate sustainable water management solutions (such as SUDS, non-porous surfacing and green roofs) to create safe places. Development plans should assess flood risk by implementing the recommendations of the Planning System and Flood Risk Assessment Guidelines for Planning Authorities (2009) and Circular PL02/2014 (August 2014)."*

2.3.2 Galway Metropolitan Area Strategic Plan (MASP)

A key ambition of the RSES strategy is to grow globally competitive urban centres of scale that shall be compact, connected, vibrant and inclusive places for people and for businesses to grow. The primary centre identified for growth in the region is Galway City through its designation as a Metropolitan Area in the National Planning Framework (NPF).

The MASP notes that while there is scope for infill development and refurbishment of existing commercial space, the city centre is constrained being located in the historic core and cannot easily meet significant future commercial floorspace demand. Regeneration lands are ideally placed to meet these future demands and it is the regeneration lands that will be the particular focus of this SFRA.

The MASP further identifies that the metropolitan area is vulnerable to the harmful effects of climate change, in particular sea level encroachment and extreme weather events. The CFRAM study has set out a Flood Risk Management Plan for parts of the metropolitan area which identify a range of measures to manage flood risk. The implementation of these measures is an objective of the MASP and is important in the future development of the city.

2.3.3 Galway City Development Plan (2017-2023)

The current plan covers the period 2017-2023, and under variation No. 5 aligns with the National Planning Framework, Regional Spatial Economic Strategy and Galway Metropolitan Area Strategic Plan. This variation also incorporated the Galway City Council Climate Adaptation

[5] Hydro-Environmental (2008) Impact of proposed remediation measures on flooding at Southpark and Grattan Road Galway. Report to Galway City Council.

Strategy into the plan. The core strategy of the current plan supports an integrated sustainable land use and transportation strategy. It has a focus on the growth of designated regeneration areas at Ceannt Station, Inner Harbour and lands in the Headford Road area, it also includes for the direction of development to a sustainable urban extension on the east side of the city at Ardaun. A proposed masterplan for the regeneration of lands at Nuns Island is also identified in the plan. The balance of development is for consolidation of the existing suburbs.

Detailed policies for the management of flood risk are provided in Section 9.3 of the Development Plan and are integrated in other relevant chapters in relation to climate change sustainability, blue spaces and SUDS, amongst other areas.

In addition, flood risk policy requires a detailed site-specific FRA for identified potential flood risk areas, taking into consideration findings of the CFRAM Study when completedand specific standards and guidance are included in the document.

2.3.4 Local Area Plans

The Ardaun Local Area Plan (2018-2024) provides a framework for a sustainable urban extension on the east side of the city at Ardaun, a nationally designated Major Urban Housing Delivery Site. The preparation of the plan was informed by an FRA undertaken by RPS[6]. It is envisaged that the plan will be developed on a phased basis.

Local Area Plans are to be prepared for Murrough and the Headford Road LAP areas. SFRAs for these areas has already been carried out under a previous study and will inform the LAPs when prepared.

The recommendations of the SFRA for the Headford Road LAP area are:

A further detailed study (Stage 3) should be carried out for the Headford Road LAP area to prepare a reliable flood zone map and to assess any impacts of the proposed development on the existing flood risk and to design the associated mitigation measures. RPS considers this is vital for finalising the land use zoning process for this LAP area.

The Stage 3 study should include

- *Hydrometric (flow and water level) survey of the River Corrib and associated canal systems (including Terryland River), and*
- *Detailed hydrological analysis of River Corrib Flood Flows in the vicinity of the site*
- *Cross-sectional survey of the River Corrib and Terryland.*
- *Detailed hydraulic modelling of the River Corrib and Terryland River channel*

The recommendations of the SFRA for Murrough are:

It is recommended that only water compatible development should be allowed within the flood prone areas along the Murrough LAP area coastline. However, in the absence of any alternative sites, a Justification Test along with a detailed flood risk assessment should be carried out before allowing any development at these locations. Finished floor levels should be set at 500mm above the design tide levels. In the design of any coastal flood protection works, a detailed site- specific study along with a wave climate study should be carried out. The flood extents included in the LAP have been compared with the CFRAM extents, which formed the basis of the Flood Zones in the SFRA, and are comparable. The base tide levels for both studies originated from the ICPSS. It should be noted that the Flood Zones in the LAP include an allowance for climate change, which the Flood Zone maps in this report do not. Recommendations for avoiding areas at risk of flooding should be noted and carried through to the City Development Plan.

2.3.5 Galway City Council Climate Adaptation Strategy 2019-2024

The Galway City Council Climate Adaptation Strategy 2019-2024 sets out our strategic priorities, measures and responses for adaptation for Galway City Council over the next five years as required by the Climate Action and Low Carbon Development Act 2015. Of the four themes identified within the strategy, Water Resources and Flood Risk Management is one. The strategy identifies a number of opportunities associated with climate change and flood risk management

[6] RPS Group (November 2012) Strategic Flood Risk Assessment for Three Local Area Plans - Initial Flood Risk Assessment Stage II

and a number of goals and objectives associated with reducing vulnerability to climate change and increasing the adaptability of the city.

By considering climate change within this SFRA and making it a requirement of site specific flood risk assessments to also assess and mitigate climate change risks, objectives to ensure future infrastructure and buildings are planned and built in consideration of future flood risk projections are being met.

3 The Planning System and Flood Risk Management

3.1 Introduction

Prior to discussing the management of flood risk, it is helpful to understand what is meant by the term. It is also important to define the components of flood risk in order to apply the principles of the Planning System and Flood Risk Management in a consistent manner.

The Planning System and Flood Risk Management: Guidelines for Planning Authorities, published in November 2009, describe flooding as a natural process that can occur at any time and in a wide variety of locations. Flooding can often be beneficial, and many habitats rely on periodic inundation. However, when flooding interacts with human development, it can threaten people, their property and the environment.

The following paragraphs will outline the definitions of flood risk and the Flood Zones used as a planning tool; a discussion of the principles of the Planning Guidelines and the management of flood risk in the planning system follows.

3.2 Definition of Flood Risk

Flood risk is generally accepted to be a combination of the likelihood (or probability) of flooding and the potential consequences arising. Flood risk can be expressed in terms of the following relationship:

Flood Risk = Probability of Flooding x Consequences of Flooding

The assessment of flood risk requires an understanding of the sources, the flow path of floodwater and the people and property that can be affected. The *source - pathway - receptor model,* shown below in Figure 3-1*,* illustrates this and is a widely used environmental model to assess and inform the management of risk.

Figure 3-1 Source Pathway Receptor Model

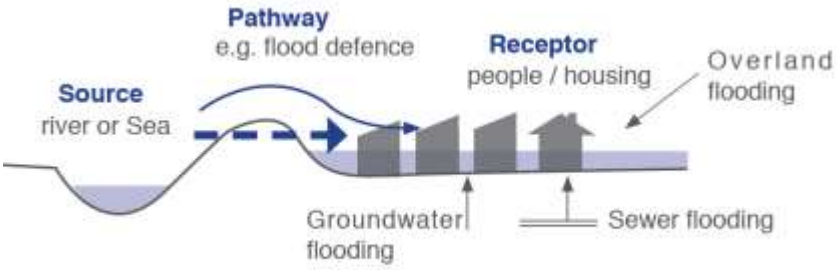


Fig. A1: Sources, pathways and receptors of flooding

Source: Figure A1 The Planning System and Flood Risk Management Guidelines Technical Appendices

Principle sources of flooding are rainfall or higher than normal sea levels while the most common pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets. Receptors can include people, their property and the environment. All three elements must be present for flood risk to arise. Mitigation measures, such as defences or flood resilient construction, have little or no effect on sources of flooding but they can block or impede pathways or remove receptors.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk.

3.2.1 Likelihood of Flooding

Likelihood, or probability, of flooding from a particular flood event is classified by its annual exceedance probability (AEP) or return period (in years). A 1% AEP flood indicates the flood event

that will occur or be exceeded on average once every 100 years and has a 1 in 100 chance of occurring in any given year.

Return period is often misunderstood to be the period between large flood events rather than an average recurrence interval. Annual exceedance probability is the inverse of return period as shown in Table 3-1.

Table 3-1 Probability of Flooding

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

Considered over the lifetime of development, an apparently low-frequency or rare flood has a significant probability of occurring. For example:

- A 1% flood has a 22% (1 in 5) chance of occurring at least once in a 25-year period - the period of a typical residential mortgage;
- And a 53% (1 in 2) chance of occurring in a 75-year period - a typical human lifetime.

3.2.2 Consequences of Flooding

Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure, of the population, presence and reliability of mitigation measures etc).

The 'Planning System and Flood Risk Management' provides three vulnerability categories, based on the type of development, which are detailed in Table 3.1 of the Guidelines, and are show in Table 3-2.

Table 3-2: Classification of vulnerability of different types of development

Vulnerability Class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location;

Vulnerability Class	Land uses and types of development which include*:
	Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).
*Uses not listed here should be considered on their own merit	

3.3 Definition of Flood Zones

In the 'Planning System and Flood Risk Management', Flood Zones are used to indicate the likelihood of a flood occurring. These Zones indicate a high, moderate or low risk of flooding from fluvial or tidal sources and are defined below in Table 3-3.

It is important to note that the definition of the Flood Zones is based on an **undefended scenario** and does not take into account the presence of flood protection structures such as flood walls or embankments. This is to allow for the fact that there is a residual risk of flooding behind the defences due to overtopping or breach and that there may be no guarantee that the defences will be maintained in perpetuity.

It is also important to note that the Flood Zones indicate flooding from fluvial and tidal sources and do not take other sources, such as groundwater or pluvial, into account, so an assessment of risk arising from such sources should also be made.

Table 3-3 Definition of Flood Zones

Zone	Description	Depiction in Flood Zone Map
Zone A High probability of flooding.	This zone defines areas with the highest risk of flooding from rivers (i.e. more than 1% probability or more than 1 in 100) and the coast (i.e. more than 0.5% probability or more than 1 in 200).	Dark blue
Zone B Moderate probability of flooding.	This zone defines areas with a moderate risk of flooding from rivers (i.e. 0.1% to 1% probability or between 1 in 100 and 1 in 1000) and the coast (i.e. 0.1% to 0.5% probability or between 1 in 200 and 1 in 1000).	Light blue
Zone C Low probability of flooding.	This zone defines areas with a low risk of flooding from rivers and the coast (i.e. less than 0.1% probability or less than 1 in 1000).	All other areas

3.4 Objectives and Principles of the Planning Guidelines

The 'Planning System and Flood Risk Management' describes good flood risk practice in planning and development management. Planning authorities are directed to have regard to the guidelines in the preparation of Development Plans and Local Area Plans, and for development control purposes.

The objective of the 'Planning System and Flood Risk Management' is to integrate flood risk management into the planning process, thereby assisting in the delivery of sustainable development. For this to be achieved, flood risk must be assessed as early as possible in the planning process. Paragraph 1.6 of the Guidelines states that the core objectives 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 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".*

The guidelines aim to facilitate '*the transparent consideration of flood risk at all levels of the planning process, ensuring a consistency of approach throughout the country.*' SFRAs therefore become a key evidence base in meeting these objectives.

The 'Planning System and Flood Risk Management' works on a number of key principles, including:

- Adopting a staged and hierarchical approach to the assessment of flood risk;
- Adopting a sequential approach to the management of flood risk, based on the frequency of flooding (identified through Flood Zones) and the vulnerability of the proposed land use.

3.5 The Sequential Approach and Justification Test

Each stage of the FRA process aims to adopt a sequential approach to management of flood risk in the planning process.

Where possible, development in areas identified as being at flood risk should be avoided; this may necessitate de-zoning lands within the plan boundary. If de-zoning is not possible, then rezoning from a higher vulnerability land use, such as residential, to a less vulnerable use, such as open space may be required.

Figure 3-2 Sequential Approach Principles in Flood Risk Management

Source: The Planning System and Flood Risk Management (Figure 3.1)

Where rezoning is not possible, exceptions to the development restrictions are provided for through the Justification Test. Many towns and cities have central areas that are affected by flood risk and have been targeted for growth. To allow the sustainable and compact development of these urban centres, development in areas of flood risk may be considered necessary. For development in such areas to be allowed, the Justification Test must be passed.

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of such developments. The test is comprised of two processes; the Plan-making Justification Test, which is undertaken for a number of development opportunity sites in Section 7 of this SFRA, and the Development Management Justification Test. The latter is used at the planning application stage where it is intended to develop land that is at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be considered inappropriate for that land.

Table 3-4 shows which types of development, based on vulnerability to flood risk, are appropriate land uses for each of the Flood Zones. The aim of the SFRA is to guide development zonings to those which are 'appropriate' and thereby avoid the need to apply the Justification Test.

Table 3-4 Matrix of Vulnerability versus Flood Zone

Development vulnerability	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

Source: Table 3.2 of the Planning System and Flood Risk Management

3.6 Scales and Stages of Flood Risk Assessment

Within the hierarchy of regional, strategic and site-specific flood-risk assessments, a tiered approach ensures that the level of information is appropriate to the scale and nature of the flood-risk issues and the location and type of development proposed, avoiding expensive flood modelling and development of mitigation measures where it is not necessary. The stages and scales of flood risk assessment comprise:

- **Regional Flood Risk Appraisal (RFRA)** – a broad overview of flood risk issues across a region to influence spatial allocations for growth in housing and employment as well as to identify where flood risk management measures may be required at a regional level to support the proposed growth. This should be based on readily derivable information and undertaken to inform the Regional Planning Guidelines.
- **Strategic Flood Risk Assessment (SFRA)** – an assessment of all types of flood risk informing land use planning decisions. This will enable the Planning Authority to allocate appropriate sites for development, whilst identifying opportunities for reducing flood risk. This SFRA will revisit and develop the flood risk identification undertaken in the RFRA, and give consideration to a range of potential sources of flooding. An initial flood risk assessment, based on the identification of Flood Zones, will also be carried out for those areas which will be zoned for development. Where the initial flood risk assessment highlights the potential for a significant level of flood risk, or there is conflict with the proposed vulnerability of development, then a site specific FRA will be recommended, which will necessitate a detailed flood risk assessment.
- **Site Specific Flood Risk Assessment (FRA)** – site or project specific flood risk assessment to consider all types of flood risk associated with the site and propose appropriate site management and mitigation measures to reduce flood risk to and from the site to an acceptable level. If the previous tiers of study have been undertaken to appropriate levels of detail, it is highly likely that the site specific FRA will require detailed channel and site survey, and hydraulic modelling.

4 Stage 1 - Identification of flood risk

4.1 Flood Zones

One of the first tasks within the SFRA is to undertake a data collection exercise which will allow Flood Zone maps to be developed. The Flood Zones relate to risk arising from fluvial (river) and coastal flooding. Other sources of flooding, such as surface water and groundwater, are also taken into account through the SFRA but are not part of the initial assessment process, and do not form part of the Flood Zones.

It is important to note that the Flood Zones do not take into account the benefits of flood defences. The sequential approach and Justification Test should be applied using the undefended outlines, but the benefits of the defences can be used to inform the requirements for detailed flood risk assessment and development design, if the Justification Test for plan making has been passed.

There are a number of datasets which record either historical or predicated flood extents. The aim of this phase of work is to identify flood risk based on the data available, including historical records, considering all sources of flooding, and to appraise the quality and usefulness of the data. Table 4-1 summarises the data available and its quality, includes an assessment of confidence in its accuracy (when attempting to incorporate it into the Flood Zone map) and gives an indication of how it was used in the SFRA study. The primary dataset will be the Flood Zone generated for the 2017-2023 Development Plan, supplemented by the finalised CFRAM mapping.

The Office of Public Works (OPW) is the lead Authority on flooding in the Country. The OPW commissioned the Western Catchment Flood Risk Assessment and Management (CFRAM) Study, which included Galway. The study was finalised in 2016, with flood maps and supporting reports available on-line[7].

The Flood Zone maps have been developed using the most appropriate data available to Galway at the time of preparing the Development Plan. The Flood Zone maps have been created specifically to inform the application of the Justification Test and to guide development policy within the plan area and have been through several iterations of review and are now considered to be fit for purpose. However, it should be borne in mind that the input data was developed at a point in time and there may be changes within the catchment that mean a future study, or more localised assessment of risk may result in a change in either flood extent or depth. This means a site-specific flood risk assessment may result in locally appropriate information which could show a greater or lesser level of risk than is included in the Flood Zone maps. This is to be expected and it will require discussion between the developer and the GCC planning and engineering sections to ensure the assessment is appropriate and relevant to the site in question.

The Flood Zone map, included in Appendix A, shows Flood Zones A, B and C and also shows areas identified through the CFRAM as being prone to wave overtopping. This is discussed further in Section 4.2.2, but is particularly significant in Salthill. For the purposes of applying the Planning Guidelines, recommendations and guidance for development within Flood Zones A and B should be taken as also applying to the wave overtopping zones.

Table 4-1 - Flood risk datasets

Title	Description / Source	Quality	Confidence	Used
Galway City SFRA for the 2017-2023 Development Plan	Flood Zone maps for fluvial and tidal sources	High	High	Used as the basis for the Flood Zone Maps in the 2023-2027 plan.
Western CFRAM	Maps have been published for the Corrib and canals / mill streams and key tributaries, as well as tidal and wave overtopping risk.	High	High	Draft CFRAM maps formed the basis of the SFRA in the 2017-2023 Development Plan. Review of finalised maps has been carried out but no changes identified.

[7] www.floodinfo.ie

Title	Description / Source	Quality	Confidence	Used
National Indicative Fluvial Mapping (NIFM)	Produced by the OPW, these maps are 'indicative' flood maps for watercourse with a catchment area greater than 5km^2.	Moderate	Moderate	Used to supplement CFRAM Information on watercourse to the west in Knocknacarra.
Irish Coastal Protection Strategy Study	Tidal extents for indicative (200yr) and extreme (1000yr) events from ICPSS study	High	High	Tide levels fed into the CFRAM analysis, but flood extents not used explicitly.
National Coastal Flood Hazard Mapping	Study provided an update to the ICPSS water levels, and reprojected them onto a relatively coarse DTM	Water levels - high levels Flood extents - Low	Low to moderate	Following a review against CFRAM tide levels and extents, the NCFHM has not been used as it appears to considerably overestimate flood extents in certain locations.
Benefiting lands	Extents which show the extents of land which would (or has) benefited from a drainage scheme. This is not based on a 'design flood event' (i.e. the extents do not have a return period), but indicates low-lying, poorly drained land, which is mainly focused within the tidal part of the study area. It is not the same as lands which are defended by a flood relief scheme.	Moderate	Low	Not used - superseded by more detailed information
Historical Flood Records including photos, aerial photos and reports.	Various sources, including CCC records, press archives and www.floodinfo.ie Coverage is broad, combination of spot records, description and extents.	Various	Various	Indirectly used to validate Flood Zones & identify other flood sources
Walkover survey	Selected locations, including city centre and key structures and flood defences	Moderate	Low	Yes, to validate outlines and flow paths at key locations

4.2 Sources of Flooding

This SFRA has reviewed flood risk from fluvial, tidal, pluvial and groundwater sources. It also considers flooding from drainage systems, canals and other artificial or man-made systems.

The focus of the study is on risk from fluvial flooding from the Corrib and its tributaries and canals and the tidal flooding arising in Salthill and Spanish Arch. The influence of high tides on river levels has also been taken into account, whilst the impact of drainage systems, groundwater and man-made systems has formed a secondary consideration. This is because Flood Zones in the 'Planning System and Flood Risk Management' are defined on the basis of fluvial and tidal flood risk. In addition, the SFRA should be based on readily derivable information, and records and indicators for fluvial and tidal flood risk are generally more abundant than for other sources of flooding.

4.2.1 Fluvial Flooding

Flooding of watercourses is associated with the exceedance of channel capacity during higher flows. The process of flooding on watercourses depends on a number of characteristics associated with the catchment including geographical location and variation in rainfall, steepness of the channel and surrounding floodplain and infiltration and rate of runoff associated with urban and rural catchments. Generally, there are two main types of catchments: large and relatively flat or small and steep, both giving two very different responses during large rainfall events.

In a large, relatively flat catchment, flood levels will rise slowly and natural floodplains may remain flooded for several days, acting as the natural regulator of the flow. This is typical of the River Clare as it flows into Lough Corrib, and the undeveloped parts of the River Corrib upstream of the city. In small, steep catchments, such as the westerly streams, local intense rainfall can result in the rapid onset of deep and fast-flowing flooding with little warning. Such “flash” flooding, which may only last a few hours, can cause considerable damage and possible threat to life.

