2017 - 2023

Galway City Development Plan

Strategic Flood Risk Assessment
Contract

This Part 1 report describes work commissioned by Joe O'Neill, Director of Services, Planning and Transportation, on behalf of Galway City Council, by a letter dated 19th June 2015. Galway City Council’s representative for the contract was Helen Coleman. Elizabeth Russell and Ethan McGowan of JBA Consulting carried out this work.

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(December 2015)

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Part 2 Strategic Flood Risk Assessment
Addendum (September 2016)
## Abbreviations

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<tr>
<td>AEP</td>
<td>Annual Exceedance Probability</td>
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<td>CFRAM</td>
<td>Catchment Flood Risk Assessment and Management</td>
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<tr>
<td>CFRAMS</td>
<td>Catchment-Based Flood Risk Assessment and Management Study</td>
</tr>
<tr>
<td>DoEHLG</td>
<td>Department of the Environment, Heritage and Local Government</td>
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<td>FRA</td>
<td>Flood Risk Assessment</td>
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<tr>
<td>GSI</td>
<td>Geological Survey of Ireland</td>
</tr>
<tr>
<td>HEFS</td>
<td>High End Future Scenario</td>
</tr>
<tr>
<td>ICPSS</td>
<td>Irish Coastal Protection Strategy Study</td>
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<tr>
<td>LA</td>
<td>Local Authority</td>
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<tr>
<td>LAP</td>
<td>Local Area Plan</td>
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<tr>
<td>MRFS</td>
<td>Medium Range Future Scenario</td>
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<td>OPW</td>
<td>Office of Public Works</td>
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<tr>
<td>OS</td>
<td>Ordnance Survey</td>
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<tr>
<td>PFRA</td>
<td>Preliminary Flood Risk Assessment</td>
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<tr>
<td>SFRA</td>
<td>Strategic Flood Risk Assessment</td>
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<tr>
<td>SPR</td>
<td>Standard percentage runoff</td>
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<tr>
<td>SUDS</td>
<td>Sustainable Urban Drainage Systems</td>
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<td>Tp</td>
<td>Time to Peak</td>
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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 2017-2023.

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 2017-2023 (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 this document are to:

- Produce Flood Mapping
- Prepare a Stage 2 - Flood Risk Assessment of Galway City in particular in relation to location and type of zoning and land-use proposals.
- Advise on zonings/land use-proposals, 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 artificial reservoirs 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 identify flood risk and is based primarily on the findings of the Western Catchment Flood Risk Assessment and Management Study (WCFRAM)\(^2\). 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 of flooding, and specifically looks at flood risk and the potential for development within a number of key sites in Galway City, including a stage three assessment of flood risk and management options for the

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\(^1\) DoEHLG 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.
Headford Road site, which has previously been subject to flood risk assessment under the Headford Road Local Area Plan\(^3\).

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 Section 5 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 6 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 7 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 8.

Triggers for the ongoing monitoring and future review of the SFRA are detailed in Section 8.

As part of the development plan process, a number of alterations to the draft Plan were proposed. An assessment of the proposed alterations were considered as an Addendum to the SFRA and is included as Part 2 of this document.

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\(^3\) RPS Group (November 2012) Strategic Flood Risk Assessment for Three Local Area Plans - Initial Flood Risk Assessment Stage II
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 km² 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). 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.

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.

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4 T. W. Freeman (1957): Galway—the key to west Connacht, Irish Geography, 3:4, 194-205
5 Eamon de Buitléar (1986) Irish Rivers.
This 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\(^6\).

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 Galway City Development Plan (2011-2017)

The current plan which covers the period 2011-2017. The plan sets out compliance with National Spatial Strategy and the West Regional Planning Guidelines, including; "To include policies for the protection of areas at risk from flooding."

Some of the key flood management policies of Galway City Council, as laid out in the development plan include:

Policy 8.5 Flood Risk -

- Have regard to the findings and relevant identified actions of the future Corrib CFram Study when available and incorporate into the Development Plan, where appropriate.
- Review flood risk in the city and carry out detailed site-specific FRA for locations of potential flood risk, where necessary.
- Require development applications in the locations of potential flood risk, to provide flood impact assessment and flood risk minimisation and mitigation measures, to facilitate assessment, in the interest of reducing the risk of flooding.
- Prohibit the location of structures other than structures with essential links to the waterway within 10 metres of the River Corrib in G agricultural zoned lands.
- Ensure flood risk is addressed in any future local area plans, framework plans and masterplans in the city.
- Facilitate sustainable flood defence and coastal protection works in order to prevent flooding and coastal erosion, subject to environmental and visual considerations.
- Ensure the use of Sustainable Urban Drainage Systems (SUDS) wherever practical, in the design of development to reduce the rate and quantity of surface water run-off.
- Ensure new developments, where appropriate, are designed and constructed to meet the flood design standards outlined under Section 11.27 Flood Risk.
- Have regard to the findings and recommendations of the imminent Irish Coastal Protection Strategy Study of the West Coast, when available and incorporate into the Development Plan, where appropriate.
- Continue to protect the coastal area and foreshore and avoid inappropriate development in areas at risk of coastal erosion and/or would cause and escalate coastal erosion in adjoining areas.
- Protect and maintain, where feasible, undeveloped riparian zones and natural floodplains along the River Corrib and its tributaries.

In addition, the Specific Objective for Flood Risk Management requires a detailed site-specific FRA for identified potential flood risk areas, taking into consideration findings of the CFram Study when completed.

The requirement for a detailed FRA for every development within Flood Zones A or B has been reviewed as part of this SFRA, and specific standards and guidance are included in this document.

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2.4 Local Area Plans

Within Galway City there are three areas designated for the preparation of Local Area Plans. These are Ardaun, Murrough and the Headford Road south of the Bodkin junction. Stage 1 and 2 Strategic Flood Risk Assessment have been carried out in these LAP areas. The recommendations of the three SFRAs are reproduced below.

2.4.1 Ardaun LAP

In the absence of surface water courses in the vicinity of the Ardaun LAP area, Sustainable Urban Drainage Systems should be implemented to manage the storm runoff. Storm runoff from the developments located in the west and north-western parts of the LAP area (approximate area of 100ha) should be drained westwards to Galway Bay through the Merlin Park Area Drainage System. Surface runoff from the remaining LAP area (58ha) should be discharged to ground via infiltration. Alternatively, where infiltration is not an option, a surface water outfall pipe may be required to discharge this runoff to Galway Bay. Furthermore, it is recommended that no development be allowed in the immediate vicinity of the area identified by the GSI as being the Doughiska turlough. This area should not be used for infiltration.

2.4.2 Headford Road LAP

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:

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

2.4.3 Murrough LAP

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.

2.4.4 LAPs in the City Development Plan

The work undertaken by RPS has been reviewed and incorporated into this SFRA as follows:

- Ardaun LAP - the areas indicated to be at risk of flooding have been incorporated into the Flood Zone Map for the city. Recommendations for avoiding areas at risk of flooding should be noted and carried through to the City Development Plan.
- Headford Road area LAP - detailed assessment of risks has been carried out through the Western CFRAM, which included hydrological calculations and topographic survey. Additional assessment in relation to the management of risks (i.e. detailed flood risk assessment) has been carried out and is detailed in Section 8.4 of this report.
- Murrough LAP - the flood extents included in the LAP have been compared with the CFRAM extents, 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.
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:

\[
\text{Flood Risk} = \text{Probability of Flooding} \times \text{Consequences of Flooding}
\]

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.

![Source Pathway Receptor Model](source.png)

Principal 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 or 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>
<thead>
<tr>
<th>Return Period (Years)</th>
<th>Annual Exceedance Probability (%)</th>
</tr>
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<tbody>
<tr>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>200</td>
<td>0.5</td>
</tr>
<tr>
<td>1000</td>
<td>0.1</td>
</tr>
</tbody>
</table>

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 summarised as:

- **Highly vulnerable**, including residential properties, essential infrastructure and emergency service facilities;
- **Less vulnerable**, such as retail and commercial and local transport infrastructure;
- **Water compatible**, including open space, outdoor recreation and associated essential infrastructure, such as changing rooms.

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 3-2.

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 3-2 Definition of Flood Zones

<table>
<thead>
<tr>
<th>Zone</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Zone A</strong></td>
<td>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).</td>
</tr>
<tr>
<td><strong>Zone B</strong></td>
<td>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).</td>
</tr>
<tr>
<td><strong>Zone C</strong></td>
<td>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).</td>
</tr>
</tbody>
</table>

### 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 8 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 3-3 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>
<thead>
<tr>
<th>Highly vulnerable development (including essential infrastructure)</th>
<th>Flood Zone A</th>
<th>Flood Zone B</th>
<th>Flood Zone C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Justification Test</td>
<td>Justification Test</td>
<td>Appropriate</td>
<td></td>
</tr>
<tr>
<td>Less vulnerable development</td>
<td>Justification Test</td>
<td>Appropriate</td>
<td>Appropriate</td>
</tr>
<tr>
<td>Water-compatible development</td>
<td>Appropriate</td>
<td>Appropriate</td>
<td>Appropriate</td>
</tr>
</tbody>
</table>

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 Data Collection and Availability

4.1 Overview

This section of the SFRA will review the availability of data relating to flood risk in Galway City. Due to the level of flood risk in Galway, particularly in relation to the sea, there are a number of datasets which record either historical or predicted flood extents. The aim of the review 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.

<table>
<thead>
<tr>
<th>Title</th>
<th>Description / Source</th>
<th>Quality</th>
<th>Confidence</th>
<th>Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional Flood Risk Appraisal</td>
<td>Regional screening report</td>
<td>Broadscale and descriptive</td>
<td>Low</td>
<td>Provided guidance on sources of risk (Section 0)</td>
</tr>
<tr>
<td>OPW PFRA - Fluvial and groundwater extents</td>
<td>The Preliminary Flood Risk Assessment (PFRA) is a national screening exercise that was undertaken by OPW to identify areas at potential flood risk.</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Fluvial used to cross reference other information. Groundwater used to review development zonings and cross reference to historical floods.</td>
</tr>
<tr>
<td>Irish Coastal Protection Strategy Study</td>
<td>Tidal extents for indicative (200yr) and extreme (1000yr) events from ICPSS study</td>
<td>High</td>
<td>High</td>
<td>Tide levels fed into the CFRAM analysis.</td>
</tr>
<tr>
<td>Benefiting lands</td>
<td>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.</td>
<td>Moderate</td>
<td>Low</td>
<td>Not used - superseded by more detailed information</td>
</tr>
<tr>
<td>Historical Flood Records including photos, aerial photos and reports.</td>
<td>Various sources, including CCC records, press archives and <a href="http://www.floodmaps.ie">www.floodmaps.ie</a> Coverage is broad, combination of spot records, description and extents.</td>
<td>Various</td>
<td>Various</td>
<td>Indirectly used to validate Flood Zones &amp; identify other flood sources</td>
</tr>
<tr>
<td>Walkover survey</td>
<td>Selected locations, including city centre and key structures and flood defences</td>
<td>Moderate</td>
<td>Low</td>
<td>Yes, to validate outlines and flow paths at key locations</td>
</tr>
<tr>
<td>Western CFRAM (draft)</td>
<td>Draft Western CFRAM Maps have been published for the Corrib and canals / mill streams</td>
<td>High</td>
<td>High</td>
<td>Although still in Draft format, the CFRAM maps have been reviewed and</td>
</tr>
<tr>
<td>Title</td>
<td>Description / Source</td>
<td>Quality</td>
<td>Confidence</td>
<td>Used</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------</td>
<td>---------</td>
<td>------------</td>
<td>------</td>
</tr>
</tbody>
</table>
| SFRA for LAPs | Stage 2 SFRA undertaken for Murrough, Ardaun and Headford Road | Moderate | Moderate | form the basis of the Flood Zones. Model also used to test development scenarios See Section 2.4.