The form of the floodplain, either natural or urbanised, can influence flooding along watercourses. The location of buildings and roads can significantly influence flood depths and velocities by altering flow directions and reducing the volume of storage within the floodplain. Critical structures such as bridge and culverts can also significantly reduce capacity creating pinch points within the floodplain. These structures are also vulnerable to blockage by natural debris within the channel or by fly tipping and waste.

In Galway City there is proportionally less risk from fluvial flooding than from tidal, but it is still important that river side development is fully considered in the context of flood management, particularly for sites which are currently defended (see Section 4.2.3). The main source of flooding is the River Corrib, as can be seen from historical records. The Corrib catchment is large, covering approximately 3,140km^2 and is relatively slow responding to rainfall, both as a result of the size and due to the attenuation effects of Lough Corrib and Lough Mask.

4.2.2 Tidal and Coastal Flooding

Galway City has a coastline of approximately 13.5km that stretches from Silverstrand in the west to Roscam Point to the east. The key areas of flood risk within the city are properties along the Salthill promenade, the Claddagh Basin and Nimmo's Pier and the harbour. The area around the Claddagh Basin and the Docklands are also influenced by the River Corrib which discharges to Galway Bay. Significant, and relatively frequent, flooding occurs at Spanish Arch and Flood Street. The properties that encompass Lough Atalia are also in an area of possible risk.

Figure 4-1 shows a photograph of a stretch along the Salthill Promenade with properties in a linear pattern along the coast. Many hotels and restaurants are located in close proximity to the promenade due to the attraction of tourists all year round.

There is substantial evidence from historical OSi maps that reclamation of lands from the sea occurred in Salthill during the last century; White Strand, Toft Park, Galway Atlantiquarium and car park are all located on reclaimed land.

Galway city is also vulnerable to wave overtopping, which impacts Salthill, and in particular Leisureland, premises on Salthill Road Upper, which fronts the promenade and the Atlantiquarium. Whilst the Flood Zones do not take into account wave overtopping, the modelled extent which may occur as a result of wave action has also been included on the Flood Zone maps and should be considered as part of Flood Zone A.

Figure 4-1: Salthill Promenade

4.2.3 Flooding from Flood Defence Overtopping or Breach

There are a number of flood relief schemes in Galway, including the dyke which protects the Headford Road area from the Corrib, a retaining wall on the right bank of the River Corrib downstream of the Salmon Weir and the quay walls which provide some protection against tidal inundation. There are also a number of walls and other structures which, whilst not designed to act as flood defences, provide a level of protection against flood water. Since the winter flooding in 2013/2014, Galway City Council has carried out small scale works in the Salthill area with the aim of providing a higher level of protection to Leisureland. A flood gate has been installed to provide protection to the Galway Business School and a number of gates also installed at Toft Park. Three sets of demountable defences have also been purchased to protect Spanish Arch and the surrounding area when extreme tides are forecast. The demountable defences are erected when warnings for high tides and storm surges are received by Galway City Council.

Consultants were appointed in November 2020 to begin work on the design of a flood relief scheme to provide protection against fluvial and tidal risks in the City under the Coirib go Cósta Galway City Flood Relief Scheme. This is a significant flood relief scheme for the city and has recently gone through the first public consultation stage. Until such a time as this scheme is complete, with construction programmed to start in 2025 and a 36 month build, development within the city must be progressed on the basis of the undefended scenario because the existing defences, detailed above, do not provide protection to the 1% AEP (fluvial) or 0.5% AEP (tidal) standard, which is the target standard of protection used by the OPW.

Existing development clearly benefits from the construction of defences, and new defences will be considered as one means of facilitating the redevelopment of the city centre. However, it is premature to consider the benefits of schemes which have not been constructed, and which may only be at pre-feasibility or design stage.

Even after defences have been completed, it is still important to consider the undefended scenario in the first instance, due to the risk of defences failing; residual risk is the risk that remains after measures to control flood risk have been carried out. Residual risk can arise from overtopping of flood defences and / or from the breach from structural failure of the defences.

The concept of residual risk is explained in 'The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009' as follows:

"*Although flood defences may reduce the risk of flooding, they cannot eliminate it. A flood defence may be overtopped by a flood that is higher than that for which it was designed, or be breached and allow flood water to rapidly inundate the area behind the defence. In addition, no guarantee can be given that flood defence will be maintained in perpetuity. As well as the actual risk, which may be reduced as a result of the flood defence, there will remain a residual risk that must be considered in determining the appropriateness of particular land uses and development. For these reasons, flooding will still remain a consideration behind flood defences and the flood zones deliberately ignore the presence of flood defences*."

Overtopping of flood defences will occur during flood events greater than the design level of the defences. Overtopping is likely to cause more limited inundation of the floodplain than if defences had not been built, but the impact will depend on the duration, severity and volume of floodwater. However, and more critically, overtopping can destabilise a flood defence, cause erosion and make it more susceptible to breach or fail. Recovery time and drainage of overtopping quantities should also be considered. Overtopping may become more likely in future years due to the impacts of climate change and it is important that any assessment of defences includes an appraisal of climate change risks.

Breach or structural failure of flood defences is hard to predict and is largely related to the structural condition and type of flood defence. 'Hard' flood defences such as solid concrete walls are less likely to breach than 'soft' defence such as earth embankments. Breach will usually result in sudden flooding with little or no warning and presents a significant hazard and danger to life. There is likely to be deeper flooding in the event of a breach than due to overtopping.

The assessment of breach should be proportionate to the likelihood of the defence failing, taking into account the age, maintenance regime, construction type and the presence of any demountable or mechanically operated components.

Whilst it is important that residual risks are recognised and appropriate management measures put in place, it is also important to acknowledge the benefits that a flood relief scheme provides to those living and working behind it. In this regard, although 'The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009' requires flood zones to be undefended, consideration should be given to the benefit provided by flood defences, but only once the Justification Test has been applied and passed. The benefit of defences has been reviewed in relation to specific sites, and most notably in relation to the Headford Road and Dyke Road regeneration area, detailed in Section 7 and is addressed more generally in the development management guidance provided in Section 5.

4.2.4 Pluvial Flooding

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

The OPW's Preliminary Flood Risk Assessment (PFRA) study considered pluvial flood risk and produced a national set of pluvial flood maps. This dataset was reviewed and used to identify development areas at particular risk of surface water and pluvial flooding. However, the level of detail contained in the PFRA map, and the wide-spread distribution of areas at risk did not allow a commentary relating to pluvial flood risk to be developed, or for particularly high risk areas to be identified. Instead, an overall strategy for the management of pluvial risk is presented and should be implemented across all development proposals.

SFRAs require a strategic assessment of the likelihood of surface water flooding, which includes consideration of the following:

- Are there zoned lands which may need to accommodate and retain surface water flow routes?
- Are there zoned lands which might discharge upstream of an area vulnerable to surface water flooding?

Recommendations for the assessment of surface water risks are provided in Section 5.4 and a preliminary assessment of the potential for specific zoned lands to contribute or to be vulnerable to surface water flooding has been undertaken as part of Section 7.

4.2.5 Flooding from Drainage Systems

Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its discharge capacity, it becomes blocked or it cannot discharge due to a high water level in the receiving watercourse.

Flooding in urban areas can also be attributed to sewers. Sewers have a finite capacity which, during certain load conditions, will be exceeded. In addition, design standards vary and changes within the catchment areas draining to the system, in particular planned growth and urban creep,

will reduce the level of service provided by the asset. Sewer flooding problems will often be associated with regularly occurring storm events during which sewers and associated infrastructure can become blocked or fail. This problem is exacerbated in areas with under-capacity systems. In the larger events that are less frequent but have a higher consequence, surface water will exceed the sewer system and flow across the surface of the land, often following the same flow paths and ponding in the same areas as overland flow.

Foul sewers and surface water drainage systems are spread extensively across the urban areas with various interconnected systems discharging to treatment works and into local watercourses.

4.2.6 Groundwater Flooding

Groundwater flooding is caused by the emergence of water originating from underground and is particularly common in karst landscapes. This can emerge from either point or diffuse locations. The occurrence of groundwater flooding is usually very local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas and pose further risks to the environment and ground stability.

Groundwater flooding can persist over a number of weeks and poses a significant but localised issue that has attracted an increasing amount of public concern in recent years. In most cases groundwater flooding cannot be easily managed or lasting solutions engineered although the impact on buildings can be mitigated against through various measures.

Groundwater flooding maps (historic & predictive) are available through GSI's web viewers. The historic flood maps provide information of historic flooding, both surface water and groundwater. The predictive groundwater flood map provides information on the probability of future karst groundwater flooding (where available).

Parts of Galway City are particularly vulnerable to groundwater flooding, including the Ardaun area, where flood risk was reviewed through the Local Area Plan. The Terryland River flows east from the Corrib towards a sinkhole that drains the flow into the karst limestone beneath. The river has been used historically for water abstraction for the Galway City environs. Within the CFRAM model certain conservative assumptions have been made regarding its representation, but there is still a level of uncertainty over the capacity of the swallow hole and the interactions with surface and ground water.

5 Approach to Flood Management

5.1 The Strategic Approach

A strategic approach to the management of flood risk is important in Galway City as the risks are varied and disparate, with scales of risk and scales of existing and proposed development varying across the city. There is also pressure to develop the available land and continue to grow the city.

Following the Planning Guidelines, development should always be located in areas of lowest flood risk first, and only when it has been established that there are no suitable alternative options should development (of the lowest vulnerability) proceed. Consideration may then be given to factors which moderate risks, such as defences, and finally consideration of suitable flood risk mitigation and site management measures is necessary.

It is important to note that whilst it may be technically feasible to mitigate or manage flood risk at site level, strategically it may not be a sustainable approach.

A summary of flood risks associated with each of the zoning objectives has been provided in Table 5-1, below. It should be noted that this table is intended as a guide only and should be read in conjunction with the detailed assessment of risks provided in Section 7. However, when applications are being considered it is important to remember that not all uses will be appropriate on flood risk grounds, hence the need to work through the Justification Test for Development Management on a site by site basis. For example, the community zoning objective could include a highly vulnerable crèche, less vulnerable shops and water compatible car parking / sports facilities but they would not be equally appropriate on the ground floor within Flood Zone A or B.

Table 5-1: Zoning objective vulnerability

Zoning Objective	Indicative Primary Vulnerability	Flood Risk Commentary
Residential	High vulnerability	Justification needs to be passed to allow zoning in Flood Zone A and B. For existing development, see Section 6.
Low Density Residential	High vulnerability	Justification needs to be passed to allow zoning in Flood Zone A and B. For existing development, see Section 6.
Community, Cultural and Institutional	Highly or less vulnerable	Justification needs to be passed to allow highly vulnerable development Flood Zone A and B and for less vulnerable development in Flood Zone B.
City Centre	Less vulnerable, with some highly vulnerable	Justification needs to be passed to allow highly vulnerable development Flood Zone A and B and for less vulnerable development in Flood Zone B.
Enterprise, Light Industrial and Commercial	Less vulnerable	Justification needs to be passed to allow zoning in Flood Zone B.
Enterprise, Industry and Related Uses	Less vulnerable	Justification needs to be passed to allow zoning in Flood Zone B.
Recreational and amenity	Water compatible or less vulnerable	Water compatible uses are appropriate. Justification needs to be passed to allow less vulnerable development in Flood Zone B.
Agriculture and high amenity	Water compatible	Water compatible uses are appropriate. Development within these areas should avoid Flood Zone A and B.
Agriculture	Water compatible	Water compatible uses are appropriate. Development within these areas should avoid Flood Zone A and B.
Urban Village Centre	Less and Highly vulnerable	Justification needs to be passed to allow highly vulnerable development Flood Zone A and B and for less vulnerable development in Flood Zone B.
Local Area Plan	LAP areas have been subject to SFRA - see Section 2.3 for more details.	

5.2 Development Management and Flood Risk

In order to guide applicants and relevant council staff through the process of planning for and mitigating flood risk, the key features of a range of development scenarios have been identified (relating to the Flood Zone, development vulnerability and presence or absence of defences). For each scenario, a number of considerations relating to the suitability of the development are summarised below. Flow charts illustrating the process have been prepared and are included in Appendix B.

Where land has not passed the Justification Test for Development Plans for a particular use, where development is considered premature pending a flood relief scheme, or where flood risk arising from a watercourse is only identified at Development Management Stage, the following sections do not apply and a site specific flood risk assessment (SSFRA) may be premature. In these situations, a discussion with Galway City Council is required to determine an appropriate route forward.

In addition to the general recommendations in the following sections, Section 7 should be reviewed for specific recommendations for a selection of sites and zoning objectives within the City.

5.3 Requirements for a Flood Risk Assessment

Assessment of flood risk is required in support of any planning application, as detailed in Section 9.2 and Policy 9.1 of the Development Plan. The level of detail will vary depending on the risks identified and the proposed land use. As a minimum, all proposed development, including that in Flood Zone C, must consider the impact of surface water flood risks on drainage design. In addition, flood risk from sources other than fluvial and tidal should be reviewed. The assessment may be a qualitative appraisal of risks, including drainage design. Alternatively, the findings of the CFRAM, or other detailed study, may be drawn upon to inform finished floor levels. In other circumstances a detailed modelling study and flood risk assessment may need to be undertaken. Further details of each of these scenarios, including considerations for the flood risk assessment are provided in the following sections.

For sites within Flood Zone A or B, a site specific "Stage 2 - Initial FRA" will be required, and may need to be developed into a "Stage 3 - Detailed FRA". The extents of Flood Zone A and B are delineated through this SFRA. However, future studies may refine the extents (either to reduce or enlarge them) so a comprehensive review of available data should be undertaken once a SSFRA has been triggered.

Within the SSFRA the impacts of climate change and residual risk (including culvert/structure blockage) and more extreme scenarios (such as the 0.1% AEP fluvial and tidal event) should be considered and modelled or remodelled where necessary. Further information on the required content of the SSFRA is provided in the Planning System and Flood Risk Management Guidelines.

Any proposal that is considered acceptable in principle shall demonstrate the use of the sequential approach in terms of the site layout and design and, in satisfying the Justification Test (where required) the proposal will demonstrate that appropriate mitigation and management measures are put in place.

Although there are locations where development may, in the future, benefit from a flood relief scheme, the assessment must progress on the basis of the current level of protection and any risks to the development itself or third party land must be managed as part of the development design.

5.4 Drainage impact assessment

All proposed development, whether in Flood Zone A, B or C, must consider the impact of surface water flood risks on drainage design, as required under Section 9.5 and Policy 9.6 of the Development Plan. An assessment of the impact of surface water drainage and flood risk will be required in the design of a proposed development and considered in the planning process. This may be 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 mapping, but this should not be considered the only indicator of flood risk. Particular attention should be given to development in low-lying areas which may act as natural ponds for collection of runoff.

The drainage design should ensure no increase in flood risk to the site, or the downstream catchment. Considerable detail on the process and design of SUDS is provided in the Greater Dublin Strategic Drainage Study (which in the absence of other guidance may be applied in Galway City). Consideration of SUDS should also extend to the use of alternatives to below ground attenuation, such as storage ponds, swales and greenroofs.

Where possible, and particularly in areas of new development, floor levels should at a minimum be 300mm 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.

In addition, 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.

5.5 Development in Flood Zone C

Where a site is within Flood Zone C but adjoining or in close proximity to Flood Zone A or B there could be a risk of flooding associated with factors such as future scenarios (climate change) or in the event of failure of a defence or blockage of a bridge or culvert. Risk from sources other than fluvial and coastal must also be addressed for all development in Flood Zone C. As a minimum in such a scenario a flood risk assessment should be undertaken which will screen out possible indirect sources of flood risk, and where they cannot be screened out it should present mitigation measures. The most likely mitigation measure will involve setting finished floor levels, and details of required allowances provided in Section 5.10. Design elements such as channel maintenance or trash screens may also be required. Evacuation routes in the event of inundation of surrounding land should also be detailed.

The impacts of climate change should be considered for all proposed developments. This is particularly important for development near areas at risk of tidal flooding. A development which is currently in Flood Zone C may be shown to be at risk when 0.5m is added to the extreme (0.5% AEP) tide. Details of the approach to incorporating climate change impacts into the assessment and design are provided in Section 5.10.5.

5.6 Development in Flood Zone A or B

5.6.1 Minor Development

Section 5.28 of the Planning Guidelines on Flood Risk Management identifies certain types of development as being 'minor works' and therefore exempt from the Justification Test. Such development relates to works associated with existing developments, such as extensions, renovations and rebuilding of the existing development, small scale infill and changes of use.

Despite the ‘Sequential Approach’ and ‘Justification Test’ not applying, as they do not relate to existing buildings, an assessment of the risks of flooding should accompany such applications. This must demonstrate that the development would not increase flood risks, by introducing significant numbers of additional people into the flood plain and/or putting additional pressure on emergency services or existing flood management infrastructure. The development must not have adverse impacts or impede access to a watercourse, floodplain or flood protection and management facilities. Where possible, the design of built elements in these applications should demonstrate principles of flood resilient design (See ‘The Planning System and Flood Risk Management Guidelines for Planning Authorities Technical Appendices, 2009', Section 4 - Designing for Residual Flood Risk).

The requirement for providing compensatory storage for minor developments has been reviewed and can generally be relaxed, even where finished floor levels have been raised. This is because the development concerns land which has previously been developed and would already have limited capacity to mitigate flooding. However, a commentary to this effect must be substantiated in the FRA.

Further details on the process of assessing flood risk for minor development is provided in the Flow Charts in Appendix B.

5.6.2 Highly vulnerable development in Flood Zone A or B

Development which is highly vulnerable to flooding, as defined in The Planning System and Flood Risk Management, includes (but is not limited to) dwelling houses, hospitals, emergency services and caravan parks.

5.6.2.1 New development

It is generally not appropriate for new, highly vulnerable development to be located on greenfield land in Flood Zones A or B, particularly outside the core of a settlement and where there are no flood defences. Such proposals do not pass the Justification Test. Instead, a less vulnerable use should be considered.

In some cases, land use objectives which include for highly vulnerable uses have been justified in the Development Plan. This includes zonings focused around the urban core which allow for a mix of residential, commercial and other uses. In such cases, a sequential approach to land use within the site must be taken and will consider the presence or absence of defences, land raising and provision of compensatory storage, safe access and egress in a flood and the impact on the wider development area. The supporting Flood Risk Assessment must take into account residual risks, including the impacts of climate change.

5.6.2.2 Existing developed areas

The Planning Circular (PL02/2014) states that "*notwithstanding the need for future development to avoid areas at risk of flooding, it is recognised that the existing urban structure of the country contains many well established cities and urban centres which will continue to be at risk of flooding. In addition, development plans have identified various strategically important urban centres whose continued consolidation, growth, development or generation, including for residential use, is being encouraged to bring about compact and sustainable growth*.

Within this SFRA, small scale infill housing, extensions or changes of use have been considered and, subject to site specific flood risk assessment, can generally be considered appropriate.

In cases where development has been justified, the outline requirements for a flood risk assessment and flood management measures have been detailed in this SFRA in both the following sections and the site specific assessments in Section 7, which also provides details of the Justification Tests. Of prime importance is the requirement to manage risk to the development site and not to increase flood risk elsewhere. This should give due consideration to safe evacuation routes and access for emergency services during a flood event. Climate change impacts must also be considered, along with other, relevant, residual risks.

5.6.3 Less vulnerable development in Flood Zone A or B

This section applies to less vulnerable development in Flood Zone A which has passed the Justification test for development plans, and less vulnerable development in Flood Zone B, where this form of development is appropriate and the Justification Test is not required.

The design and assessment of less vulnerable development should begin with 1% AEP fluvial or 0.5% tidal events as standard, with climate change and a suitable freeboard included in the setting of finished floor levels (see Section 5.10).

The presence or absence of flood defences informs the level of flood mitigation recommended for less vulnerable developments in areas at risk of flooding. In contrast with highly vulnerable development, there is greater scope for the developer of less vulnerable uses to accept flood risks and build to a lower standard of protection, which is still high enough to manage risks for the development in question although, any deviation from the design standard of 1%/0.5% AEP, plus climate change, plus freeboard, needs to be fully justified within the FRA. However, in Galway City there are limited locations where flood defences are present and provide a sufficient standard of protection to permit such relaxations is design standards.