### 4.2 Flood Zone Maps

As can be seen from Table 4-1, a range of data, including hydraulic modelling, historical reports and site walkover was used to inform this SFRA. Regard was also had to the draft CFRAM outputs although this was only one of a number of data sources and was not solely relied on. However, as authors of the Western CFRAM, JBA have a robust knowledge of the CFRAM process and are fully aware of the provenance of the data and were able to incorporate this information into the development of the Flood Zone Maps. It should be noted that the CFRAM Flood Maps are currently in draft format and will be subject to consultation in the coming months. Comments received in relation to the maps will be addressed through the CFRAM Study process, and will be updated in subsequent iterations of this SFRA.

In addition to the extents of Flood Zone A and B, which are shown in Appendix A, the map also depicts the impact of wave overtopping. This is discussed further in Section 5.2, 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.
5 Sources of Flooding

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

The Regional Flood Risk Appraisal included the information shown in Table 5-1.

Table 5-1: Summary of flood risk to Galway City

<table>
<thead>
<tr>
<th>Type of flood risk</th>
<th>Current risk classification based on preliminary PFRAs</th>
<th>Risk Areas (based on OPW <a href="http://www.floodmaps.ie">www.floodmaps.ie</a>)</th>
<th>Recommendations for Development Plans and Local Area Plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal and Fluvial</td>
<td>High</td>
<td>- Lands adjacent to coastline</td>
<td>- Permit only appropriate development subject to mandatory flood risk assessment and ecological impact assessment and/or Habitats Directive Assessment, where necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Land adjacent to the River Corrib which is prone to flash flooding</td>
<td>- Support catchment based hydrological assessments and flood path analysis (through CFRAMS) and where possible incorporate SUDS1 based techniques to minimise flood impacts in future Development Plans.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- High Tide &amp; Storm flooding associated with Quay Street, Docks Area, Lower Salthill, Headford Road at Ballindooley, Claddagh</td>
<td>- Incorporate appropriate policies to flood proof redevelopment of brownfield sites and preserve appropriate flow channels through setting back of development and creation of open space amenity along river banks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Turlough located at Doughiska which is liable to flood</td>
<td>- Implement appropriate improvement works based on HDA, where necessary and condition appropriate catchment based SUDS provisions for new developments.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Ballindooley Lough margin is liable to flood during heavy rain</td>
<td>- Continued use of canals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Existing Coastal Protection Works at Gential Hill extending along the promenade and coastal protection at Ballyloughn</td>
<td>- A collaborative approach to the shared management of river catchments should be fostered under aegis of River Basin Districts and International River Basin Districts so as to facilitate implementation of flood management initiatives.</td>
</tr>
</tbody>
</table>

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

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7 The West Regional Authority (2010) Regional Planning Guidelines for the West Region: Regional Flood Risk Appraisal 2010-2022
Flood Zones in the 'Planning System and Flood Risk Management' are defined on the basis of fluvi al and tidal flood risk. In addition, the SFRA should be based on readily derivable information, and records and indicators for fluvi al and tidal flood risk are generally more abundant than for other sources of flooding.

5.1 Fluvi al 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 fluvi al 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 5.3) the main source of flooding is the River Corrib, as can be seen from historical records. The Corrib catchment is large, covering approximately 3,140km² 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.

Flood risk to specific potential development sites is discussed in Section 7 and has been used to inform the zoning objectives for the Galway City Development Plan. Where zoning for development is proposed within Flood Zones A or B, the Justification Test must be applied, and passed.

5.2 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 an area of possible risk.

Figure 5-1 shows a photograph stretch along the Salthill Promenade with properties in a linear pattern to the contour of 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 extents which may occur as a result of wave action has also be included on the Flood Zone maps.
5.3 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 and a flood gate has been installed to provide protection to the Galway Business School. Three sets of demountable defences have also been purchased to protect Spanish Arch and the surrounding area when extreme tides are forecast.

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 against sustainability objectives, and the general approach of the OPW, to construct defences with the intention of releasing green field land for development. It is also not appropriate to consider the benefits of schemes which have not been constructed, and which may only be at pre-feasibility or design stage.

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 Site, detailed in Section 8, and is addressed more generally in the development management guidance provided in Section 6.

5.4 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 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 6.4 and a preliminary assessment of the potential for specific zoned lands to contribute or to be vulnerable to surface water flooding has been undertaken (see Section 80).

5.5 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 sprawl, 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-

8 http://www.cfram.ie/pfra/
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.

5.6 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.

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 Terrylands 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.

5.7 Climate Change

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.

The 'Planning System and Flood Risk Management' recommends that a precautionary approach to climate change is adopted due to the level of uncertainty involved in the potential effects. A significant amount of research into climate change has been undertaken on both a national and international front. This section will briefly examine some of the key findings of the research to date.

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 and its first report in 1990 justified concern about the effects of climate change on a scientific basis. The more recent IPCC Fourth Assessment Report 2007\(^8\) concludes that climate change is unequivocal. It projects a global average sea level rise of between 0.18m and 0.59m for different SRES emissions scenarios, up to the end of the century. (SRES refers to the IPCC Special Report on Emissions Scenarios, published in 2000. The scenarios explore different demographic, economic and technological forces and resultant greenhouse gas emissions.)