5.7 Water compatible uses in Flood Zone A or B

Water compatible uses can include the non-built environment, such as open space, agriculture and green corridors. These uses do not require a flood risk assessment and are appropriate for Flood Zone A and B. However, there are numerous other uses which are classified as water compatible, but which involve some kind of built development, such as lifeguard stations, harbour

operations and other activities requiring a waterside location. The Justification Tests are not required for such development, but an appropriately detailed flood risk assessment is required. This should consider mitigation measures such as development layout and finished floor levels, access, egress and emergency plans. Climate change and other residual risks should also be considered within the SSFRA.

5.8 Climate Change

Ireland's climate is changing and analysis of the potential impacts of future climate change is essential for understanding and planning. Climate change should be considered when assessing flood risk and in particular residual flood risk. Areas of residual risk are highly sensitive to climate change impacts as an increase in flood levels will increase the likelihood of defence failure. As laid out in the Climate Adaptation Strategy, new development should include consideration of climate change impacts on fluvial, pluvial and tidal source of flooding.

The Planning Guidelines recommend that a precautionary approach to climate change is adopted due to the level of uncertainty involved in the potential effects. Specific 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[8]. However, this guidance is over 10 years old now and climate science, particularly in relation to sea level rise, has developed rapidly. There are many coastal related climate change impacts, these include:

- continued sea level rise;
- potentially more severe Atlantic storms, which could generate more significant storm surges and extreme waves;
- increased water depths lead to larger waves reaching the coast.

The OPW guidance recommended two climate change scenarios are considered. These are the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). The allowances should be applied to the 1% AEP fluvial or 0.5% AEP tidal levels. Where a development is critical or extremely vulnerable (see Table 5-2) the impact of climate change on 0.1% AEP flows should also be applied, and greater climate change allowances tested for resilience purposes.

The impact of climate change on flood risk has been considered from both a plan making and development management perspective as part of the preparation of this SFRA. As part of the specific assessment of risks to each regeneration and opportunity sites, and other zoned areas of the city a commentary has been included in the relevant part of Section 7. As the climate change allowances are particularly important at the development management stage of planning and will ensure that proposed development is designed and constructed according to current local and national Government advice. Further advice on the incorporation of climate change into flood risk assessments, for development in Flood Zone C and in setting finished floor levels is also provided in Section 5.10 of this SFRA.

Table 5-2: Climate change allowances by vulnerability and flood source

Development vulnerability	Fluvial climate change allowance (increase in flows)	Tidal climate change allowance (increase in sea level)	Storm water / surface water
Less vulnerable	20%	0.5m (MRFS)	20% increase in rainfall
Highly vulnerable	20%	0.5m (MRFS)	
Critical or extremely vulnerable (e.g. hospitals, major sub-stations, blue light services)	30%	1.0m (HEFS)	
Note: there will be no discounting of climate change allowances for shorter lifespan developments.			

Further work on the impacts of climate change on flood levels was undertaken as part of the Western CFRAM Study, the ICPSS and the OPW's most recent coastal study, the ICWWS.

8 OPW Assessment of Potential Future Scenarios, Flood Risk Management Draft Guidance, 2009

Together, the studies provide flood extents for both fluvial and coastal risk, which are available on www.floodinfo.ie.

Assessment of climate change impacts at both plan making and development management can be carried out in a number of ways. For watercourses that fall within the Western CFRAM study area, flood extents and water levels for the MRFS and HEFS have been developed. For other fluvial watercourses a conservative approach would be to take the 0.1% AEP event levels and extent as representing the 1% AEP event plus climate change. Where access to the hydraulic river model is readily available a run with climate change could be carried out, or hand calculations undertaken to determine the likely impact of additional flows on river levels. In a coastal or tidal scenario, a 0.5 or 1m increase to the 0.5% AEP sea level can be assessed based on topographic levels.

5.9 Checklist for Applications for Development in Areas at Risk of Flooding

This section applies to both highly and less vulnerable development in Flood Zone A and highly vulnerable development in Flood Zone B that satisfy the following:

- Meet the definition of Minor Development; or
- Pass the Justification Test for Development Plans and Justification Test for Development Management to the satisfaction of the Planning Authority.

The following checklist is required for all development proposals:

- The SSFRA be carried out by an appropriately qualified Engineer with relevant FRA experience (as deemed acceptable by the Planning Authority), in accordance the Galway City SFRA and the Planning System and Flood Risk Management Guidelines.
- Demonstration that the specific objectives or requirements for managing flood risk set out in Section 7 of this SFRA have been complied with, including an assessment of residual risks.
- Preparation of access, egress and emergency plans which are appropriate to the vulnerability of the development and its occupiers, the intensity of use and the level of flood risk.
- An assessment of the potential impacts of climate change and the adaptive capacity of the development
- SUDs to be designed in accordance with the principles outlined in Chapter 11, Section 9.5 and Policy 9.4 of the Development Plan, Section 6.0 of the Greater Dublin Strategic Drainage Study – Regional Drainage Policies – Volume 2 New Development or in accordance with other international best practices SUDS Manuals.

5.10 Flood Mitigation Measures at Site Design

For any development proposal in Flood Zone A or B that has passed the Justification Test for Development Plans, it must be demonstrated that appropriate mitigation measures can be put in place and that residual risks can be managed to acceptable levels. Guidance on what might be considered 'acceptable' has been given in a number of sections in this document and should be discussed with GCC planners and engineers.

To ensure that adequate measures are put in place to deal with residual risks, proposals should demonstrate the use of flood-resistant construction measures that are aimed at preventing water from entering a building and that mitigate the damage floodwater causes to buildings. Alternatively, designs for flood resilient construction may be incorporated into the development design where it can be demonstrated that entry of floodwater into buildings is preferable to limit damage caused by floodwater and allow relatively quick recovery.

Various mitigation measures are outlined below and further detail on flood resilience and flood resistance are included in the Technical Appendices of the Planning Guidelines.

It should be emphasised that measures such as those highlighted below should only be considered once it has been deemed 'appropriate' to allow development in a given location or the Justification Test for Development Plans has been passed. The Planning Guidelines do not advocate an approach of engineering solutions in order to justify a development which would otherwise be inappropriate.

5.10.1 Site Layout and Design

To address flood risk in the design of new development, a risk based approach shall be adopted to locate more vulnerable land uses to higher ground while water compatible development i.e. recreational or open space, and in some situations car parking, can be located in higher flood risk areas. Highly vulnerable land uses (i.e. residential housing) shall be substituted with less vulnerable development (i.e. retail unit).

The site layout should identify and protect land required for current and future flood risk management, including the Galway FRS. Waterside areas or areas along known flow routes can be used for recreation, amenity and environmental purposes to allow preservation of flow routes and flood storage, while at the same time providing valuable social and environmental benefits.

At an individual building level, assigning a water compatible use, such as open public realm, or less vulnerable use to the ground floor level, along with suitable flood resilient construction, is an effective way of raising vulnerable living space above design flood levels. It can however have an impact on the streetscape. The provision of safe access and egress is a critical consideration in allocating ground floor uses. It should be noted that for residential buildings within Flood Zone A or B, bedroom accommodation is more appropriate at upper floor levels.

5.10.2 Ground levels and floor levels

Modifying ground levels to raise land above the design flood level is a very effective way of reducing flood risk to the particular site in question. However, in most areas of fluvial flood risk, conveyance or flood storage would be reduced locally and could have an adverse effect on flood risk off site. There are a number of criteria which must all be met before this is considered a valid approach:

- Development at the site must have been justified through this SFRA based on the existing (unmodified) ground levels.
- The FRA should establish the function provided by the floodplain. Where conveyance is a prime function then a hydraulic model will be required to show the impact of its alteration.
- Compensatory storage should be provided on a level for level basis to balance the total area that will be lost through infilling where the floodplain provides static storage.
- The provision of the compensatory storage should be in close proximity to the area that storage is being lost from (i.e. within the same flood cell).
- The land proposed to provide the compensatory storage area must be within the ownership / control of the developer.
- The land being given over to storage must be land which does not flood in the 1% AEP event (i.e. Flood Zone B or C) and there should be no increase in flood risk to third party lands in the 1% AEP event and impacts in the 0.1% event must be tested.
- The compensatory storage area should be constructed before land is raised to facilitate development.

In some sites it is possible that ground levels can be re-landscaped to provide a sufficiently large development footprint within Flood Zone C. However, it is likely that in other potential development locations there is insufficient land available to fully compensate for the loss of floodplain. In such cases it will be necessary to reconsider the layout or reduce the scale of development, or propose an alternative and less vulnerable type of development. In other situations, it is possible that the lack of availability of suitable areas of compensatory storage mean the target site cannot be developed and should remain open space.

Raising finished floor levels within a development is an effective way of avoiding damage to the interior of buildings (i.e. furniture and fittings) in times of flood. Finished floor levels should be assessed in relation to the specific development, but the minimum levels set out in Table 5-3 should apply. It should be noted that in certain locations it may be appropriate to adopt a more precautionary approach to setting finished floor levels, for example where residual risks associated with bridge blockage occur or the 0.1% AEP event is more extreme, and this should be specifically assessed in the SSFRA. It is also noted that typically finished floor levels should be set a minimum of 300mm above surrounding ground levels to prevent ingress of surface water.

Table 5-3: Recommended minimum finished floor levels

Scenario	Finished floor level to be based on
Fluvial, undefended	1% AEP flood + climate change (as Table 5-2) + 300mm freeboard
Tidal, undefended	0.5% AEP flood + climate change (as Table 5-2) + 300mm freeboard (or 500mm where there is risk of storm surge and wave action)
Fluvial, defended	1% AEP flood + 300mm freeboard. Climate change does not need to be included, provided it is included in the defence height or adaption plan for the scheme.
Tidal, defended	0.5% AEP flood + 300mm freeboard (or 500mm where there is risk of storm surge and wave action). Climate change does not need to be included, provided it is included in the defence height or adaption plan for the scheme.

5.10.3 Raised Defences

Construction of raised defences (i.e. flood walls and embankments) has traditionally been the response to flood risk. However, this is not a preferred option on an ad-hoc basis and where the defences to protect the development are not part of a strategically led flood relief scheme (FRS). Where a FRS is proposed as the means of providing flood defence, the impact of the scheme on flood risk up and downstream must be assessed and appropriate compensatory storage must be provided.

A site is considered to be defended if the standard of protection is 1% AEP (fluvial) or 0.5% AEP (tidal), within which a freeboard of at least 300mm is included. The FFL of the proposed development needs to include for the impacts of climate change and other residual risks, including overtopping in the 0.1% event, unless this has also been incorporated into the defence design. This may be assessed through breach analysis, overtopping analysis or projection of water levels across the floodplain.

5.10.4 Emergency Flood Response Plans

In some instances, and only when all parts both the Plan Making and Development Management Justification Tests have been passed, it may be necessary for an emergency flood response plan to be prepared to support other flood management measures within the context of a less vulnerable or water compatible development. An emergency response plan may be required to trigger the operation of demountable flood defences to a less vulnerable development, evacuation of a car park or closure of a business or retail premises.

The emergency plan will need to detail triggers for activation, including receipt of a timely flood warning, a staged response and to set out the management and operational roles and responsibilities. The plan will also need to set out arrangements for access and egress, both for pedestrians, vehicles and emergency services. The details of the plan should be based on an appropriately detailed assessment of flood risk, including speed of onset of flooding, depths and duration of inundation.

However, just because it is possible to prepare and emergency plan does not mean this is advisable or appropriate for the nature and vulnerability of development and GCC will generally not accept an emergency response plan as part of a residential development, but the final decision will be on the basis of a wider assessment and should be made in conjunction with Galway City Council planners and engineers.

5.10.5 Nature based solutions / Green Infrastructure

Measures can be applied that aim to retain water on the landscape during periods of high rainfall and flood by mimicking the functioning of a natural landscape, thereby reducing the magnitude of flood events and providing complimentary ecosystem services. In general, nature-based measures aim to:

- Reduce the rate of runoff during periods of high rainfall;
- Provide flood storage in upper catchment areas; and

- Use natural materials and “soft” engineering techniques to managing flooding in place of “hard” engineering in river corridors.

Nature-based measures to control flooding typically focus on the use of porous surfaces in developments (Sustainable Urban Drainage Systems or SUDS), planting of native vegetation communities/assemblages that are tolerant of both wet and dry conditions, and reversing the impacts of over-engineered river corridors (river restoration) to reduce the peak of flood events by mimicking the function of a natural catchment landscape. In addition to providing flood relief benefits, nature-based solutions can provide an array of ecosystem services including silt and pollution control for runoff entering the river system, improved riparian and in-river habitats, localised temperature reduction during periods of extreme heat, reduced maintenance requirements in engineered systems, groundwater recharge, and carbon sequestration. Further information and guidance is available in the DHLGH document ‘Nature Based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas, Water Sensitive Urban Design Best Practice Interim Guidance Document’ (November 2021), prepared under the Local Authority Waters Programme.

These measures can be implemented across an array of scales, for instance across a catchment as part of a wider flood relief scheme, or on a site-specific basis as part of a landscaping or green infrastructure plan. Nature-based solutions can provide flood mitigation benefits and ecosystem services across all scales if given adequate planning, and should be considered during the site layout and design stages of a development.

5.10.6 'Blue Spaces'

Within the city, the coastline, River Corrib and Terryland River are for the most part bounded by lands zoned 'RA' providing a natural buffer to the built environment and part of the green network for the city.

It is recommended that, where possible, and particularly where there is greenfield land adjacent to the river, open spaces within the 'green network' are retained on all rivers and streams. This will have a number of benefits, including:

- Retention of all, or some, of the natural floodplain;
- Opportunities to undertake works to restore natural in-river processes and habitats;
- Potential opportunities for amenity, including better views, riverside walks and public open spaces;
- Maintenance of the connectivity between the river and its floodplain, encouraging the development of a full range of riparian and floodplain habitats;
- Natural attenuation of flows in the immediate floodplain will help ensure no increase in flood risk downstream;
- Allows access to the river for maintenance works;
- Helping to achieve “Good” Ecological Status for river waterbodies under the EU Water Framework Directive (WFD); and
- Retention of clearly demarcated areas where development is not appropriate on flood risk grounds, and in accordance with the Planning System and Flood Risk Management.

The width of this corridor should be determined by undertaking a river restoration strategy, but can also be informed by the available land, and topographical constraints, such as raised land and flood defences, but would ideally span the full width of the floodplain (i.e. all of Flood Zone A). Along sections of the rivers and streams in the city, blue spaces and open spaces within the green network have evolved which contribute to the benefits set out above.

5.10.7 Bridges, culverts and weirs

Where a planning application includes proposals to amend an existing bridge, culvert or weir, or introduce a new in-channel structure, it will be necessary for the applicant to seek OPW’s approval under Section 48 (weirs) and Section 50 (bridges and culverts) of the Arterial Drainage Act 1945. It should be noted that OPW approval under Section 48 and / or 50 does not influence or determine the outcome of the Planning Application process.

6 Application of the Justification Test

Having reviewed the level of flood risk within the City, and determined appropriate measures for assessing and managing risks to high and low vulnerability development in Flood Zones A, B and C, a more detailed assessment of sites and areas was carried out. The aim of this assessment was to apply the Plan Making Justification Test (Figure 6-1), taking into account circular PL02/2014 in relation to existing development.

Figure 6-1: Justification Test for Development Plans

Box 4.1: Justification Test for development plans

Where, as part of the preparation and adoption or variation and amendment of a development/local area plan[1], 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 settlement[2];

(ii) Comprises significant previously developed and/or under-utilised lands;

(iii) Is within or adjoining the core[3] 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.

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.

Source: Box 4.1 The Planning System and Flood Risk Management

6.1 Development on Brownfield and Greenfield Land

The core strategy of the draft plan supports an integrated sustainable land use and transportation strategy. It also has a focus on the growth of 'brownfield' lands, building up infill sites and redeveloping existing sites and buildings. These sites are classed in the core strategy as regeneration and opportunity sites. The sites included legacy regeneration sites from the 2017 - 23 City Development Plan Ceannt Station, Inner Harbour and the Headford Road area. Other emerging key regeneration sites include lands at Sandy Road, the potential development of these lands are being progressed by the City Council in collaboration with the LDA. They also include NUIG plans for regeneration at Nun's Island, which have been identified for funding under the URDF. Other sites associated with district centre designations and a number of brownfield opportunity sites have also been identified as having potential to accommodate planned growth. Many of these sites generally have spatial advantages such as close proximity to the city core, a location along an existing /planned high frequency bus route, good proximity and access to employment, services and amenities. Some of these sites are within Flood Zones A and B and an

assessment of flood risk has been carried out and is detailed in Section 7, along with Justification Test where required.

The majority of 'greenfield' land that is within Flood Zone A or B is zoned for water compatible uses, such as Recreation and Amenity (RA) with no structures permitted. This is an appropriate zoning and should continue. The exceptions is the Huntsman site at Lough Atalia.

6.2 Existing, Developed, Zoned Areas at Risk of Flooding

6.2.1 Highly vulnerable uses

Circular PL02/2014 states that "*In some instances, particularly in older parts of cities and towns, an existing land use may be categorised as a "highly vulnerable development" such as housing, be zoned for residential purposes and also be located in flood zone A/B. Additional development such as small scale infill housing, extension or changes of use that could increase the risk or number of people in the flood-prone are can be expected in such a zone into the future. In these instances, where the residential/vulnerable use zoning has been considered as part of development plan preparation, including uses of the Justification Test as appropriate, and it is considered that the existing use zoning is still appropriate, the development plan must specify the nature and design of structural or non-structural flood risk management measures prior to future development in such areas in order to ensure that flood hazard and risk to the area and to other adjoining locations will not be increased or, if practicable, will be reduced".*

There are a number of such areas in the city identified on the Flood Zone maps, including existing housing and established development. It is considered that it would be unrealistic to down zone these lands as they are fully developed and constitute core areas of the settlement. Parts 1 and 2 of the Justification Test in relation to these areas of existing housing in the city is outlined below in Appendix **Error! Reference source not found.** and details of Part 3 of the Justification Test are provided in Section 7.

In applying the Justification Test Part 3, consideration has been given to structural and non-structural measures which may be required prior to further development taking place. In most areas flood risk can be addressed through non-structural responses, such as requiring a site specific flood risk assessment which will identify appropriate mitigation measures such as retaining flow paths, flood resistant and resilient construction and emergency planning.

There are a number of locations where flood risk is greater and non-structural responses are not appropriate to the scale of risks. In these locations, structural measures, generally in the form of flood defences, will be required prior to future development occurring. As such, it is considered that development in these locations is premature until the Galway flood relief scheme has been completed, or unless a site specific mitigation solution can be proposed that does not obstruct the main scheme.

7 Specific Development Site Review

Within the Development Plan, a number of sites were identified as being potentially suitable for future development as regeneration and opportunity sites, but were found to be wholly or partly within Flood Zones A and/or B when considering the UNDEFENDED flood extents. These sites were subject to the Justification Test for Development Plans. This has been undertaken in an iterative process and has involved consultation between Galway City Council and JBA Consulting.

The land use zonings and specific development objectives (including infrastructural objectives) contained in the Development Plan have also been considered having regard to this SFRA and the Planning System and Flood Risk Management Guidelines for Planning Authorities. The Justification Test for Development Plans has formed part of the consideration, and where plan led decisions are required to satisfy the Justification Test, these have been made by the Local Authority. A review of proposed land use changes was also undertaken.

In the following sections, an initial review of flood risk to the sites has been provided with a summary of the need for the Justification Test or otherwise. Where required, the Justification Test is detailed, along with recommendations for the development of the sites. Within a number of the sites, specific recommendations have been made regarding zones of mixed use vulnerability and phasing of development within zoned areas as they relate to flood risk.

For each site, consideration of flood risk is required at the development management stage of the planning process. This ranges from an assessment of surface water drainage for sites within Flood Zone C, to more considered FRA for sites in Flood Zone A and B, based on the undefended flood extents. The availability of the Western CFRAM study means there is a good set of data available on which a flood risk assessment can be based, and it is generally possible to understand risks through an initial FRA without incurring the cost and time input required for a detailed FRA. However, there will be instances where a more complex engineering solution is required. In some instances development will be considered premature until the Coirib go Cósta flood relief scheme has been constructed and is operational, or as a minimum, development proposals will need to include a site specific flood mitigation solution which should not obstruct the flood relief scheme.. In all cases, the advice on flood mitigation for site design contained in Section 5 should be followed, along with any site specific recommendations detailed in the following sections.