More 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\(^9\). Two climate change scenarios are considered. These are the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). The MRFS is intended to represent a "likely" future scenario based on the wide range of future predictions available. The HEFS represents a more "extreme" future scenario at the upper boundaries of future projections. Based on these two scenarios the OPW recommended allowances for climate change are given in Table 5-2. These climate change allowances are particularly important at the development management stage of planning, and will ensure that proposed development is designed and constructed to take into account best current knowledge. At this, the development planning stage, a detailed knowledge of the impact of climate change on flood levels is not required to inform the strategic allocation of land. However, through the CFRAM both MRFS and HEFS runs have been completed for the

\(^8\) Inter-Governmental Panel on Climate Change (IPCC), 4th assessment report. "Climate Change 2007".
\(^9\) OPW Assessment of Potential Future Scenarios, Flood Risk Management Draft Guidance, 2009
Corrib and associated watercourses, providing a quantitative assessment of future risk. For watercourses that are not part of the CFRAM programme, flood extents can be assessed by using the Flood Zone B outline as a surrogate for 'Flood Zone A with allowance for the possible impacts of climate change', as suggested in the 'Planning System and Flood Risk Management'.

### Table 5-2  Allowances for Future Scenarios (100 Year Time Horizon)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>MRFS</th>
<th>HEFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme Rainfall Depths</td>
<td>+20%</td>
<td>+30%</td>
</tr>
<tr>
<td>Flood Flows</td>
<td>+20%</td>
<td>+30%</td>
</tr>
<tr>
<td>Mean Sea Level Rise</td>
<td>+500mm</td>
<td>+1000mm</td>
</tr>
<tr>
<td>Land Movement</td>
<td>-0.5mm / year*</td>
<td>-0.5mm / year*</td>
</tr>
<tr>
<td>Urbanisation</td>
<td>No General Allowance - Review on Case by Case Basis</td>
<td>No General Allowance - Review on Case by Case Basis</td>
</tr>
<tr>
<td>Forestation</td>
<td>-1/6 Tp**</td>
<td>-1/3 Tp** +10% SPR***</td>
</tr>
</tbody>
</table>

Notes:
* Applicable to the southern part of the country only (Dublin - Galway and south of this)
** Reduce the time to peak (Tp) by a third; this allows for potential accelerated runoff that may arise as a result of drainage of afforested land
*** Add 10% to the Standard Percentage Runoff (SPR) rate; this allows for increased runoff rates that may arise following felling of forestry

Guidance on climate change is provided in this report in a number of ways:
- An appraisal of the development potential of a number of sites has been Section 8. This includes a review of the likely impacts of climate change.
- Section 6.8 includes specific guidance on development management in relation to flood risk, including a suggested approach to designing for climate change.
- In addition, the Western CFRAM reports and maps should be consulted for further information on climate change impacts.
6 Approach to Flood Management

6.1 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 6-1, 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 8. 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 and with reference to Section 8. 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 permissible on the ground floor within Flood Zone A or B.

<table>
<thead>
<tr>
<th>Zoning Objective</th>
<th>Indicative Primary Vulnerability</th>
<th>Flood Risk Commentary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>High vulnerability</td>
<td>Justification needs to be passed to allow zoning in Flood Zone A and B. For existing development, see Section 7.</td>
</tr>
<tr>
<td>Low Density Residential</td>
<td>High vulnerability</td>
<td>Justification needs to be passed to allow zoning in Flood Zone A and B. For existing development, see Section 7.</td>
</tr>
<tr>
<td>Community, Cultural and Institutional uses</td>
<td>Highly or less vulnerable</td>
<td>Justification needs to be passed to allow highly vulnerable development Flood Zone A and B and for less vulnerable development in Flood Zone B.</td>
</tr>
<tr>
<td>City Centre uses</td>
<td>Less vulnerable, with some highly vulnerable</td>
<td>Justification needs to be passed to allow highly vulnerable development Flood Zone A and B and for less vulnerable development in Flood Zone B.</td>
</tr>
<tr>
<td>Enterprise, Industrial and Related uses</td>
<td>Less vulnerable</td>
<td>Justification needs to be passed to allow zoning in Flood Zone B.</td>
</tr>
<tr>
<td>Recreational and amenity uses</td>
<td>Water compatible or less vulnerable</td>
<td>Water compatible uses are appropriate. Justification needs to be passed to allow less vulnerable development in Flood Zone B.</td>
</tr>
<tr>
<td>Agriculture and high amenity</td>
<td>Water compatible</td>
<td>Water compatible uses are appropriate. Development within these areas should avoid Flood Zone A and B.</td>
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<td>Agriculture</td>
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</tr>
<tr>
<td>Village envelope</td>
<td>Murroogh and Ardaun have been subject to SFRA within the LAP - see Section 2.3 for more details.</td>
<td></td>
</tr>
</tbody>
</table>

6.2 Development Management and Flood Risk
In order to guide both 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 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.

It should be noted that this section of the SFRA begins from the point that all land zoned for development has passed the Justification Test for Development Plans, and therefore Part 1 of the Justification Test for Development Management. In addition to the general recommendations in the following sections, Section 8 should be reviewed for specific recommendations for a number of development sites within the city, including details of the application of the Justification Test.

In order to determine the appropriate design standards for a development it may be necessary to undertake a site specific flood risk assessment. This 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.

6.3 Requirements for a Flood Risk Assessment

Assessment of flood risk is required in support of any planning application. 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.

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 FRA has been triggered.

Within the FRA the impacts of climate change and residual risk (including culvert/structure blockage) should be considered and remodelled where necessary, using an appropriate level of detail, in the design of finished floor levels. Further information on the required content of the FRA 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.

6.4 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. 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. 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), and more details and guidance are available on the 'Irish SuDS: Guidance and Tools' website.

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.

### 6.5 Development proposals 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, blocking 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 to a height that is above the 1 in 100 year fluvial or 1 in 200 year tidal flood level, with an allowance for climate change and freeboard, or to ensure a step up from road level to prevent surface water ingress. 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 (1 in 200 year) tide. Details of the approach to incorporating climate change impacts into the assessment and design are provided in Section 6.8.

### 6.6 Applications for Developments in Flood Zone A or B

#### 6.6.1 Minor Developments

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 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).

Generally the approach to deal with flood protection would involve raising the ground floor levels above the level of extreme high tides, or extreme river levels. However in some parts of the plan area, which are already developed, ground floor levels for flood protection could lead to floor levels being much higher than adjacent streets, thus creating a hostile streetscape for pedestrians. This would cause problems for infill development sites if floor levels were required to be significantly higher than those of neighbouring properties. In this regard, for the key sites in the plan area it has been recognised that ground floor levels below predicted high tide levels could be allowed, in limited circumstances, on a site by site basis, for commercial and business developments. In these cases, 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. For high risk areas, less vulnerable uses are encouraged at ground floor levels. A site specific FRA will inform appropriate uses and detailed design and layout.

It should be noted that for residential buildings within Flood Zone A or B, bedroom accommodation is more appropriate at upper floor levels.

For commercial operations, business continuity must be considered, and steps taken to ensure operability during and recovery after a flood event for both residential and commercial
developments. Emergency access must be considered as in many cases flood resilience will not be easily achieved in the existing built environment.

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.

6.6.2 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.

6.6.2.1 New development
It is 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.

6.6.2.2 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 8, which also details where such development has been justified. Of prime importance are 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.

6.6.3 Less vulnerable development in Flood Zone A or B
Less vulnerable development includes retail, leisure and warehousing and buildings used for agriculture and forestry. This category includes less vulnerable development in all forms, including refurbishment or infill development, and new development both in defended and undefended situations.

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.

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. However, 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.

Major developments may also be located in areas with a higher likelihood of flooding, provided the risks are understood, and accepted, and operability and emergency response is clearly defined; this may allow construction to a finished floor level which is lower than the 'ideal' starting point.
6.7 Key points for FRAs for all types of development

- Finished floor levels to be set above the 1% AEP fluvial (0.5% AEP tide) level, with an allowance for climate change plus a freeboard of at least 300mm. The freeboard allowance should be assessed and the choice justified.

- Flow paths through the site and areas of surface water storage should be managed to maintain their function and without causing increased flood risk elsewhere.

- Compensatory storage is to be provided to balance floodplain loss as a result of raising ground levels within Flood Zone A. The storage should be provided within the flood cell and on a level for level basis up to the 1% level.

- In a defended site, compensatory storage is not required, but the impact of removing the net reduction in floodplain storage should be assessed, and any impacts to existing development mitigated for the 0.1% event or a breach of these defences.

- A site is considered to be defended if the standard of protection is 1% AEP, within which a freeboard of at least 300mm is included. The FFL of the proposed development needs to take into account the impacts of climate change and other residual risks, including 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 levels from the channel inland.

- For less vulnerable development, it may be that a finished floor level as low as the 1% AEP level could be adopted, provided the risks of climate change are included in the development through adaptable designs or resilience measures. This approach should reflect emergency planning and business continuity to be provided within the development. It may reflect the design life of the development, the proposed use, the vulnerability of items to be kept in the premises, the occupants and users, emergency plan and inclusion of flood resilience and recovery measures.

6.8 Incorporating Climate Change into Development Design

As detailed throughout this SFRA, consideration and incorporation of the potential impacts of climate change into development layout and design is essential in areas that are at risk of flooding, or may be at risk of flooding in the future. The following summary provides an indication of allowances that should be considered when assessing the impacts of climate change. It should be noted that this information is intended as a guide only and there may be instances where it is appropriate for a greater or lesser allowance to be provided, particularly as climate change projections are further refined. The guidance does not necessarily relate directly to the vulnerability of the development used within the Planning Guidelines, but should be assessed on a case by case basis. For watercourses that fall within the Western CFRAM study area, water levels for future scenarios are being developed. For other watercourses a conservative approach would be to take the 0.1% AEP event levels 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.

For most development, including residential, nursing homes, shops and offices, the medium-range future scenario (20% increase in flows and / or 0.5m increase in sea level) is an appropriate consideration. This should be applied in all areas that are at risk of flooding (i.e. within Flood Zone A and B) and should be considered for sites which are in Flood Zone C but are adjacent to Flood Zone A or B. This is because land which is currently not at risk may become vulnerable to flooding when climate change is taken into account.

Where the risk associated with inundation of a development is low and the design life of the development is short (typically less than 30 years) the allowance provided for climate change may be less than the 20% / 0.5m level. However, the reasoning and impacts of such an approach should be provided in the site specific FRA.

Conversely, there may be development which requires a higher level response to climate change. This could include major facilities which are extremely difficult to relocate, such as hospitals, Seveso sites or power stations, and those which represent a high-economic and long term investment within the scale of development across the city. In such situations it would be reasonable to expect the high-end future scenario (30% increase in flow or 1m in sea level) to be
used as the design standard. In the case of coastal locations, and as climate projections are further developed, it may be prudent to demonstrate adaptability to even higher sea levels.

6.9 Flood Mitigation Measures at Site Design

For any development proposal in an area at moderate or high risk of flooding that is considered acceptable in principle, 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.

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 adopted 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, The Planning System and Flood Risk Management[11].

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. The Planning Guidelines do not advocate an approach of engineering solutions in order to justify the development which would otherwise be inappropriate.

6.9.1 Site Layout and Design

To address flood risk in the design of new development, a risk based approach should be adopted to locate more vulnerable land use to higher ground while water compatible development i.e. car parking, recreational space can be located in higher flood risk areas. Highly vulnerable land uses (i.e. residential housing) should 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. 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.

6.9.2 Ground levels, floor levels and building use

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.

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• 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).
• 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. 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 cases, 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.

Alternatively, assigning a water compatible use (i.e. garage / car parking) 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. Safe access and egress is a critical consideration in allocating ground floor uses.

Depending on the scale of residual risk, resilient and resistance measures may be an appropriate response but this will mostly apply to less vulnerable development.

6.9.3 Raised Defences

Construction of raised defences (i.e. flood walls and embankments) traditionally has been the response to flood risk. However, this is not a preferred option on an ad-hoc basis where the defences to protect the development are not part of a strategically led flood relief scheme. Where a defence scheme 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.