7.1 Zoning Objective Changes

A review of changes to land use zonings between the 2017-2023 plan and the 2023-2029 plan has been made and is summarised in Table 7-1. The majority of the sites are within Flood Zone C, so any land use is appropriate form a flooding perspective. Those that lie within Flood Zone A and B have been included in the discussion on Regeneration Areas and Opportunity Sites in the following sections.

Table 7-1: Zoning changes from current plan

No	Existing zoning	Site location	Change to zoning
1	R	Barna Road	RA
2	CI	Westwood site	R
3	CF	Waterworks surplus lands – Dyke Road	R
4	CF	Sandy Road/Tuam Road	CI
5	RA	Sandy Road	CI
6	R	Galwegians, Glenina, Dublin road	CF
7	RA	Renmore Road	R
8	I	Monivea Road	CI
9	LDR	Merlin lands, Dublin road, Doughiska	R
10	LDR	Doughiska Road, Briarhill	R
11	CF	Newtownsmith	CC

7.2 Regeneration and opportunity sites screening

For the regeneration and opportunity sites, an initial screening of flood risk was undertaken, and the findings shown in Table 7-2. Those that are entirely within Flood Zone C and are at low risk of fluvial and tidal flooding and have not been considered further in this section of the SFRA. They

are considered appropriate for all vulnerabilities of development, but development proposals should take into account the guidance in Section 5 when considering other sources of flood risk. Where a site spans Flood Zone A and B there is further commentary on the risks and, where required, the Justification Test, in the following section of the report (see also Section 3.3 for Flood Zone definitions).

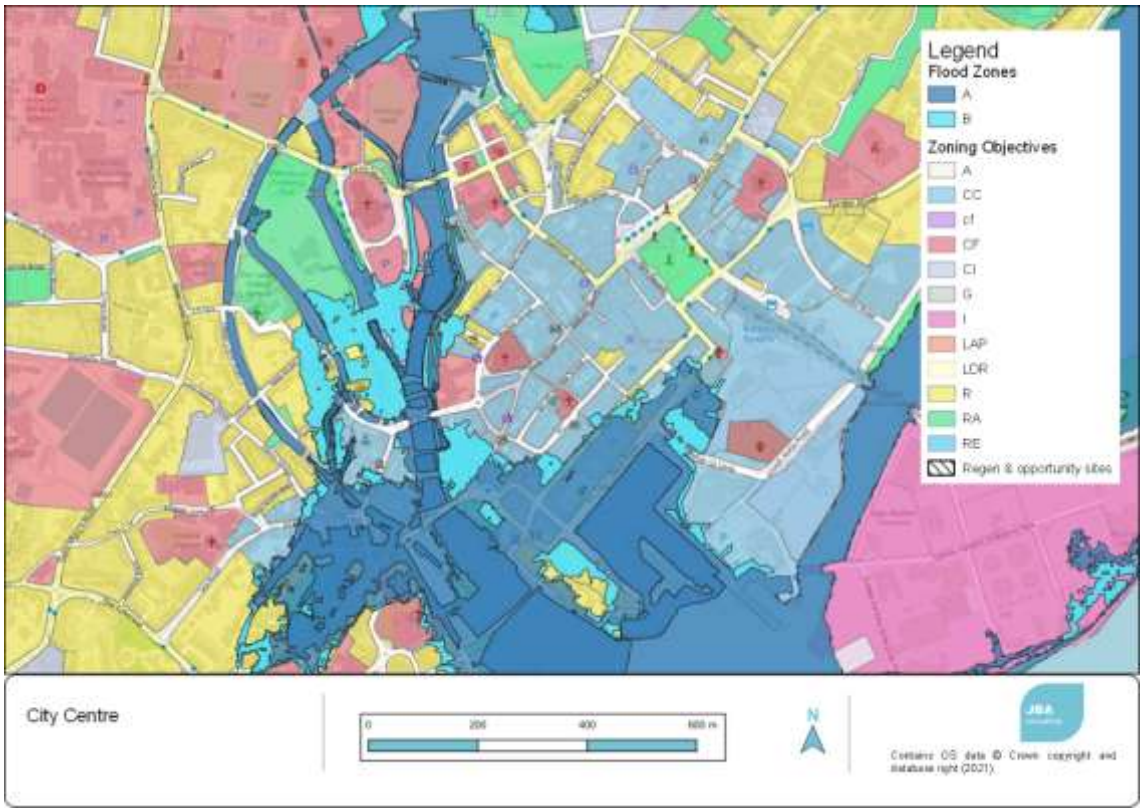
Table 7-2: Regeneration and opportunity sites flood risk screening

Site location	Flood Zone
Ceannt Station Lands	A/B/C
Inner Harbour Lands	A/B/C
Eyre Square East	C
Nuns Island Masterplan Area	A/B/C
Dyke Rd car park site	A/B
Headford Retail Park, Headford Rd.	A/B/C
Headford Rd Shopping centre	A/B/C
Arch Motors, Seamus Quirke Rd.	C
Sandy Road	A/B/C
Westside, Seamus Quirke Rd.	C
Crown site, Monivea road	C
Corrib Great Southern site, Dublin Rd.	C
Dawn Dairies site, Dublin Rd., Renmore	C
Royal Tara, Connolly Avenue, Mervue	C
Knocknacarra District Centre (north)	C
Knocknacarra District Centre (south)	C
Doughiska District centre, Doughiska road	C
Ardaun LAP lands	C
Lands at Ballybane Ind Estate	C

7.3 City Centre

The city centre covers a range of uses, including but not limited to residential, commercial, retail, community and tourism. The majority of the city centre has been developed but there are opportunities for redevelopment, renovation, extension and changes of use. The area is zoned for city centre activities and particularly those which preserve the city centre as the dominant commercial area of the city. It is highly accessible with potential for redevelopment, enhancing the role of the City Centre as a Regional Retail Centre.

The city centre comprises a mix of highly and less vulnerable, and water compatible, zoning objectives, and is in Flood Zones A, B and C. As required by the Planning Circular PL02/2014, the Justification Test is required for highly and less vulnerable development in this area. Note, within the City Centre are a number of regeneration sites and the specific details for those should also be reviewed.



Justification Test Part 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan. The city centre covers a range of uses, including but not limited to residential, commercial, retail, community and tourism.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	These lands include established residential communities within the city. These communities and neighbourhoods are essential in maintaining a living city contributing to the vitality of the city. They also include designated regeneration area which are essential in meeting planned growth for the city and ensure the continued viability and vitality of the city centre and enhance its role as a regional centre.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	These lands are largely developed.
2(iii)	Is within or adjoining the core	These lands are within the designated urban area.

	of an established or designated urban settlement:	
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	These lands which are already developed are part of the sustainable neighbourhood network and are an essential part of a sustainable compact city linked to the street network and the public transport network and proximate to a range of services and facilities. These lands are essential in meeting objectives to develop Galway City as a regional city.
2(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.	These lands which are already developed, with well-established strong communities, Their location, with links established to the street network with good accessibility to the public transport network and proximity to a range of services and facilities, contributes to achieving a compact and sustainable city. These lands are essential in meeting objectives to develop Galway City as a regional city. As such, there are no suitable alternatives within the city.

Flood Risk Assessment and Justification Test Part 3

Benefitting from Defences (flood relief scheme works)	There is currently no benefit to this area from any permanent flood relief scheme works, although the Claddagh Basin and Spanish Arch areas have demountable defences which protect from high tides. However, these defences cannot be taken into account when considering risk to new or existing development. The area within the study area for the Coirib go Cósta flood relief scheme, and should benefit from those defences once completed.
Sensitivity to Climate Change	The city centre has a low sensitivity to climate change in areas affected only by fluvial flooding. There is a high level of sensitivity to sea level rise. The MRFS scenario which is a 0.5m rise which would increase the extent, frequency and depth of flooding, particularly to the west of Dominck Street Lower and along Merchants Road. With the completion of the FRS there will be the potential for increased sensitivity to climate change, with overtopping of defences a risk. However, the FRS will include an adaptation plan which should mitigate these risks.
Residual Risk	None identified currently.
Historical Flooding	Historic flooding has occurred on New Dock Street, Merchants Road, Flood Street, Lower Quay Street, Dominick Street Upper and Lower, Spanish Parade, Munster Avenue, Fr Burke Park and Ravens Terrace, amongst other locations.
Surface Water	Should sites in the city centre be developed, a site specific FRA would be required to consider surface water management and discharge, whether this is to the canals or Corrib directly or into the surface water system, particularly during (but not limited to) flood events. The occurrence of both fluvial and pluvial flood events also needs to be assessed and mitigated, as the combination could lead to a greater flood extent than indicated on the mapping.
Commentary on Flood Risk: Much of the area lies within Flood Zone A and B. The main risk in this area is from tidal flooding.	
Development Considerations: Development proposals in this area should take into the account flood relief scheme as project advances. Any major developments (i.e. not Minor Development as Section 5.28) will require a detailed FRA that takes account design of flood relief scheme and propose	

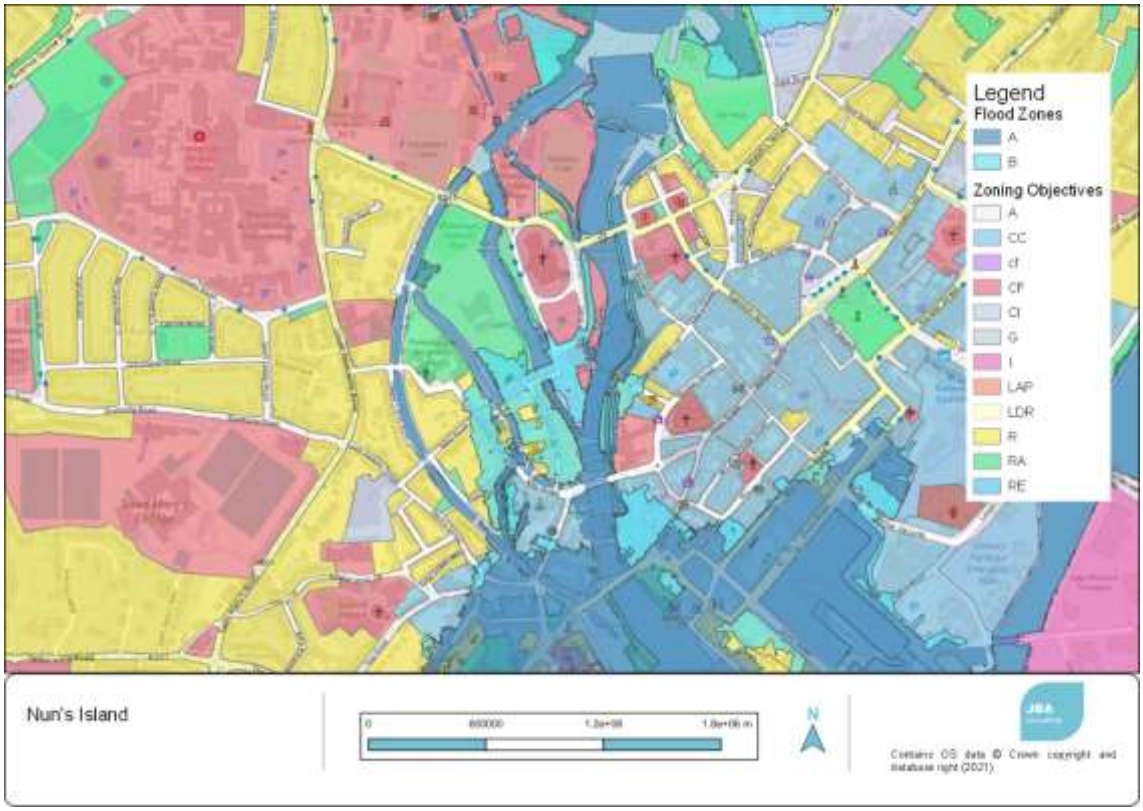
development specific flood mitigation as appropriate. However, it is essential that any projects progressing in advance of the Flood Relief Scheme do not obstruct the scheme. The FRA should also account for the alteration of flow paths around buildings and through other street features, which may direct flood flows in ways not wholly indicated on the broadscale SFRA Flood Zone mapping.

The detailed design of the development should reflect the vulnerability of the site in terms of internal layout, materials, fixtures and fittings and internal layout. With flood risk areas, less vulnerable uses are encouraged at ground floor levels. A site specific FRA for minor and major developments will also inform appropriate uses and detailed design and layout.

7.4 Nuns Island Masterplan Area

The masterplan area lies in Galway City Centre and is a mix of residential, recreational and institutional zoned lands. The regeneration of this area is subject to a masterplan which is being progressed by NUIG. Flooding is shown in Flood Zone B for the area. Nun's Island is out of the tidal risk area and slightly to the north of the City Centre area discussed in Section 7.3.

The Nuns Island Masterplan Area comprises a mix of highly and less vulnerable, and water compatible, zoning objectives, and spans Flood Zones A, B and C. As required by the Planning Circular PL02/2014, the Justification Test is required for highly and less vulnerable development in this area.



Justification Test Part 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan. The city centre covers a range of uses, including but not limited to residential, commercial,

		retail, community and tourism.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	These lands include established residential communities within the city. These communities and neighbourhoods are essential in maintaining a living city contributing to the vitality of the city. They also include designated regeneration area which are essential in meeting planned growth for the city and ensure the continued viability and vitality of the city centre and enhance its role as a regional centre.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	These lands are largely developed.
2(iii)	Is within or adjoining the core of an established or designated urban settlement:	These lands are within the designated urban area.
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	These lands which are already developed are part of the sustainable neighbourhood network and are an essential part of a sustainable compact city linked to the street network and the public transport network and proximate to a range of services and facilities. These lands are essential in meeting objectives to develop Galway City as a regional city.
2(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.	These lands which are already developed, with well-established strong communities, Their location, with links established to the street network with good accessibility to the public transport network and proximity to a range of services and facilities, contributes to achieving a compact and sustainable city. These lands are essential in meeting objectives to develop Galway City as a regional city. As such, there are no suitable alternatives within the city.

Flood Risk Assessment and Justification Test Part 3

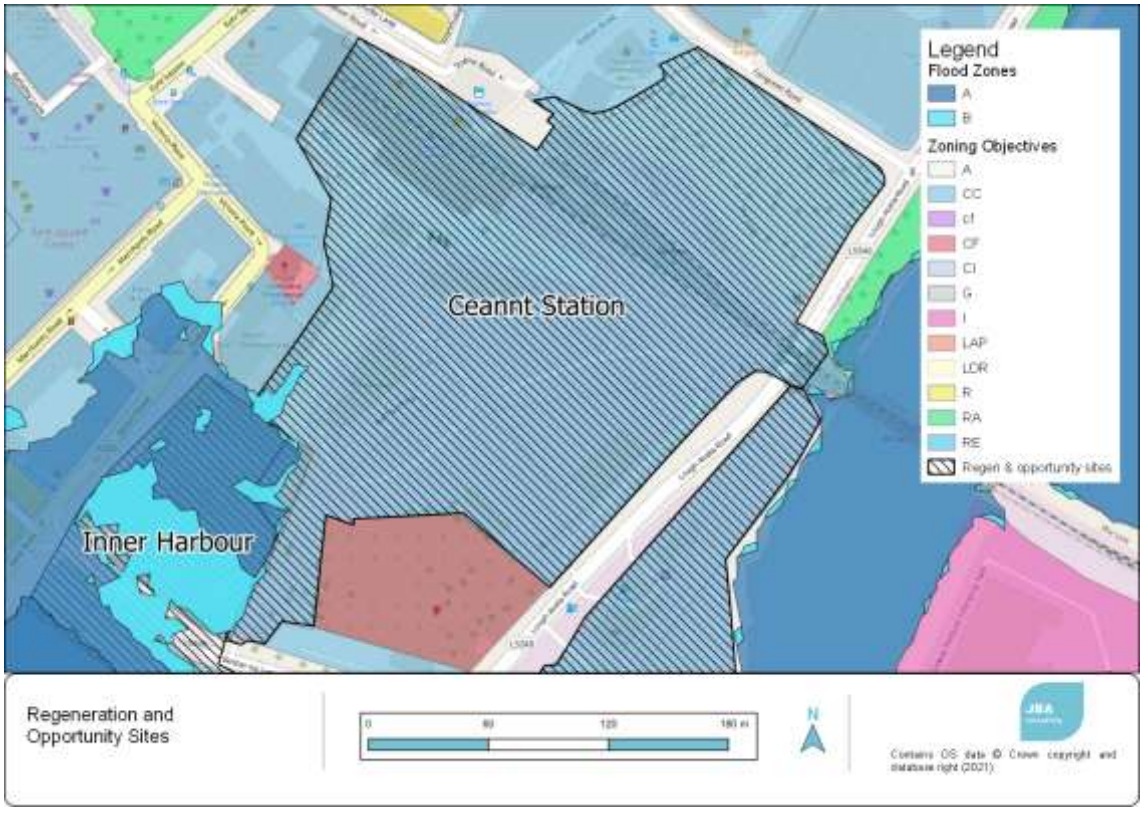
Benefitting from Defences (flood relief scheme works)	The site does not benefit from the protection of any flood relief scheme. The area within the study area for the Coirib go Cósta flood relief scheme, and should benefit from those defences once completed.
Sensitivity to Climate Change	The site may be sensitive to climate change if there in an increase in flow and frequency in the future. Depths of water are modelled in increase by 50-150mm under the MRFS. With the completion of the FRS there will be the potential for increased sensitivity to climate change, with overtopping of defences a risk. However, the FRS will include an adaptation plan which should mitigate these risks.
Residual Risk	Culvert blockage may give rise of overland flow paths.
Historical Flooding	There is record of historical flooding in the area.
Surface Water	As the area is already developed it is assumed that the existing surface water systems will be used in redevelopment proposals. Where finished floor levels can be raised this will provide protection from overland flow paths.
Commentary on Flood Risk:	

The flood risk in this area is fluvially dominated. The canal head races overtop their banks and flood towards the tail races where the natural gradient of the land dictates the direction of flooding.
Development Considerations: As required by the Planning Circular PL02/2014, the Justification Test has been carried out for highly vulnerable development in this area (see Appendix **Error! Reference source not found.**) Development in this area is primarily redevelopment of existing buildings, so flood management opportunities in these cases will be limited by the nature of the building and surround land, building and service levels, although opportunities to further reduce flood risk should be sought. This will primarily be in the form of finished floor levels and consideration of flood resilience and emergency access. The detailed design of the development should reflect the vulnerability of the site in terms of internal layout, materials, fixtures and fittings and internal layout. With flood risk areas, less vulnerable uses are encouraged at ground floor levels. A site specific FRA will inform appropriate uses and detailed design and layout. This should be included in the masterplan for the area. There is sufficient information available from the CFRAM to assist applicants in preparing a simple flood risk assessment for site specific development proposals.

7.5 Ceannt Station Regeneration Site

The Ceannt Station Regeneration Site lies in Galway City Centre and is identified in the core strategy of the Development Plan as a significant brownfield regeneration site. The prominent location of this city centre site makes it an attractive prime site for significant redevelopment for city centre uses, including residential.

The site comprises a mix of highly and less vulnerable, and water compatible, zoning objectives. A small part of the regeneration site is within Flood Zone A and B, with the vast majority in Flood Zone C. As required by the Planning Circular PL02/2014, the Justification Test is required for highly and less vulnerable development in Flood Zone A and B.



Justification Test Part 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan. These sites are identified in the core strategy as significant brownfield regeneration sites at a strategic location in the city centre, adjacent to the waterfront.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	This is a strategic city centre brownfield site earmarked for comprehensive redevelopment, essential for the consolidation of the city centre and are key regeneration sites in the core strategy of the Development Plan. The sustainable redevelopment of the serviced site will enhance the role of the city centre as a regional centre.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	Previously under-utilised. A proposal for land behind Ceannt Station, Augustine Hill, has been approved by the Council with modifications and is currently under appeal to An Bord Pleanála.
2(iii)	Is within or adjoining the core of an established or designated urban settlement:	This site is within the city centre.
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	The sustainable development of the serviced site is essential in consolidating the city centre and will play an essential part in achieving a compact and sustainable city.
2(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.	This serviced brownfield site is in a prime city centre location and ideally suited for significant redevelopment. There are few available sites of this scale and nature within the city centre. The location of the site within a high amenity area close to the waterfront, proximity to Ceannt station, a key sustainable transportation hub and linkage to the city centre street network are characteristics which make it a unique site with significant potential to contribute to the sustainable development of the city. As such, there are no suitable alternative site available.