6.10 'Green Corridor'

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, a 'green corridor', is retained on all rivers and streams. This will have a number of benefits, including:

• Retention of all, or some, of the natural floodplain;
• Potential opportunities for amenity, including riverside walks and public open spaces;
• Maintenance of the connectivity between the river and its floodplain, encouraging the development of a full range of habitats;
• Natural attenuation of flows will help ensure no increase in flood risk downstream;
• Allows access to the river for maintenance works;
• 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 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, a green corridor has evolved which contributes to the benefits set out above.
7 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 7-1), taking into account circular PL02/2014 in relation to existing development.

Figure 7-1: Justification Test for Development Plans

7.1 Development on Greenfield Land

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 are the proposed residential land on the Headford Road and the RA lands with the specific objective at Lough Atalia. A Justification Test has been carried out for both of these sites and is discussed in Section 8. Other proposals for new development on greenfield land within Flood Zone A or B would not pass the Justification Test.

7.2 Existing, Developed, Zoned Areas at Risk of Flooding

7.2.1 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 area 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 B.1 and details of Part 3 of the Justification Test are provided in Section 8.1.

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. Further detail on the specifics of the flood management measures in these locations will be available in the Western CFRAM.
8 Specific Development Site Review

Within the Development Plan, a number of sites were identified as being potentially suitable for future development but were found to be wholly or partly within Flood Zones A and/or B. These sites were subject to the Justification Test for Development Plans (see Appendix B). 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 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.

In the following sections, an initial review of flood risk to the sites has been provided, 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.

Specific consideration for the sites has been given to ensure the criteria laid out under the Justification Test for Development Plans have been met. The outcome of the Justification Test review process for parts 1 and 2, as undertaken by the Council is detailed in Appendix A. Part 3 of the Justification Test is addressed through this report. Details of the flood risk within the opportunity sites and the consequences of the application of the Planning Guidelines are provided in table format below. The application of the sequential approach and where necessary, justification test, is an iterative process that is assessed in conjunction with the planning authorities; this process, for each of the opportunity sites, is informed by this section.

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. The forthcoming CFRAM study mean 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 and development will be considered premature until such works as recommended in the Western CFRAM have been carried out. In all cases, the advice on flood mitigation for site design contained in Section 6 should be followed, along with any site specific recommendations detailed in the following sections.
## 8.1 City Centre

### Site Description
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.

### Benefitting from Defences (flood relief scheme works)
There is 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.

### 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.

### Residual Risk
None as there are no permanent defences.

### Historical Flooding
Historic flooding has occurred on Dominick Street and Raven Place.

### 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.

### 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:
As required by the Planning Circular PL15/02, the Justification Test is required for highly vulnerable development in this area (see Appendix B.1).
## City Centre

The Western CFRAM Study will include a Flood Risk Management Plan for the city, and it is important that the plan is reviewed and actions related to reducing flood risk in this area be implemented prior to any major or new development taking place.

Prior to the CFRAM works taking place, development should be limited to minor works such as changes of use and refurbishment of existing buildings. In this case, flood management opportunities will be limited by the nature of the building and the neighbouring buildings and utilities, although opportunities to further reduce flood risk should be sought. This will primarily be in the form of finished floor levels (where possible) 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.
8.2 Nuns Island area

| Site Description | The site lies in Galway City Centre and is a mix of residential, recreational and institutional zoned lands. 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 8.1. |
| Benefit from Defences (flood relief scheme works) | The site does not benefit from the protection of any flood relief scheme. |
| 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. |
| 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 PL15/02, the Justification Test has been carried out for highly vulnerable development in this area (see Appendix B.1) Development in this area is likely to consist of redevelopment of existing buildings, so flood management opportunities 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
**Nuns Island area**

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.

There is sufficient information available from the CFRAM to assist applicants in preparing a simple flood risk assessment for site specific development proposals.
8.3 Undeveloped proposed residential land, Headford road

**Site Description**
The site is an undeveloped green field site zoned for residential use.

**Benefitting from Defences (flood relief scheme works)**
The site benefits greatly from the Dyke Road defence in Galway City which prevents flooding to all areas of Terryland. The site itself is low lying in nature and many drains exist in the area which flow into the Terryland River.

**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. Climate change will also increase the risk of the Dyke Road defence failing.

**Residual Risk**
Dyke road overtopping or breach

**Historical Flooding**
The land is marked ‘liable to floods’ on the 1829-41 6” historic OS
### Undeveloped proposed residential land, Headford road

| Surface Water | Should the site be developed, a 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 front of the site is within Flood Zone C, but the rear is subject to flooding from a few different sources i.e. Terryland River and the River Corrib and is within Flood Zone A.
- 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 up into the floodplain and may cause flooding through the drains onto the site. 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, but still possible.
- The River Corrib is prevented from spilling 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. Therefore it is critical to preventing flood risk to the subject site. However, the site is partly at risk from the 0.1% event, which overtops the Dyke Road embankment.
- There is also another flood risk potential to the site via the blockage of the existing drains to the Terryland River. If these drains block, surface water will be impounded by the Bother na dTreach road.

**Development Considerations:**
- Highly and less vulnerable development should be limited to the front of the site along the road. A site specific FRA will be required to demonstrate appropriate finished floor levels have been included in the development design; typically such levels will be at least 6.4mOD which includes freeboard and an allowance for climate change. Loss of floodplain storage, through landdraining in Flood Zone A, will not be permitted and uses at the low lying rear of the site should be limited to water compatible. This is because current and residual risks are high and will increase in the future as climate change impacts are realised.
- The Justification Test is not required because development of highly and less vulnerable uses will be limited to Flood Zone C.
8.4 Headford Road LAP Area - Western Section

Site Description
The site consists of existing commercial/retail development and surface parking. The site is 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 Development Plan as a significant redevelopment site. A LAP will be prepared for this area to guide its comprehensive redevelopment. Most of the site is between 4.7-5.3mAOD.