Flood Risk Assessment and Justification Test Part 3

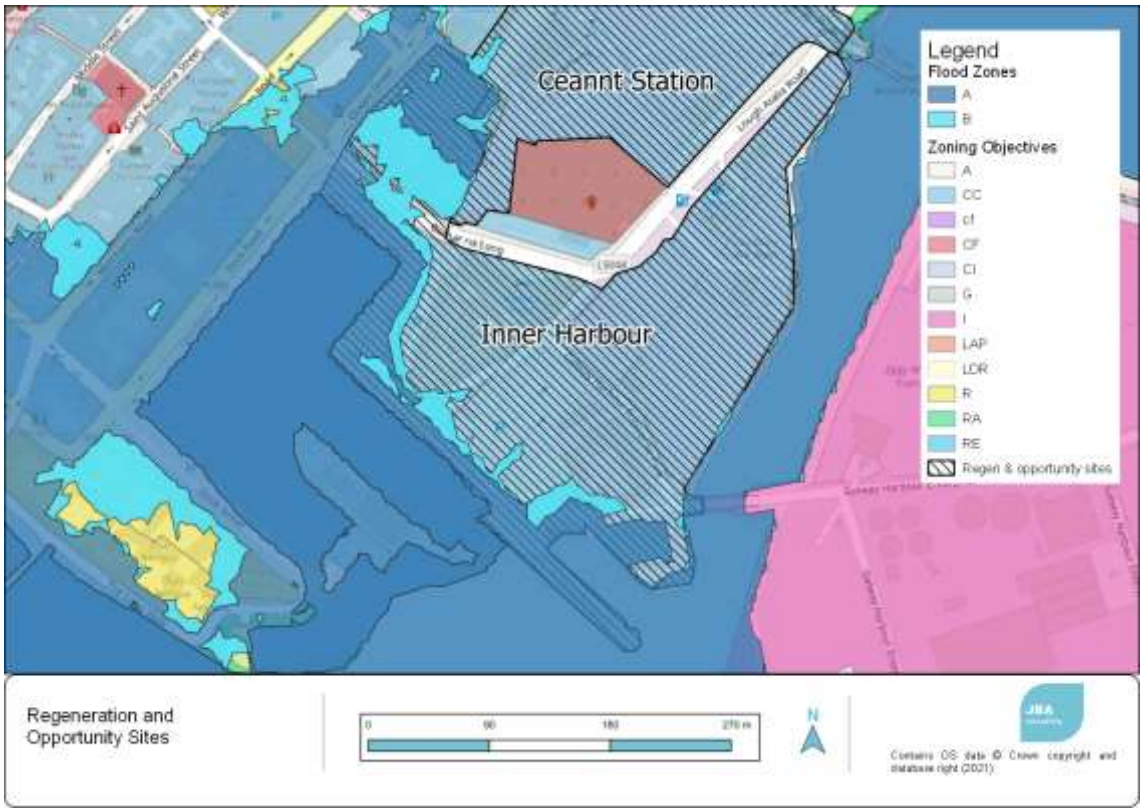
Benefitting from Defences (flood relief scheme works)	There is currently no benefit to this area from any flood relief scheme works. The area is within the study area for the Coirib go Cósta flood relief scheme and should benefit from those defences once

	completed.
Sensitivity to Climate Change	Due to the site footprint and current elevation, the site is relatively insensitive to climate change, although sea level rise could increase the extent, frequency and depth of flooding.
Residual Risk	None identified currently.
Historical Flooding	Historic flooding has occurred in the city centre, no specific record on site.
Surface Water	As the area has been previously developed it is assumed that the existing surface water systems will be used in redevelopment proposals. Where finished floor levels can be raised this will provide protection from overland flow paths.
Commentary on Flood Risk: Much of the area lies within Flood Zone C, but a very small section of the southern and western boundaries are in Flood Zone A and B. The risk in this area is from tidal flooding.	
Development Considerations: The majority of the site is within Flood Zone C and is appropriate for all vulnerabilities of development. For a small part of the south-west corner, Part Two of the Justification test has been satisfied. A proposal for land behind Ceannt Station, Augustine Hill, has been approved by the Council with modifications and is currently under appeal to An Bord Pleanála. Flood mitigation measures were incorporated in the site specific flood risk assessment of the current development proposals and include provision of surface water management (SUDS) systems and appropriately setting finished floor levels. A similar form of mitigation should be applied to future development here, in the event the current development proposals are not granted.	

7.6 Inner Harbour Regeneration Site

The Inner Harbour Regeneration Site is identified in the core strategy of the Development Plan as a significant brownfield regeneration site. The site includes Bonham Quay which is currently under construction. Additional harbour lands are earmarked for regeneration subject to a master plan.

The site comprises a mix of highly and less vulnerable, and water compatible, zoning objectives, and is in Flood Zones A, B and C. As required by the Planning Circular PL02/2014, the Justification Test is required for highly and less vulnerable development in this area.



Justification Test Part 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan. These sites are identified in the core strategy as significant brownfield regeneration sites at a strategic location in the city centre, adjacent to the waterfront.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	These sites are strategic city centre brownfield sites earmarked for comprehensive redevelopment, essential for the consolidation of the city centre and are key regeneration sites in the core strategy of the Development Plan. The sustainable redevelopment of these serviced sites will enhance the role of the city centre as a regional centre.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	Previously under-utilised. The Inner Harbour site includes Bonham Quay which is currently under construction. Additional harbour lands are earmarked for regeneration subject to a master plan.
2(iii)	Is within or adjoining the core of an established or designated urban settlement:	This site is within the city centre.

2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	The sustainable development of these serviced sites are essential in consolidating the city centre and will play an essential part in achieving a compact and sustainable city.
2(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.	These serviced brownfield sites at a prime city centre location and are ideally suited for significant redevelopment. There are few available sites of this scale and nature within the city centre. The location of the sites within a high amenity area close to the waterfront, their proximity to Ceannt station, a key sustainable transportation hub and linkage to the city centre street network are characteristics which make them unique sites with significant potential to contribute to the sustainable development of the city. As such, there are no suitable alternative sites available.

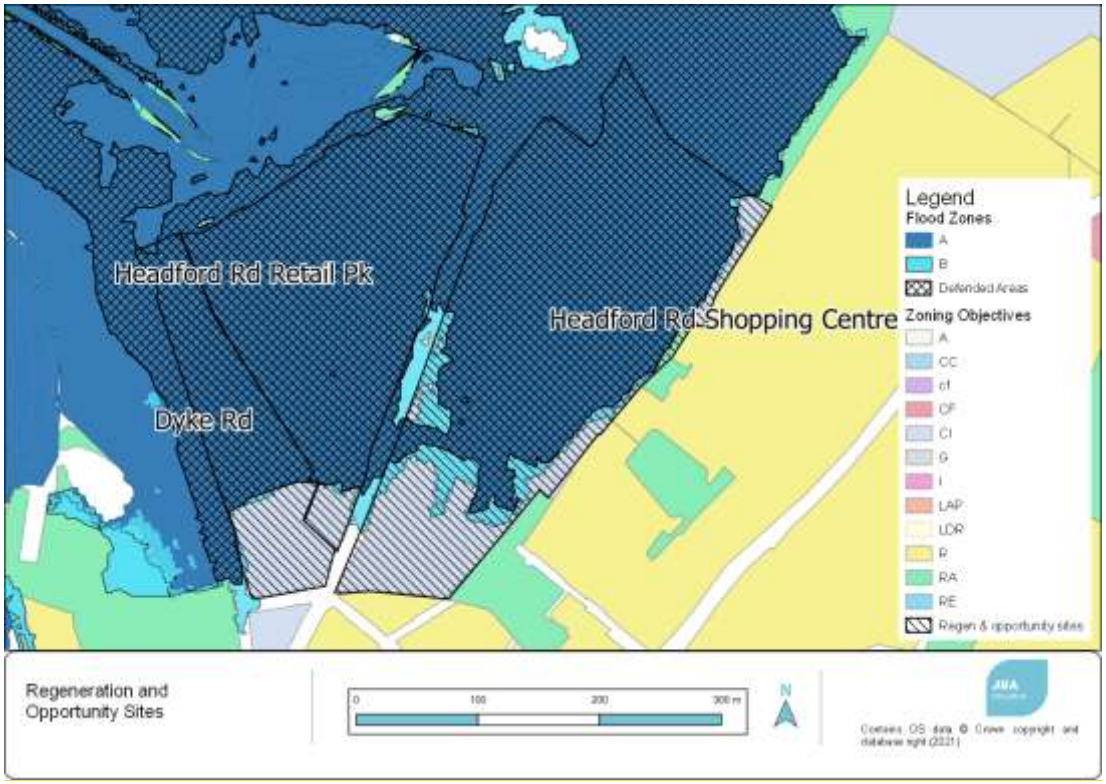
Flood Risk Assessment and Justification Test Part 3

Benefitting from Defences (flood relief scheme works)	There is no benefit to this site from any flood relief scheme works. The area is within the study area for the Coirib go Cósta flood relief scheme and should benefit from those defences once completed.
Sensitivity to Climate Change	The site is sensitive to climate change and in particular sea level rise. The Mid Range Future Scenario (MRFS), which is a 0.5m rise in sea level, would increase the extent, frequency and depth of flooding.
Residual Risk	None
Historical Flooding	Yes, flooding is noted to occur on the road adjacent to the site.
Surface Water	As the area has been previously developed it is assumed that the existing surface water systems will be used in redevelopment proposals. Where finished floor levels can be raised this will provide protection from overland flow paths.
Commentary on Flood Risk: The site is subject to tidal flooding and is shown in Flood Zone A and B. The water flows through the dock onto Dock Road and floods the site.	
Development Considerations: Part Two of the Justification test has been satisfied and redevelopment of the hardstanding area of the site may be possible, but careful consideration would need to be given to finished floor levels and access and egress during a flood event. There are significant climate implications that need to be considered in the FRA also. Flood mitigation measures were incorporated in the site specific flood risk assessment for the Bonham Quay development, which is under construction, and includes provision of surface water management (SUDS) systems and setting finished floor levels, thresholds and access ramps above the 0.5% AEP tidal level with an allowance for climate change. As the site is vulnerable to tidal flooding, there is no requirement to provide compensatory storage where the attainment of such floor levels requires ground infill. Suitable flood mitigation measures should be incorporated in masterplans and site specific flood risk assessment for the remainder of the Inner Harbour Regeneration Site, taking into account the vulnerability of the proposed development and the level of risk on site. Mitigation may include raising the site, raising floor levels and/or incorporating flood resilient construction. Given the location of the site alongside the dock and at tidal risk, compensatory storage would not be required if site levels were raised, but it is important to ensure flow routes are not changed or blocked which could increase flood risk to neighbouring sites. The Western CFRAM includes flood management measures for this area, but it is considered that site specific flood management can be carried out in advance of the Coirib go Costa FRS being completed.	

7.7 Dyke Road Car Park and Headford Road Retail Area - Part of Headford Road and Dyke Road Regeneration Site

The Headford Road and Dyke Road Regeneration Site consists of existing commercial/retail development and surface parking. The sites are located close to the city centre. The site is zoned for CI use and city centre type uses are also considered at this location. The site is identified in the core strategy of the Development Plan as a significant brownfield regeneration site. A Plan for the Headford Road and Dyke Road regeneration area will guide its comprehensive redevelopment. Most of the site is between 4.7-5.3m AOD.

The sites comprises a mix of highly and less vulnerable, and water compatible, zoning objectives, and is in Flood Zones A, B and C. As required by the Planning Circular PL02/2014, the Justification Test is required for highly and less vulnerable development in this area.



Justification Test Parts 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan. These sites are identified in the core strategy as strategic regeneration sites adjacent to the city centre.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	The sites are significant regeneration sites earmarked for comprehensive redevelopment, essential for the sustainable development of the city and consolidation of a physically compact city centre. The sustainable development of these serviced sites will ensure the continued viability and vitality of the city centre and

		enhance its role as a regional retail centre.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	The sites are already developed with commercial/retail uses and car parking. Site 7.7 comprises relatively underutilised serviced lands with surface car parking and a low density retail park. Site 7.8 comprises a major shopping centre in need of modernisation.
2(iii)	Is within or adjoining the core of an established or designated urban settlement:	These sites are designated regeneration sites and are directly adjacent to the city centre.
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	The redevelopment of these serviced sites is essential in the sustainable development of the city. Their location adjacent to the city centre conforms to the sequential approach to retail development and will be an essential element in creating a compact and sustainable city.
2(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.	These serviced sites are ideally suited for comprehensive redevelopment given their proximity to the city centre and their significant accessibility. There are no available appropriate sites which could accommodate the uses envisaged or which could complement the offer of the city centre which functions as a regional retail centre. These sites already have considerable commercial/retail development, planning permission has been previously granted in the Headford Road Shopping Centre area for significant shopping centre redevelopment. As such, there are no suitable alternatives within the city.

Flood Risk Assessment and Justification Test Part 3

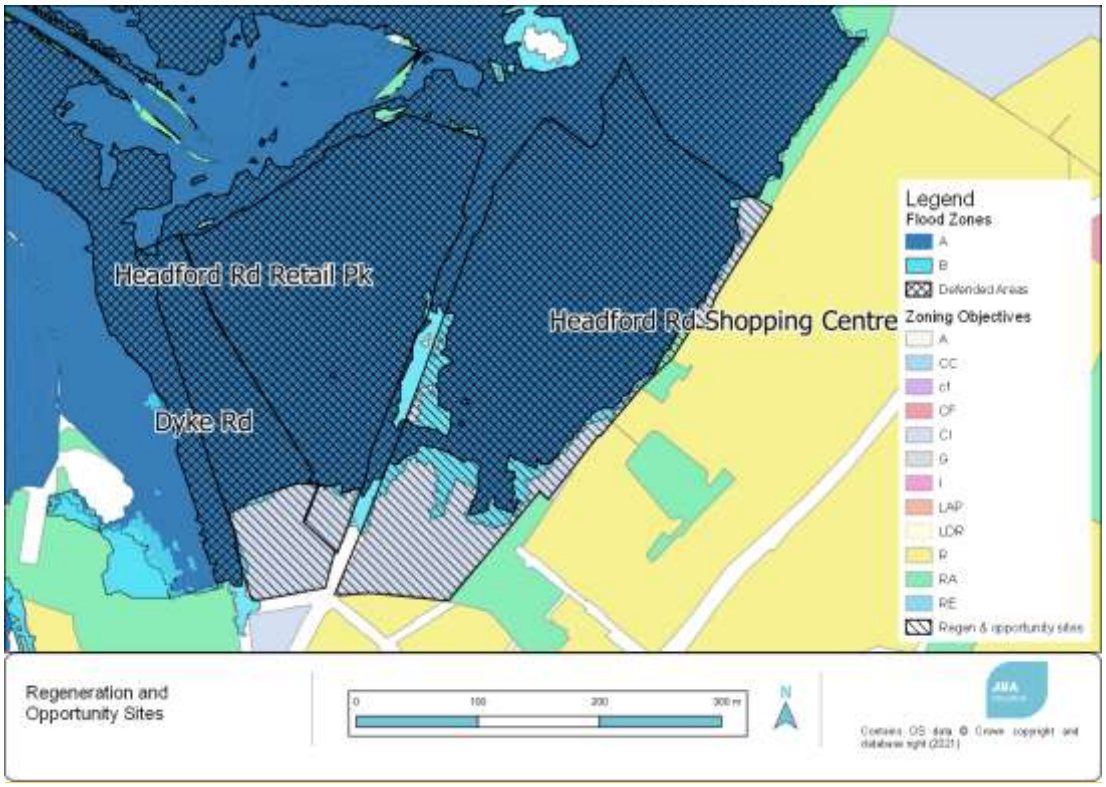
Benefitting from Defences (flood relief scheme works)	The site benefits greatly from the Dyke Road defence in Galway City and is directly adjacent to the embankment. This embankment will be subject to assessment, and possible remediation, under the Coirib go Costa FRS.
Sensitivity to Climate Change	Low – moderate. The extent will increase slightly with climate change. The depths however will be the greatest increase as climate change progresses. The frequency of the Dyke Road embankment overtopping is likely to increase also.
Residual Risk	Dyke road overtopping or breach
Historical Flooding	The land is marked ‘liable to floods’ on the 1829-41 6” historic OS maps. This is before the construction of the Dyke embankment and no record of flooding is known since.
Surface Water	Should the site be developed, the FRA would be required to consider surface water management and discharge, whether this is to the Terryland River directly or into the surface water system, particularly during (but not limited to) flood events.
Commentary on Flood Risk: The Terryland River is a distributary of the River Corrib and discharges its flow into a sinkhole to the northeast of the subject site. Flow into the Terryland River is controlled by the old Waterworks Weir. If a groundwater event or blockage occurs in the sinkhole, water will back and pond in the floodplain. This type of flooding will be very slow and the inflow at Waterworks Weir can be limited so the risk of this occurring is quite low. Due to the slow nature of the event, it likely that the cause can be remediated before damage can occur.	

The River Corrib is prevented from flooding into the Terryland area by the Dyke Road defence. The Dyke road embankment is shown to prevent the River Corrib entering the area in the defended 1% AEP fluvial event. This does not include sufficient freeboard however and does not meet the standard of protection required for a formal defence. The embankment is critical to preventing flood risk to the subject site. The embankment is modelled to overtop in the 0.1% AEP event.
Development Considerations: The sites are close to the city centre and are earmarked for significant future redevelopment. It is an important objective for the council to develop here, and as such meets Part 2 of the Justification Test, as shown in Appendix **Error! Reference source not found.**. The sites conforms to level 1 in the retail hierarchy and complements the retail/commercial offer of the City Centre. They contributes to the function of the City Centre as a Regional Retail Centre. "*The CFRAM study has identified that defences along the Dyke Road are critical and should be raised and strengthened in order to support intensification of land use behind it*." The Coirib go Costa FRS reflects the outcomes of the CFRAM and should include for works to remediate the Dyke Road defences. Part 3 of the Justification Test has been carried out and included a detailed flood risk assessment and model runs. The model runs carried out show that the site is currently defended to the 1% AEP standard of protection, but that the embankment height is variable and does not include a freeboard allowance. There is a high residual risk of flooding in both the 0.1% AEP event and when climate change is considered, when the embankment is overtopped and a high volume of water from the Corrib is allowed to fill the site and surrounding lands. Flood levels in the 0.1% AEP result in between 0.5 and 1.5m of flooding across the site. To test the feasibility and impact of raising ground levels to the site, a block of land representing the footprint of the currently developed area was raised in the model to 6.4m, which is the same level that the site filled to in the existing scenario model run. The model run showed the site still provides a certain amount of conveyance, but shallow depths (of less than 100mm) were modelled across the site. The increase in flood extent in other areas was negligible. As with the Headford Road Shopping Centre, development proposals for the sites will need to consider appropriate finished floor levels and mechanism for managing residual flood risks. However, the Stage 3 FRA undertaken in this assessment has demonstrated that the principle of land raising is acceptable. Development of the regeneration site will require site specific assessment and plans for the area should include the following additional flood management measures: • Highly vulnerable development should be located above the 0.1% AEP level, with an appropriate freeboard. This may be achieved through setting the ground floor at a suitable height or by located highly vulnerable uses (and particularly sleeping accommodation) at first floor level. • An emergency plan and evacuation procedure in the event of an embankment failure should be prepared along with any planning proposal for the site. • Basements should be discouraged, and if included should be accessed from a level above the recommended finished floor level and fully sealed to ensure no water ingress.

7.8 Headford Road Shopping Centre - Part of Headford Road and Dyke Road Regeneration Site

The Headford Road and Dyke Road Regeneration Site comprises an existing shopping centre and surface car park. Planning permission for significant redevelopment had been previously granted on site. The site is identified in the core strategy of the Development Plan as a significant brownfield regeneration site. A Plan for the Headford Road and Dyke Road regeneration area will guide its comprehensive redevelopment. It lies within Flood Zone A which is based on the undefended runs with no Dyke embankment in place.

The site comprises a mix of highly and less vulnerable, and water compatible, zoning objectives, and is in Flood Zones A, B and C. As required by the Planning Circular PL02/2014, the Justification Test is required for highly and less vulnerable development in this area.



Justification Test Parts 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan. These sites are identified in the core strategy as strategic regeneration sites adjacent to the city centre.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	The sites are significant regeneration sites earmarked for comprehensive redevelopment, essential for the sustainable development of the city and consolidation of a physically compact city centre. The sustainable development of these serviced sites will ensure the continued viability and vitality of the city centre and enhance its role as a regional retail centre.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	The sites are already developed with commercial/retail uses and car parking. Site 7.7 comprises relatively underutilised serviced lands with surface car parking and a low density retail park. Site 7.8 comprises a major shopping centre in need of modernisation.
2(iii)	Is within or adjoining the core of an established or	These sites are designated regeneration sites and

	designated urban settlement:	are directly adjacent to the city centre.
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	The redevelopment of these serviced sites is essential in the sustainable development of the city. Their location adjacent to the city centre conforms to the sequential approach to retail development and will be an essential element in creating a compact and sustainable city.
2(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.	These serviced sites are ideally suited for comprehensive redevelopment given their proximity to the city centre and their significant accessibility. There are no available appropriate sites which could accommodate the uses envisaged or which could complement the offer of the city centre which functions as a regional retail centre. These sites already have considerable commercial/retail development, planning permission has been previously granted in the Headford Road Shopping Centre area for significant shopping centre redevelopment. As such, there are no suitable alternatives within the city.

Flood Risk Assessment and Justification Test Part 3

Benefitting from Defences (flood relief scheme works)	The site benefits greatly from the Dyke Road defence in Galway City. This embankment will be subject to assessment, and possible remediation, under the Coirib go Costa FRS.
Sensitivity to Climate Change	Low – moderate. The extent will increase slightly with climate change. The depths however will be the greatest increase as climate change progresses. The frequency of the Dyke Road embankment overtopping is likely to increase also.
Residual Risk	Dyke road overtopping or breach
Historical Flooding	The land is marked 'liable to floods' on the 1829-41 6" historic OS maps. This is before the construction of the Dyke embankment and no record of flooding is known since.
Surface Water	Should the site be developed, the FRA would be required to consider surface water management and discharge, whether this is to the Terryland River directly or into the surface water system, particularly during (but not limited to) flood events.
Commentary on Flood Risk: The Terryland River is a distributary of the River Corrib and discharges its flow into a sinkhole to the northeast of the subject site. Flow into the Terryland River is controlled by the old Waterworks Weir. If a groundwater event or blockage occurs in the sinkhole, water will back and pond in the floodplain. This type of flooding will be very slow and the inflow at Waterworks Weir can be limited so the risk of this occurring is quite low. Due to the slow nature of the event, it likely that the cause can be remediated before damage can occur. The River Corrib is prevented from expanding water into the Terryland area by the Dyke Road defence. The Dyke road embankment is shown to prevent the River Corrib entering the area in the defended 1% AEP fluvial event, but is overtopped in a 0.1% AEP event. This does not include sufficient freeboard and does not meet the standard of protection required for a formal defence. The embankment is critical to preventing flood risk to the subject site.	
Development Considerations: The site is located adjacent to the city centre and is earmarked for significant future redevelopment. It is an important objective for the council to develop here, and as such meets Part 2 of the Justification Test (see Appendix B). The site conforms to level 1 in the	

retail hierarchy and complements the retail/commercial offer of the City Centre. It contributes to the function of the City Centre as a Regional Retail Centre.

"*The CFRAM study has identified that defences along the Dyke Road are critical and should be raised and strengthened in order to support intensification of land use behind it*." The Coirib go Costa FRS reflects the outcomes of the CFRAM and should include for works to remediate the Dyke Road defences.

Part 3 of the Justification Test has been carried out and included a detailed flood risk assessment and model runs.

Planning permission was granted for significant redevelopment of the shopping centre and did include flood risk consideration. Should future applications for the site be submitted they will need to take account of recommendations contained in this SFRA, the development specific plans, the CFRAM Study and the Coirib go Costa FRS.

As with the Dyke Road Car Park site and Headford Road Retail Park, development proposals for the site will need to consider appropriate finished floor levels and mechanism for managing residual flood risks. However, the Stage 3 FRA undertaken in this assessment has demonstrated that the principle of land raising is acceptable.

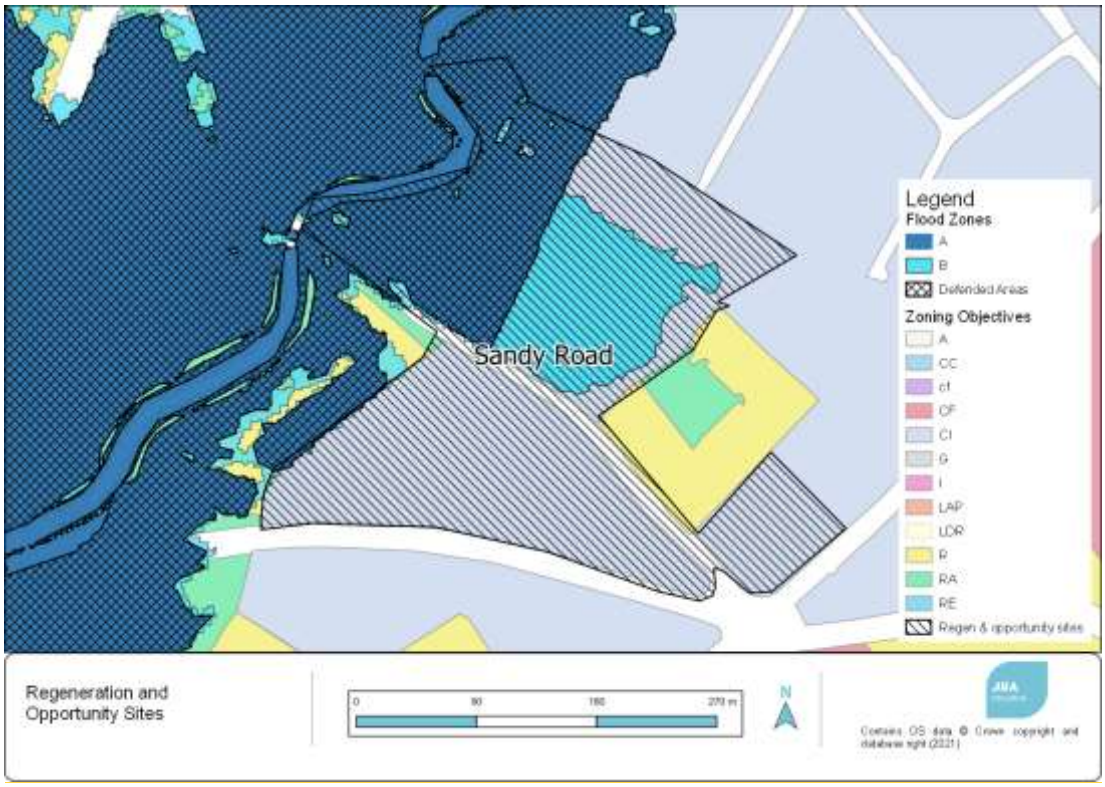
Development of the regeneration site will require site specific assessment and plans for the area should include the following additional flood management measures:

- Highly vulnerable development should be located above the 0.1% AEP level, with an appropriate freeboard. This may be achieved through setting the ground floor at a suitable height or by located highly vulnerable uses (and particularly sleeping accommodation) at first floor level.
- An emergency plan and evacuation procedure in the event of an embankment failure should be prepared along with any planning proposal for the site.

7.9 Sandy Road Regeneration Site

The Sandy Road Regeneration Site is located 1.2km from Eyre Square, city centre and is adjacent to Terryland City Park. It is characterised by a mix of industrial/warehouse/ office space and educational uses. The site is identified in the core strategy of the Development Plan as a significant brownfield regeneration site.

The site comprises a mix of highly and less vulnerable, and water compatible, zoning objectives, and is in Flood Zones A, B and C. As required by the Planning Circular PL02/2014, the Justification Test is required for highly and less vulnerable development in this area.



Justification Test Parts 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan. The site is identified in the core strategy as a significant brownfield regeneration site. It is at a strategic location close to the city centre.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	The site is a significant regeneration site earmarked for comprehensive redevelopment, essential for the sustainable development of the city and planned growth of the city. The potential development of these lands are being progressed by the City Council in collaboration with the LDA.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	The site is already developed and is characterised by a mix of low density industrial/warehouse/ office space and educational uses.
2(iii)	Is within or adjoining the core of an established or	The site is 1.2km from Eyre Square, the city centre, which is equivalent to a 15 minute journey on foot. It has

	designated urban settlement:	the benefit of being within an existing employment hub, close to public transport links and adjacent to Terryland City Park.
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	The regeneration of this serviced site is essential in the sustainable development of the city. The redevelopment of these lands close to the city centre conforms to more compact development and brownfield renewal in line with national policy in the NPF and RSES.
2(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.	This serviced site is ideally suited for comprehensive redevelopment given its proximity to the city centre and accessibility. The site will contribute to meeting targeted growth on brownfield sites as designed for Galway City in the NPF and RSES. There are no available appropriate sites which could accommodate the uses envisaged. As such, there are no suitable alternatives within the city.

Flood Risk Assessment and Justification Test Part 3

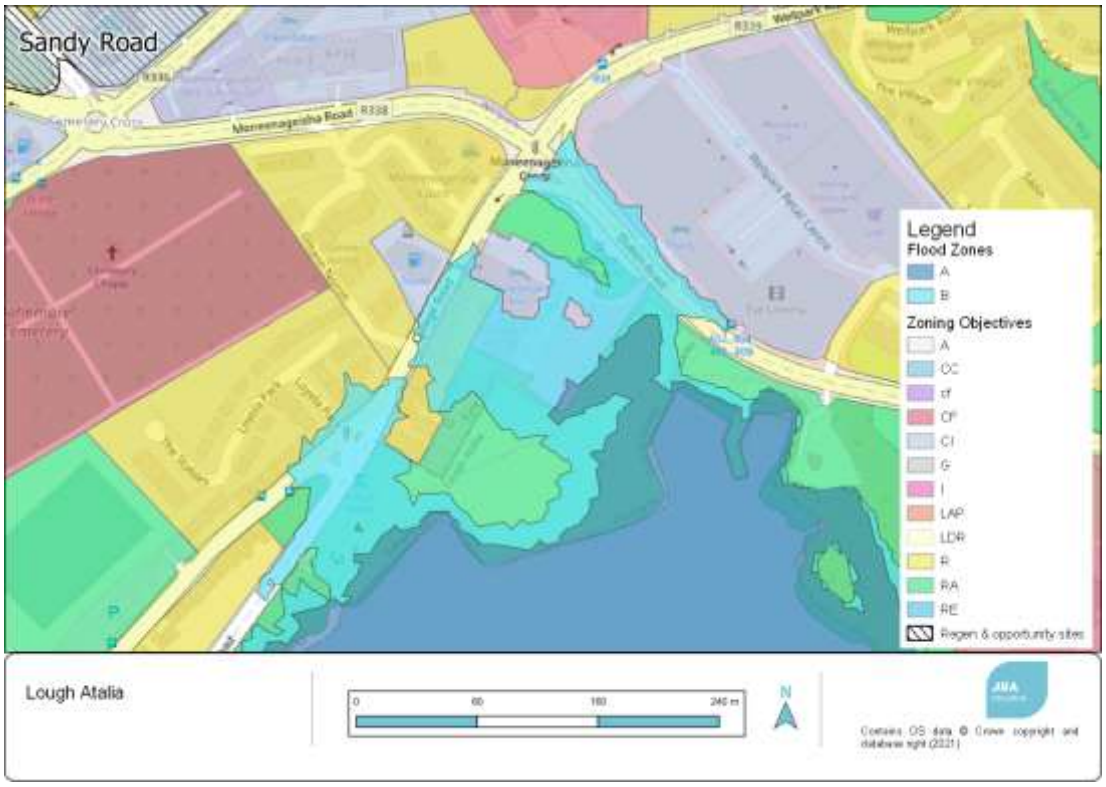
Benefitting from Defences (flood relief scheme works)	The site benefits greatly from the Terryland River defence in Galway City and is directly adjacent to the embankment. This embankment will be subject to assessment, and possible remediation, under the Coirib go Costa FRS.
Sensitivity to Climate Change	Low – moderate. The extent will increase slightly with climate change. The depths however will be the greatest increase as climate change progresses. The frequency of the Terryland River embankment overtopping is likely to increase also.
Residual Risk	Terryland River embankment overtopping or breach
Historical Flooding	No specific record on site.
Surface Water	As the area has been previously developed it is assumed that the existing surface water systems will be used in redevelopment proposals. Where finished floor levels can be raised this will provide protection from overland flow paths.
Commentary on Flood Risk: The Southern part of the area lies within Flood Zone C, but the northern part is within Flood Zone A (defended) and Flood Zone B. The risk in this area is from fluvial flooding.	
Development Considerations: Part Two of the Justification Test has been satisfied (see Appendix B). To satisfy Part 3 of the Justification Test a more comprehensive assessment of risks will be required, and will need to build on the works being carried out under the Coirib go Cósta FRS. This assessment will inform the masterplanning of the site and will need to investigate residual risks and provide guidance on site layout, uses and flood mitigation. The study may conclude that development in Flood Zone A prior to completion of the flood relief scheme is premature. Until this study is complete, development within Flood Zone A and B should be limited to Minor Development (Section 5.28 of the Planning Guidelines).	

7.10 Lough Atalia

The Lough Atalia Site is located on the corner of the R338 and R339 junction. Much of the area is undeveloped and zoned RA, although there is existing residential and commercial properties near the site. The site is a parcel of land that was reclaimed from the sea in 1913. Therefore the site is relatively low lying in relation to the surrounding land in the area.

The Development Plan includes an objective to consider the development of these lands for indoor and outdoor recreational uses which are complementary to the use of Lough Atalia as an amenity area and which do not have a negative impact on the sensitivity of the environment and where existing pedestrian access from the Dublin Road to the Lough Atalia Road is safeguarded. There is also a Bus Route (GTS) specific objective on lands adjoining the public road to provide for a link through RA zoned lands from College Road to Lough Atalia Road.

The site comprises a mix of less vulnerable and water compatible, zoning objectives, and is in Flood Zones B and C. The Justification Test is therefore not required in this area but the findings in the following table should the noted when completing a site specific flood risk assessment.



Flood Risk Assessment

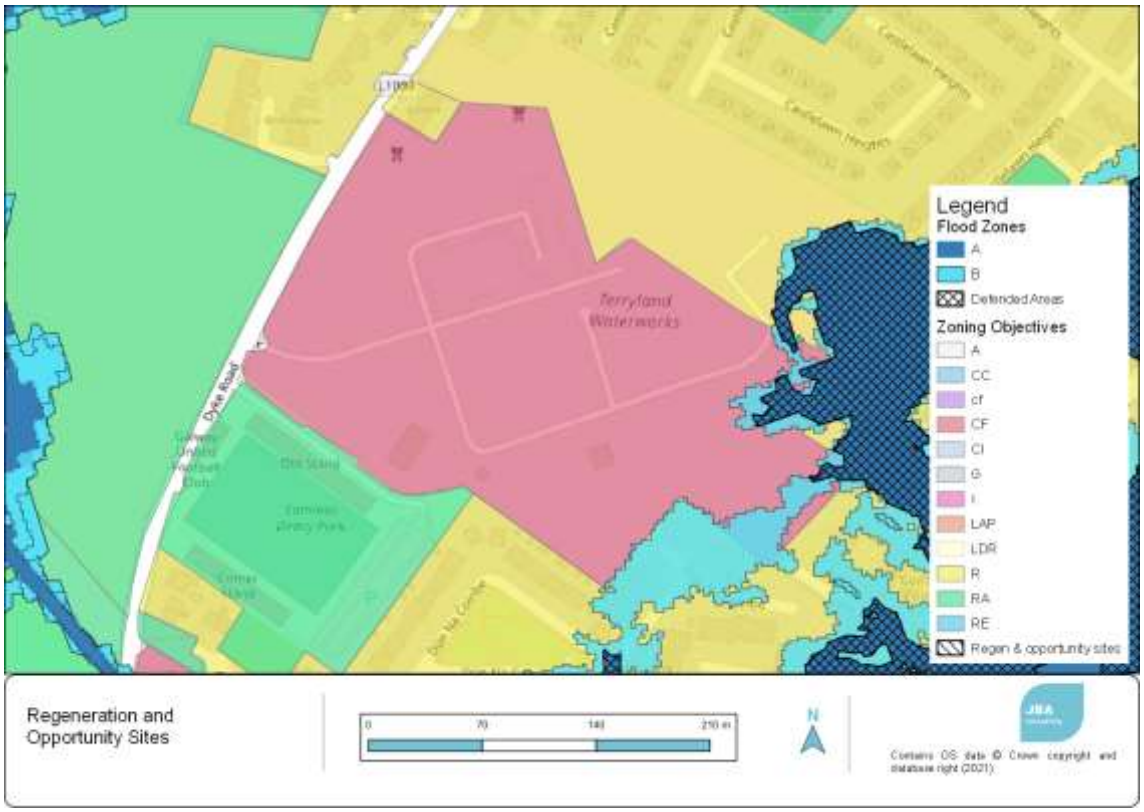
Benefitting from Defences (flood relief scheme works)	There is no benefit to this site from any flood relief scheme works.
Sensitivity to Climate Change	The site is sensitive to climate change and in particular sea level rise. The MRFS scenario which is a 0.5m rise which would increase the extent, frequency and depth of flooding.
Residual Risk	None
Historical Flooding	The land is marked 'liable to floods' on the 1829-41 6" and the 1897-1913 25" historic OS maps.
Surface Water	Should the site be developed, the FRA would be required to consider surface water management and discharge, whether this is to Lough Atalia directly or into the surface water system, particularly during (but not limited to) flood events.
Commentary on Flood Risk: Part of the site is in Flood Zone A and B the majority of the site is in Flood Zone B. The site is	

subject to tidal flooding from the coastal face of the boundary.
Development Considerations: In Flood Zone B, less vulnerable and water compatible uses are appropriate (whether indoor or outdoor), although the site would then need to be developed in line with the recommendations contained in this SFRA, including consideration of finished floor levels and safe access. The impacts of climate change and rising sea levels should also be taken into account. Given the location of the site alongside the bay, compensatory storage would not be required if site levels were raised, but it is important to ensure flow routes are not changed or blocked which could increase flood risk to neighbouring sites.

7.11 Waterworks site

The Waterworks Site was originally part of the waterworks but it was deemed surplus to Irish Water's requirements and the Institutional and Community (CF) zoning is therefore no longer required. The site is identified in the Development Plan for Residential (R) use.

The site is zoned for a highly vulnerable zoning objectives, and is in Flood Zones A, B and C. As required by the Planning Circular PL02/2014, the Justification Test is required for highly and less vulnerable development in this area.



Justification Test Parts 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan. The city centre covers a range of uses, including but not limited to residential, commercial,

		retail, community and tourism.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	This land is in an established neighbourhood within the city. These communities and neighbourhoods are essential in maintaining a living city contributing to the vitality of the city. They also include designated regeneration area which are essential in meeting planned growth for the city and ensure the continued viability and vitality of the city centre and enhance its role as a regional centre.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	These lands under utilised and in need of regeneration.
2(iii)	Is within or adjoining the core of an established or designated urban settlement:	These lands are within the designated urban area.
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	This land are within a sustainable neighbourhood network and are an essential part of a sustainable compact city linked to the street network and the public transport network and proximate to a range of services and facilities. These lands are essential in meeting objectives to develop Galway City as a regional city.
2(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.	This land is within an area with well-established strong communities. The location, with links established to the street network with good accessibility to the public transport network and proximity to a range of services and facilities, contributes to achieving a compact and sustainable city. These lands are essential in meeting objectives to develop Galway City as a regional city. As such, there are no suitable alternatives within the city.

Flood Risk Assessment and Justification Test Part 3

Benefitting from Defences (flood relief scheme works)	**There is no benefit to this site from any flood relief scheme works, but it may benefit from the Coirib go Cósta flood relief scheme when completed.**
Sensitivity to Climate Change	The site is moderately sensitive to climate change, with some lands that are currently in Flood Zone B likely to be inundated in the climate change 1% AEP event.
Residual Risk	None
Historical Flooding	None known
Surface Water	As the area has been previously developed it is assumed that the existing surface water systems will be used, or expanded, in redevelopment proposals. Where finished floor levels can be raised this will provide protection from overland flow paths.
Commentary on Flood Risk: Part of the site is in Flood Zone A and B but the majority is in Flood Zone C.	