Benefitting from Defences (flood relief scheme works)
The site benefits greatly from the Dyke Road defence in Galway City which prevents flooding to the site. The site exists in an area directly adjacent to the embankment.
Headford Road LAP Area - Western Section

<table>
<thead>
<tr>
<th>Sensitivity to Climate Change</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual Risk</td>
<td>Dyke road overtopping or breach</td>
</tr>
<tr>
<td>Historical Flooding</td>
<td>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.</td>
</tr>
<tr>
<td>Surface Water</td>
<td>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.</td>
</tr>
</tbody>
</table>

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 site is located close 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, as shown in Appendix B.1. 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 Western CFRAM Study will include a Flood Risk Management Plan for the city, and it is important that the plan is reviewed and actions related to increasing the standard of protection of the Dyke Road embankment are actioned prior to major redevelopment behind the defence taking place.
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.
The Local Area Plan for the Headford Road Area sites (both eastern and western) 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.
The LAP should include the following additional flood management measures:
<table>
<thead>
<tr>
<th>Headford Road LAP Area - Western Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 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 locating highly vulnerable uses (and particularly sleeping accommodation) at first floor level.</td>
</tr>
<tr>
<td>• An emergency plan and evacuation procedure in the event of an embankment failure should be prepared along with any planning proposal for the site.</td>
</tr>
<tr>
<td>• Basements should be discouraged, and if included should be accessed from a level above the recommended finished floor level.</td>
</tr>
</tbody>
</table>
8.5 Headford Road LAP Area - Eastern Section

**Site Description**

The site comprises an existing shopping centre and surface car park. It has planning permission for significant redevelopment. A LAP will be prepared for this area. It lies within Flood Zone A which is based on the undefended runs with no Dyke embankment in place.

**Benefitting from Defences (flood relief scheme works)**

The site benefits greatly from the Dyke Road defence in Galway City which prevents flooding to the site.
<table>
<thead>
<tr>
<th><strong>Headford Road LAP Area - Eastern Section</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensitivity to Climate Change</strong></td>
</tr>
<tr>
<td><strong>Residual Risk</strong></td>
</tr>
<tr>
<td><strong>Historical Flooding</strong></td>
</tr>
<tr>
<td><strong>Surface Water</strong></td>
</tr>
</tbody>
</table>

**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 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 is 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.

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 LAP (when published) and the CFRAM Study.

As with the Western Section, the Western CFRAM Study will include a Flood Risk Management Plan for the city, and it is important that the plan is reviewed and actions related to increasing the standard of protection of the Dyke Road embankment are actioned prior to any development behind the defence taking place.

The Local Area Plan for the Headford Road Area sites (both eastern and western) 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.

The LAP 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.
8.6 Lough Atalia

Lough Atalia

Area zoned R and RA

The 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...
<table>
<thead>
<tr>
<th><strong>Lough Atalia</strong></th>
<th>where existing pedestrian access from the Dublin Road to the Lough Atalia Road is safeguarded.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benefitting from Defences (flood relief scheme works)</strong></td>
<td>There is no benefit to this site from any flood relief scheme works.</td>
</tr>
<tr>
<td><strong>Sensitivity to Climate Change</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Residual Risk</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Historical Flooding</strong></td>
<td>The land is marked 'liable to floods' on the 1829-41 6&quot; and the 1897-1913 25&quot; historic OS maps.</td>
</tr>
<tr>
<td><strong>Surface Water</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>

**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.
### 8.7 Dock Road

<table>
<thead>
<tr>
<th>Dock Road</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Map of Dock Road" /></td>
</tr>
</tbody>
</table>

<p>| Site Description | The site is a former Shell Oil Terminal and is currently vacant. It is zoned for city centre activities and particularly those which preserve the city centre as the dominant commercial area of the city. The prominent location of this city centre site adjacent to the waterfront and linked to the street network make it an attractive prime site for significant redevelopment for city centre uses. The site is in Flood Zone A and Flood Zone B. |
| Benefitting from Defences (flood relief scheme works) | There is no benefit to this site from any flood relief scheme works. |
| Sensitivity to Climate | The site is sensitive to climate change and in particular sea level |</p>
<table>
<thead>
<tr>
<th>Dock Road</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change</td>
</tr>
<tr>
<td>Residual Risk</td>
</tr>
<tr>
<td>Historical Flooding</td>
</tr>
<tr>
<td>Surface Water</td>
</tr>
</tbody>
</table>

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 (see Appendix B) 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 is significant climate implications that need to be considered in the FRA also. Suitable flood mitigation measures should be incorporated in the site specific flood risk assessment. This should take into account the vulnerability of the proposed development and the level of risk on site. Flood levels for the current and future scenarios may be obtained from the Western CFRAM. 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 will include flood management measures for this area, but it is considered that site specific flood management can be carried out in advance of the CFRAM recommendations being actioned.
# Murrough LAP

## Site Description

The Murrough LAP area is located along the coastal front of Galway Bay. It is envisaged that this area will be developed primarily for recreational purposes. Some mixed use development will also be considered and the creation of a new residential neighbourhood. Some parts of the coastal front are in Flood Zone A and Flood Zone B. The site rises in elevation rapidly away from the coastline.

## 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 frequency and depth of flooding, but has little impact on the extents.

## Residual Risk

None

## Historical Flooding

There is no record of flooding on this site.

## Surface Water

Recommendations for surface water management were included in the SFRA for the Murrough LAP area, and should be adhered to in any development proposals.

## Commentary on Flood Risk:

The flood risk is concentrated the front at the coastal boundary.