Development Considerations:

Although less vulnerable development is appropriate in Flood Zone B, given the development of new flow paths between the 1% and 0.1% AEP events, and the likely increases in flood risk associated with climate change and proximity to existing developments, it is recommended that the sequential approach is followed to limit development within Flood Zones A and B to water compatible only.

Once the flood relief scheme has been completed, the level of risk to the site may be reviewed and as the area may benefit from defences along the Terryand River.

7.12 CI Zoning - Salthill

The Salthill area spans a length of the seafront to the western side of Galway City and includes areas of land zoned as Light Industry and Commercial, which covers retail outlets, offices, restaurants and cafes, Leisureland and other businesses.

The areas zoned for CI (Light Industry and Commercial) in Salthill comprises a mix of highly and less vulnerable, and water compatible, development, and are in Flood Zones A, B and C. As required by the Planning Circular PL02/2014, the Justification Test is required for highly and less vulnerable development in this area.

Justification Test Parts 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan.

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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	These lands form part of the established community of Salthill and is essential in maintaining a living city contributing to the vitality of the city.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	These lands are largely developed.
2(iii)	Is within or adjoining the core of an established or designated urban settlement:	These lands are within the designated urban area.
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	These lands which are already developed are part of the sustainable neighbourhood network and are an essential part of a sustainable compact city linked to the street network and the public transport network and proximate to a range of services and facilities. These lands are essential in meeting objectives to develop Galway City as a regional city.
2(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.	These lands which are already developed, with well-established strong communities, Their location, with links established to the street network with good accessibility to the public transport network and proximity to a range of services and facilities, contributes to achieving a compact and sustainable city. These lands are essential in meeting objectives to develop Galway City as a regional city. As such, there are no suitable alternatives within the city.

Flood Risk Assessment and Justification Test Part 3

Benefitting from Defences (flood relief scheme works)	The area is within the study area for the Coirib go Cósta flood relief scheme and should benefit from those defences once completed. There are also some localised flood defences in operation.
Sensitivity to Climate Change	The site is sensitive to climate change and in particular sea level rise. The Mid Range Future Scenario (MRFS), which is a 0.5m rise in sea level, would increase the extent, frequency and depth of flooding.
Residual Risk	None identified currently.
Historical Flooding	Flooding occurs relatively regularly and is linked to storm surges and high tides.
Surface Water	As the area has been previously developed it is assumed that the existing surface water systems will be used in redevelopment proposals. Where finished floor levels can be raised this will provide protection from overland flow paths.
Commentary on Flood Risk: Some parts of the CI zoning lie within Flood Zones A and B. The risk in this area is from tidal flooding.	

Development Considerations:

Development proposals in this area should take into the account flood relief scheme as the project advances. Any major developments (i.e. not Minor Development as Section 5.28) will require a detailed FRA which proposes development specific flood mitigation as appropriate. However, it is essential that any projects progressing in advance of the Flood Relief Scheme do not obstruct the scheme.

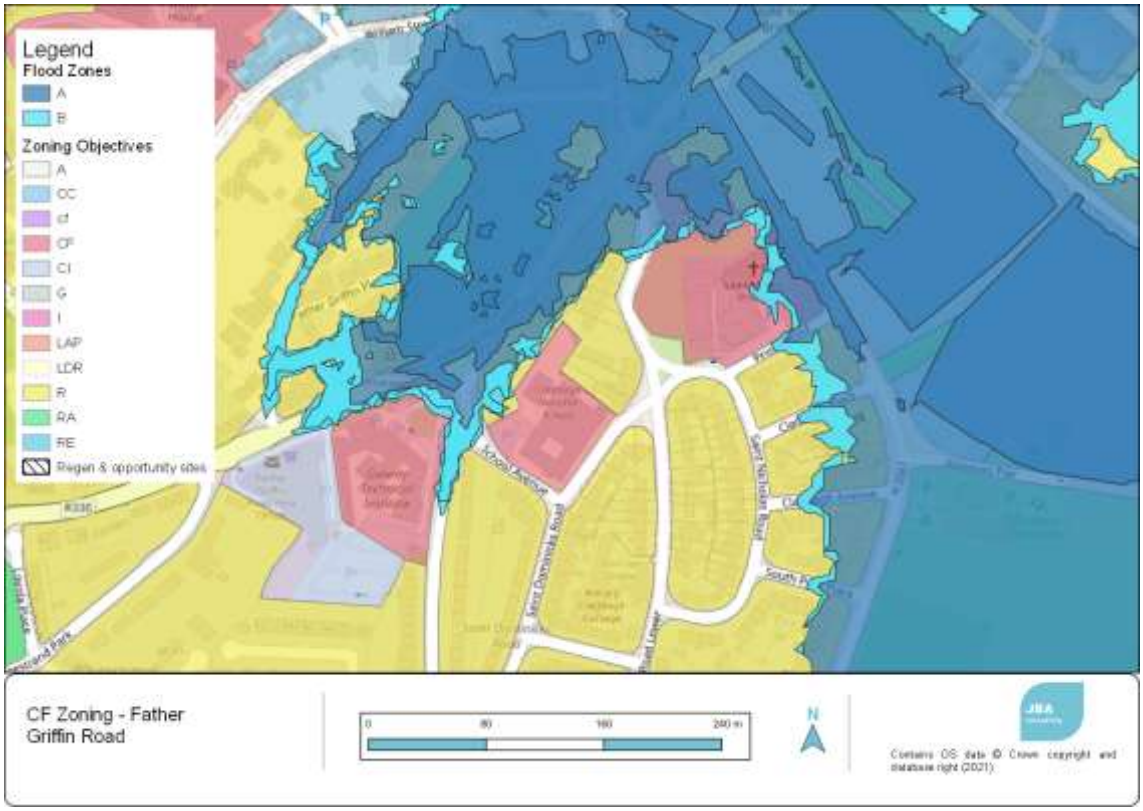
The detailed design of the development should reflect the vulnerability of the site in terms of internal layout, materials, fixtures and fittings and internal layout. As flood risk is tidal, raising ground and floor levels will not require compensatory storage. Within flood risk areas, less vulnerable uses are encouraged at ground floor levels. A site specific FRA for minor and major developments will also inform appropriate uses and detailed design and layout.

Where minor development is proposed, and it falls under Section 5.28 of the Planning Guidelines, the guidance in Section 5.6.1 should be followed.

7.13 CF Zoning - Father Griffin Road

The area around Father Griffin Road lies to the west of Galway City and forms a continuation of the City Centre and Nuns Island. It includes the established development of the fire station and GIT.

The areas zoned for CF (Community) around the Father Griffin Road comprises a mix of highly and less vulnerable, and water compatible, development, and are in Flood Zones A, B and C. As required by the Planning Circular PL02/2014, the Justification Test is required for highly and less vulnerable development in this area.



Justification Test Parts 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth,

	Planning Directives provisions of the Planning and Development Act 2000, as amended.	supporting a compact form of development. This is reflected in the core strategy of the Development Plan.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	These lands form part of the established community of the City and is essential in maintaining a living city contributing to the vitality of the city.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	These lands are largely developed.
2(iii)	Is within or adjoining the core of an established or designated urban settlement:	These lands are within the designated urban area.
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	These lands which are already developed are part of the sustainable neighbourhood network and are an essential part of a sustainable compact city linked to the street network and the public transport network and proximate to a range of services and facilities. These lands are essential in meeting objectives to develop Galway City as a regional city.
2(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.	These lands which are already developed, with well-established strong communities, Their location, with links established to the street network with good accessibility to the public transport network and proximity to a range of services and facilities, contributes to achieving a compact and sustainable city. These lands are essential in meeting objectives to develop Galway City as a regional city. As such, there are no suitable alternatives within the city.

Flood Risk Assessment and Justification Test Part 3

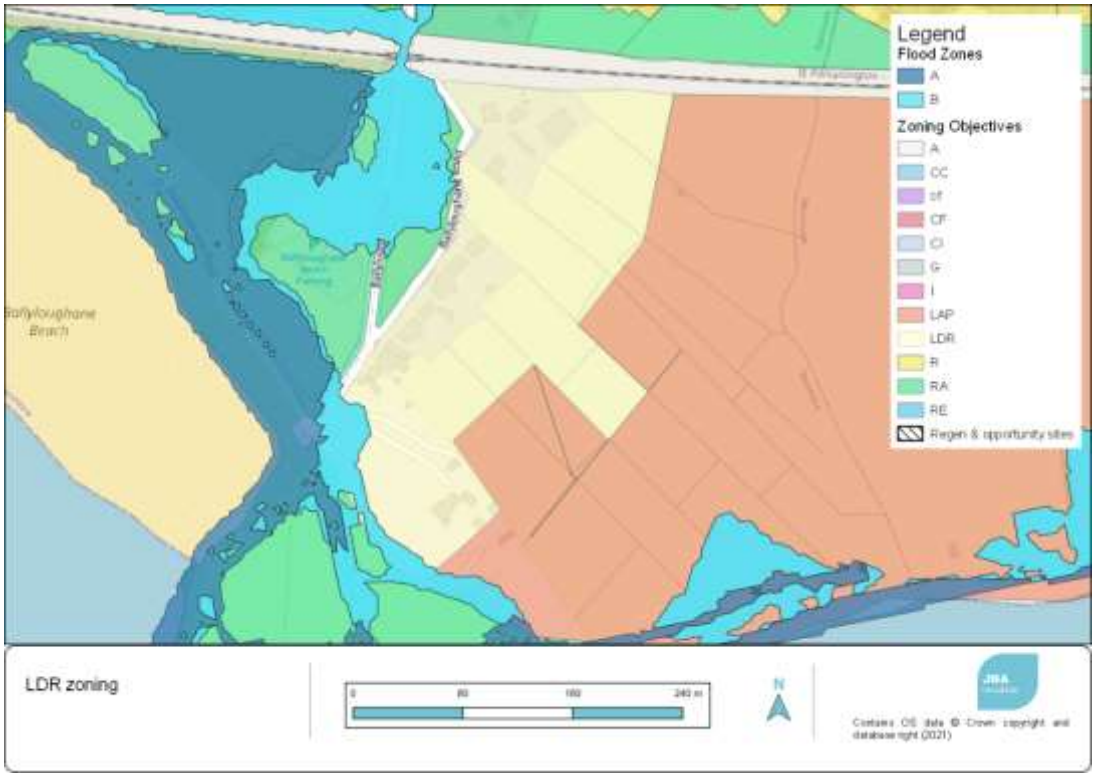
Benefitting from Defences (flood relief scheme works)	The area is within the study area for the Coirib go Cósta flood relief scheme and may benefit from those defences once completed.
Sensitivity to Climate Change	The site is sensitive to climate change and in particular sea level rise. The Mid Range Future Scenario (MRFS), which is a 0.5m rise in sea level, would increase the extent, frequency and depth of flooding.
Residual Risk	None identified currently.
Historical Flooding	Flooding has occurred historically in this area.
Surface Water	As the area has been previously developed it is assumed that the existing surface water systems will continue to be operational.
Commentary on Flood Risk: Some parts of the CF zoning lie within Flood Zones A and B. The risk in this area is from tidal flooding arising from the Corrib river channel.	

Development Considerations:
Redevelopment of existing CF lands should follow Section 5.28 of the Planning Guidelines, and guidance provided in Section 5.6.1. New development should avoid Flood Zone A and B.

7.14 LDR Zoning - Murrough

There is an area zoned LDR adjacent to the Murrough Local Area Plan Boundary. This includes a number of existing residential developments and open space which is available for development.

The LDR (low density residential) zoning permits highly vulnerable development and is partly within Flood Zones A and B, but largely in Flood Zone C. As required by the Planning Circular PL02/2014, the Justification Test is required.



Justification Test Parts 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	The developed part of the lands include established residential communities within the city. These communities and neighbourhoods are essential in maintaining a living city contributing to the vitality of the city. They also include designated regeneration

		area which are essential in meeting planned growth for the city and ensure the continued viability and vitality of the city centre and enhance its role as a regional centre.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	These lands are partly developed.
2(iii)	Is within or adjoining the core of an established or designated urban settlement:	These lands are within the designated urban area.
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	These lands are already partly developed, are part of the sustainable neighbourhood network and are an essential part of a sustainable compact city linked to the street network and the public transport network and proximate to a range of services and facilities. These lands are essential in meeting objectives to develop Galway City as a regional city.
2(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.	These lands are already partly developed, with well-established strong communities, Their location, with links established to the street network with good accessibility to the public transport network and proximity to a range of services and facilities, contributes to achieving a compact and sustainable city. These lands are essential in meeting objectives to develop Galway City as a regional city. As such, there are no suitable alternatives within the city.

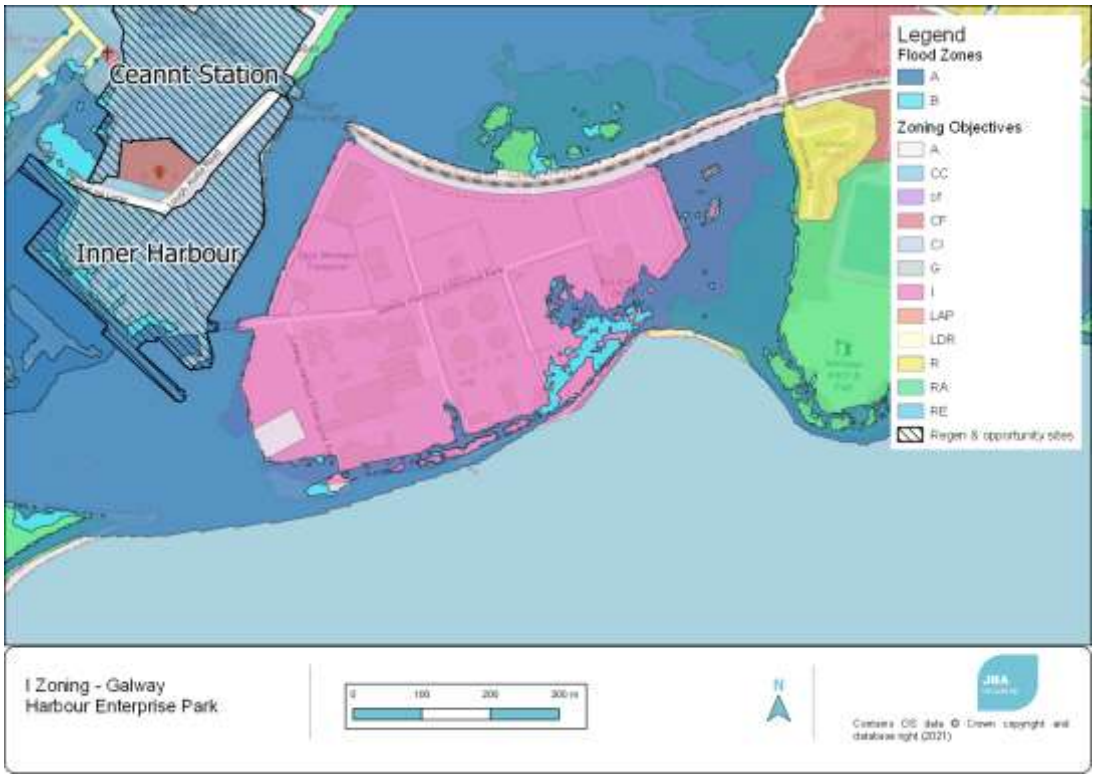
Flood Risk Assessment and Justification Test Part 3

Benefitting from Defences (flood relief scheme works)	**There is no benefit from flood defences.**
Sensitivity to Climate Change	The site is sensitive to climate change and in particular sea level rise. The Mid Range Future Scenario (MRFS), which is a 0.5m rise in sea level, would increase the extent, frequency and depth of flooding.
Residual Risk	There is no identified residual risk.
Historical Flooding	There is no record of historical flooding.
Surface Water	In the areas has been previously developed it is assumed that the existing surface water systems will continue to be operational. For areas of new development, surface water needs to be managed through the use of SUDS. Where finished floor levels can be raised this will provide protection from overland flow paths
Commentary on Flood Risk: A small part of the LDR zoning is within Flood Zone A/B and is at risk of tidal flooding. The rest is within Flood Zone C.	
Development Considerations: Redevelopment of existing residential within Flood Zone A / B should follow Section 5.28 of the Planning Guidelines, and guidance provided in Section 5.6.1. New development should avoid Flood Zone A and B, even if this is within the grounds of existing residential development. New development in Flood Zone C is appropriate and should follow the guidance in Section 5.5.	

7.15 I Zoning - Galway Harbour Enterprise Park

The Galway Harbour Enterprise Park is to the east of the city centre and has both coastal and canal frontage. These lands are Harbour Authority lands which are included in the assessment of a current Strategic Infrastructure Development Application to An Bord Pleanála (Reference 61.PA0033).

The I (Industrial) zoning permits less vulnerable development and is partly within Flood Zones A and B, but largely in Flood Zone C. As required by the Planning Circular PL02/2014, the Justification Test is required for less vulnerable development in Flood Zone A.



Justification Test Parts 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	This area consists of established industrial operations, some of which are ancillary to the harbour operation.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	These lands are partly developed with opportunities for further development and redevelopment, as proposed under the Strategic Infrastructure Development Application, which has been lodged with An Bord Pleanála.

2(iii)	Is within or adjoining the core of an established or designated urban settlement:	These lands are within the designated urban area, and are alongside the existing harbour.
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	These lands are partly developed with opportunities for further development and redevelopment, as proposed under the Strategic Infrastructure Development Application, which has been lodged with An Bord Pleanála. These lands are essential in meeting objectives to develop Galway City as a regional city.
2(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.	These lands are partly developed with opportunities for further development and redevelopment, as proposed under the Strategic Infrastructure Development Application, which has been lodged with An Bord Pleanála. These lands are essential in meeting objectives to develop Galway City as a regional city. As such, there are no suitable alternatives within the city.

Flood Risk Assessment and Justification Test Part 3

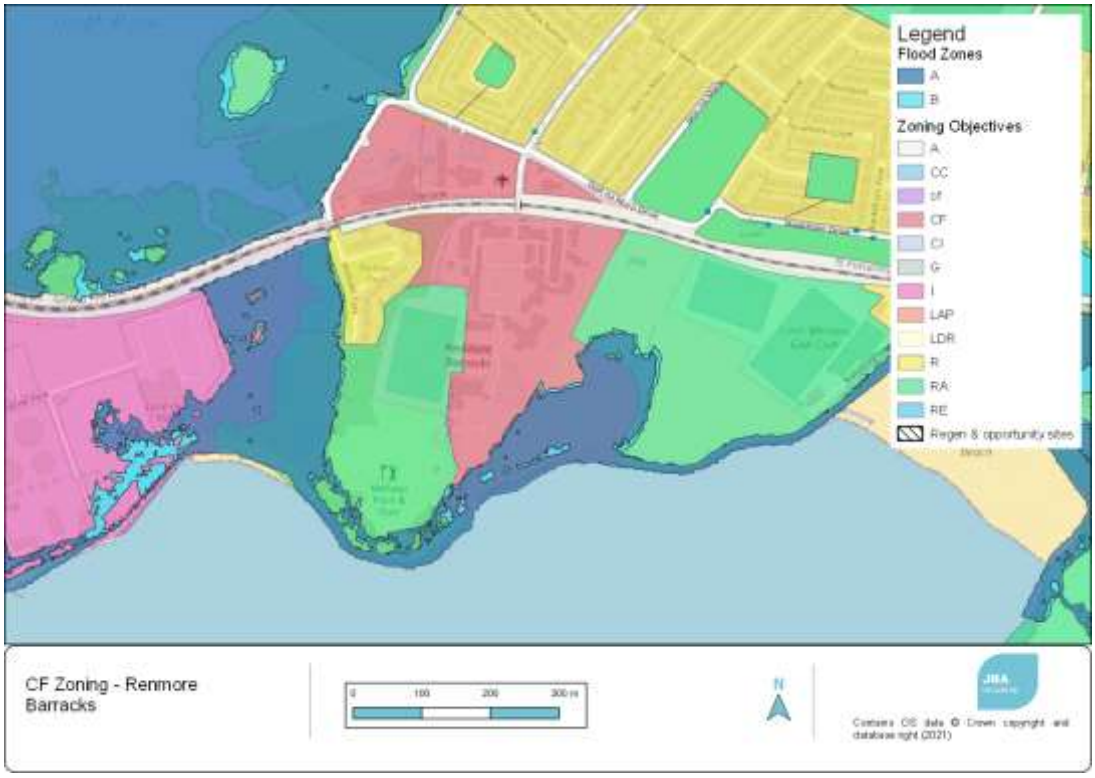
Benefitting from Defences (flood relief scheme works)	**There is no benefit from flood defences.**
Sensitivity to Climate Change	The site is sensitive to climate change and in particular sea level rise. The Mid Range Future Scenario (MRFS), which is a 0.5m rise in sea level, would increase the extent, frequency and depth of flooding.
Residual Risk	There is no identified residual risk.
Historical Flooding	There is no record of historical flooding.
Surface Water	In the areas has been previously developed it is assumed that the existing surface water systems will continue to be operational. For areas of new development, surface water needs to be managed through the use of SUDS. Where finished floor levels can be raised this will provide protection from overland flow paths
Commentary on Flood Risk: A small part of the developed I zoning is within Flood Zone A/B and is at risk of tidal flooding. There is also some undeveloped land to the east of the Bus Eireann depot which has a stream discharging into the sea running through it. This portion of undeveloped land is within Flood Zone A.	
Development Considerations: Redevelopment of existing industrial area within Flood Zone A / B should be supported by a site specific FRA, which will include consideration of climate change. Mitigation measures should include ground raising and setting of appropriate finished floor levels, as well as emergency plans for safe access and egress. As the area is vulnerable to tidal risk, there is no requirement to provide compensatory storage for ground raising. There should be no new development within the eastern, greenfield, part of the site in Flood Zones A or B.	

7.16 CF Zoning - Renmore Barracks

The Barracks lands are largely developed, with the exception of the area to the south-east and fronting the coast, which is undeveloped open space, including wetland habitat.

CF (community) lands south of the railway line at Renmore are occupied by the Defence Forces comprising approximately 9 hectares. The lands are partly within Flood Zones A and B, but largely

in Flood Zone C. As required by the Planning Circular PL02/2014, the Justification Test is required for less vulnerable development in Flood Zone A.



Justification Test Parts 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	This area consists of established operations adjacent to the core of the city.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	These lands are partly developed and opportunities for redevelopment or expansion of existing operations may arise in the future.
2(iii)	Is within or adjoining the core of an established or designated urban settlement:	These lands are within the designated urban area.
2(iv)	Will be essential in achieving compact and sustainable	These lands are partly developed with opportunities for further development and redevelopment

	urban growth; and,	potentially arising. These lands are essential in meeting objectives to develop Galway City as a regional city.
2(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.	These lands are partly developed with opportunities for further development and redevelopment potentially arising. As such, there are no suitable alternatives within the city.

Flood Risk Assessment and Justification Test Part 3

Part 3 Flood Risk Assessment	
Benefitting from Defences (flood relief scheme works)	There is no benefit from flood defences.
Sensitivity to Climate Change	The site is sensitive to climate change and in particular sea level rise. The Mid Range Future Scenario (MRFS), which is a 0.5m rise in sea level, would increase the extent, frequency and depth of flooding.
Residual Risk	There is no identified residual risk.
Historical Flooding	There is no record of historical flooding.
Surface Water	In the areas has been previously developed it is assumed that the existing surface water systems will continue to be operational. For areas of new development, surface water needs to be managed through the use of SUDS. Where finished floor levels can be raised this will provide protection from overland flow paths
Commentary on Flood Risk: A small part of the developed CF zoning, including the southern part of the permitter road and access to the shooting range, is within Flood Zone A/B and is at risk of tidal flooding. There is also some undeveloped land to the east of site which is within Flood Zone A.	
Development Considerations: The Council will consider the development of these lands for institutional, amenity or community facilities use either by the Defence Forces or another institution and will not permit residential, commercial or industrial development. Any development shall not impact on lands which have been identified as at flood risk and a site specific flood risk assessment will be required as part of any development. Redevelopment of existing Barracks area should take place within Flood Zone C. Any development should be supported by a site specific FRA, which will include consideration of climate change. Mitigation measures should include ground raising and setting of appropriate finished floor levels. As the area is vulnerable to tidal risk, there is no requirement to provide compensatory storage for ground raising. There should be no new development within the eastern, undeveloped, part of the site in Flood Zones A or B.	

7.17 R Zoning - Existing Residential Development

Existing residential development within Flood Zone A and B includes, but is not limited to, areas of the Headford Road, Terryland, Sandy Road, Gratan Road, Father Griffin Road and Salthill Upper and Lower.

Existing residential is classed as highly vulnerable and some areas are in Flood Zones A and B. As required by the Planning Circular PL02/2014, the Justification Test is required. See main body of Flood Zone maps and interactive map viewer for mapping of existing residential areas.

Justification Test Parts 1 and 2

	Criteria	Response
1	The urban settlement is targeted for growth under the NPF, RSES statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	Project Ireland 2040 National Planning Framework (NPF) and the Northern and Western Assembly's Regional Spatial and Economic Strategy 2020-2032 (RSES) includes objectives to develop Galway City as a regional city targeted for significant growth, supporting a compact form of development. This is reflected in the core strategy of the Development Plan.
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:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	These lands include established residential communities within the city. These communities and neighbourhoods are essential in maintaining a living city contributing to the vitality of the city. They also include designated regeneration area which are essential in meeting planned growth for the city and ensure the continued viability and vitality of the city centre and enhance its role as a regional centre.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	These lands are developed.
2(iii)	Is within or adjoining the core of an established or designated urban settlement:	These lands are within the designated urban area.
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	These lands are already developed, are part of the sustainable neighbourhood network and are an essential part of a sustainable compact city linked to the street network and the public transport network and proximate to a range of services and facilities. These lands are essential in meeting objectives to develop Galway City as a regional city.
2(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.	These lands are already developed, with well-established strong communities. Their location, with links established to the street network with good accessibility to the public transport network and proximity to a range of services and facilities, contributes to achieving a compact and sustainable city. These lands are essential in meeting objectives to develop Galway City as a regional city. As such, there are no suitable alternatives within the city.

Flood Risk Assessment and Justification Test Part 3

Benefitting from Defences (flood relief scheme works)	**Some areas benefit from established embankments, some will be further defended by the Coirib go Cósta flood relief scheme when completed. Others are undefended and may remain so.**
Sensitivity to Climate Change	Sensitivity to climate change varies across the city, but can be significant where tidal flood risk is present. In the area to the north of Gratton Beach, east of Salthill and west of the Claddagh, flood risk is indicated under climate change scenarios despite the

	residential development currently being in Flood Zone C.
Residual Risk	Residual risk varies across the city and depends on the presence of defences.
Historical Flooding	Some areas have flooded historically.
Surface Water	As the areas has been previously developed it is assumed that the existing surface water systems will continue to be operational.
Commentary on Flood Risk: This assessment is specifically considering the areas of Residential zoning within Flood Zones A and B.	
Development Considerations: Redevelopment of existing residential should follow Section 5.28 of the Planning Guidelines, and guidance provided in Section 5.6.1. New development should avoid Flood Zone A and B.	

8 SFRA Review and Monitoring

An update to the SFRA will be triggered by the six year review cycle that applies to Local Authority development plans. In addition, there are a number of other potential triggers for an SFRA review and these are listed in the table below.

There are a number of key outputs from possible future studies and datasets, which should be incorporated into any update of the SFRA as availability allows. Not all future sources of information should trigger an immediate full update of the SFRA; however, new information should be collected and kept alongside the SFRA until it is updated.

Additional information will arise from the Coirib go Costa Flood Relief Scheme. Not only will this study revisit the CFRAM assessment, but once the scheme is in place the definition of risk will change significantly for existing development, and by implication also for undeveloped lands, when defended and residual risks are taken into account.

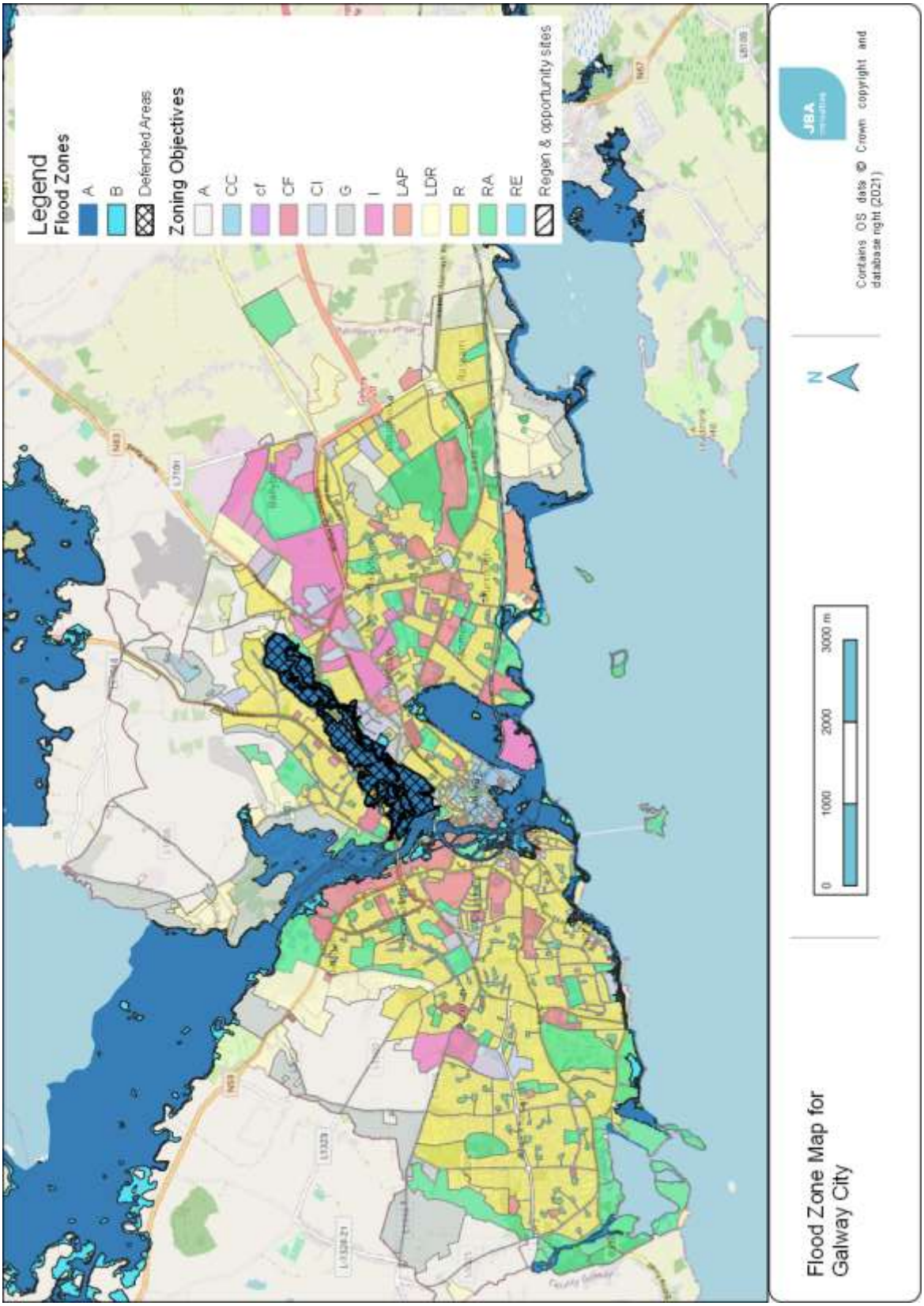
Detailed, site specific FRAs may be submitted to support planning applications. Whilst these reports will not trigger a review of the Flood Zone maps or SFRA, they should be retained and reviewed as part of the next cycle of the Development Plan.

Table 8-1 SFRA Review Triggers

Trigger	Source	Possible Timescale
OPW Flood Relief Scheme outputs - Coirib go Costa	OPW	Various stages of the project for updated flood mapping, scheme options and constructed scheme
Updates to the PFRA, required by the EU Floods Directive on a six yearly cycle.	OPW	NIFM updates have recently been completed. Further updates on an ad hoc basis when the need for updates is identified.
Flood maps of other sources, such as drainage networks	Various	Unknown
Significant flood events	Various	Unknown
Changes to Planning and / or Flood Management Policy	DoEHLG / OPW	Unknown

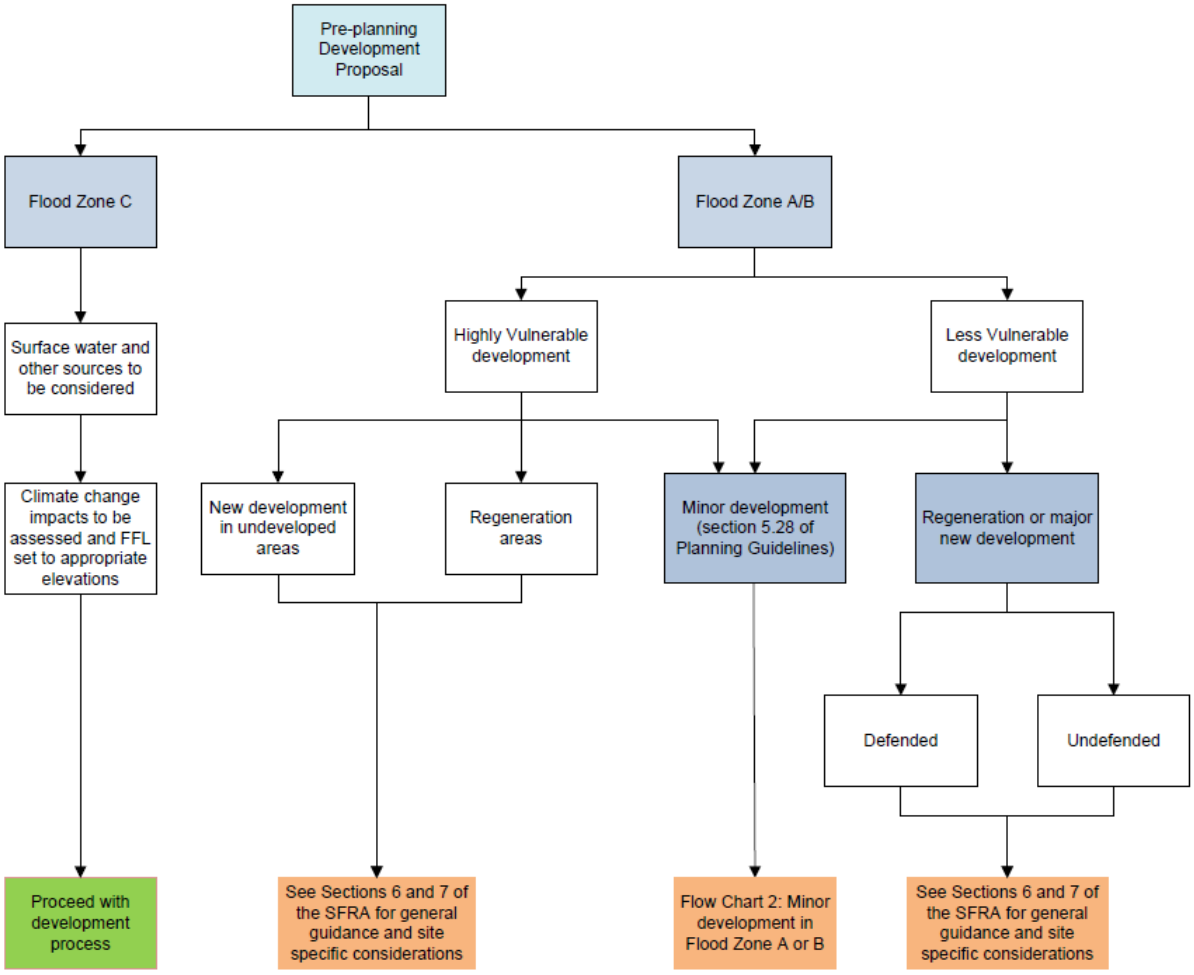
Appendices

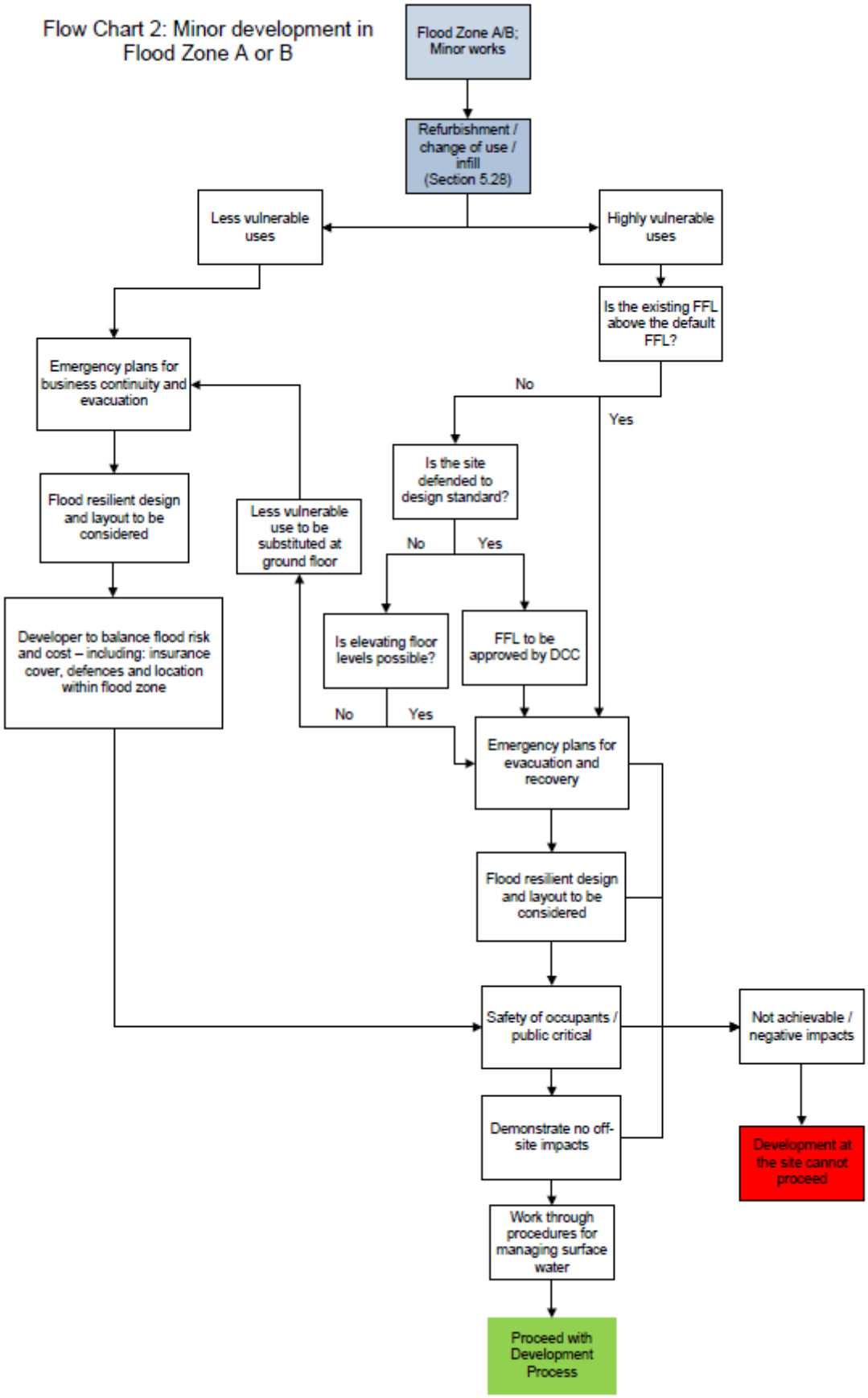
A Flood Zone Mapping



B Flow charts

Flow Chart 1: Development Management Process




Flow Chart 2: Minor development in Flood Zone A or B
Flood Zone A/B; Minor works
Refurbishment / change of use / infill (Section 5.28)
Less vulnerable uses
Highly vulnerable uses
Is the existing FFL above the default FFL?
No
Yes
Emergency plans for business continuity and evacuation
Is the site defended to design standard?
Flood resilient design and layout to be considered
Less vulnerable use to be substituted at ground floor
No
Yes
Developer to balance flood risk and cost – including: insurance cover, defences and location within flood zone
Is elevating floor levels possible?
FFL to be approved by DCC
No
Yes
Emergency plans for evacuation and recovery
Flood resilient design and layout to be considered
Safety of occupants / public critical
Not achievable / negative impacts
Demonstrate no off-site impacts
Development at the site cannot proceed
Work through procedures for managing surface water
Proceed with Development Process

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