## Development Considerations:

All vulnerabilities of development are appropriate in Flood Zone C, although a drainage impact assessment will be required, and consideration should be given to design floor levels, as detailed in the FRA guidance in this SFRA. In particular, flood levels should be raised about 4.61mOD, which includes an allowance for climate change and freeboard. Sites which become isolated in an extreme flood should not be developed, even if they are above the recommended finished floor level. In consideration of wave overtopping, it is recommended that a buffer zone is created between development and breaking waves. This may be a formal zoning, or a specific objective to set development back from the shoreline, which would broadly lie in with the climate change flood extents.
9 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.

Galway City is currently subject to a detailed flood risk mapping and management study under the Western CFRAM. It will be necessary to review the results and recommendations of the Western CFRAM with respect to the city when the results become available, although as far as possible these have been incorporated into the guidance contained in this document.

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 9.1 SFRA Review Triggers

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Source</th>
<th>Possible Timescale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catchment Flood Risk Assessment and Management (CFRAM) Flood Hazard Mapping - Final</td>
<td>OPW under the Floods Directive</td>
<td>2015 - 2016</td>
</tr>
<tr>
<td>Western River Basin Flood Risk Assessment and Management (SFRAM) Plan</td>
<td>OPW</td>
<td>2016, and 6 yearly reviews</td>
</tr>
<tr>
<td>Flood maps of other sources, such as drainage networks</td>
<td>Various</td>
<td>Unknown</td>
</tr>
<tr>
<td>Significant flood events</td>
<td>Various</td>
<td>Unknown</td>
</tr>
<tr>
<td>Changes to Planning and / or Flood Management Policy</td>
<td>DoEHLG / OPW</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
Appendices

A  Flood Zone Mapping
### B  Justification Tests - Part 2

#### B.1  City Centre Residential

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>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:</td>
</tr>
<tr>
<td><strong>2(i)</strong></td>
<td>Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:</td>
</tr>
<tr>
<td><strong>2(ii)</strong></td>
<td>Comprises significant previously developed and/or under-utilised lands:</td>
</tr>
<tr>
<td><strong>2(iii)</strong></td>
<td>Is within or adjoining the core of an established or designated urban settlement:</td>
</tr>
<tr>
<td><strong>2(iv)</strong></td>
<td>Will be essential in achieving compact and sustainable urban growth; and,</td>
</tr>
<tr>
<td><strong>2(v)</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>
### B.2 Headford Road LAP Area - Eastern and Western Sections

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.</td>
</tr>
<tr>
<td>2</td>
<td>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:</td>
</tr>
<tr>
<td>2(i)</td>
<td>Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:</td>
</tr>
<tr>
<td>2(ii)</td>
<td>Comprises significant previously developed and/or under-utilised lands:</td>
</tr>
<tr>
<td>2(iii)</td>
<td>Is within or adjoining the core of an established or designated urban settlement:</td>
</tr>
<tr>
<td>2(iv)</td>
<td>Will be essential in achieving compact and sustainable urban growth; and,</td>
</tr>
<tr>
<td>2(v)</td>
<td>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.</td>
</tr>
</tbody>
</table>
## B.3 Dock Road Site

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.</td>
<td>Galway city is a designated Gateway under the National Spatial Strategy and is targeted for significant growth under the Regional Planning Guidelines. This site is a significant brownfield regeneration site at a strategic location in the city centre, adjacent to the waterfront and within the Inner Harbour area.</td>
</tr>
<tr>
<td><strong>2</strong> 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:</td>
<td></td>
</tr>
<tr>
<td><strong>2(i)</strong> Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:</td>
<td>This site is a strategic city centre brownfield site earmarked for comprehensive redevelopment, essential for the consolidation of the city centre and a key site in the regeneration of the Harbour area. The sustainable redevelopment of this serviced site will enhance role of the city centre as a regional retail centre.</td>
</tr>
<tr>
<td><strong>2(ii)</strong> Comprises significant previously developed and/or under-utilised lands:</td>
<td>This site was previously occupied by the Shell Oil Terminal and is currently vacant and underutilised.</td>
</tr>
<tr>
<td><strong>2(iii)</strong> Is within or adjoining the core of an established or designated urban settlement:</td>
<td>This site is within the city centre.</td>
</tr>
<tr>
<td><strong>2(iv)</strong> Will be essential in achieving compact and sustainable urban growth; and,</td>
<td>The sustainable development of this serviced site is essential in consolidating the city centre and will play an essential part in achieving a compact and sustainable city with its existing links to the city centre street network and proximity to Ceannst station a key sustainable transportation interchange.</td>
</tr>
<tr>
<td><strong>2(v)</strong> 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.</td>
<td>This serviced brownfield site at a prime city centre location is 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, its proximity to Ceannst station, a key sustainable transportation hub and its linkage to the city centre street network are characteristics which make this a unique site with significant potential to contribute to the sustainable development of the city. As such, there are no suitable alternative sites available.</td>
</tr>
</tbody>
</table>
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e:info@jbaconsulting.ie

JBA Consulting Engineers and Scientists Limited

Registration number 444752
Part 2 Strategic Flood Risk Assessment Addendum (September 2016)
Following consideration of the Draft Galway City Development Plan 2017-2023, accompanying environmental assessments and the Chief Executive’s Report on submissions received to the Draft Plan, the Elected Members agreed by resolution to amend the Draft Development Plan. 109 Material Alterations to the Draft Plan were proposed.

Proposed Material Alterations in relation to policy and land use zoning/specific objectives amendments have been reviewed and assessed having regard to the Planning System and Flood Risk Management - Guidelines for Planning Authorities (2009), the SFRA carried out of the Draft Plan and mitigation outlined in the Draft Plan - Chapter 9, Section 9.3 Flood Risk Assessment which ensures that flood risk is considered for all development proposals.

The following table outlines the Proposed Material Alterations which may have potential to impact on flood risk and required further consideration.

<table>
<thead>
<tr>
<th>Proposed Material Alteration</th>
<th>SFRA Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A8</strong> Rezone lands from RA to R (0.14ha) at Terryland adjacent to the Kirwan Roundabout.</td>
<td>These lands are located within Flood Zone A. This proposed material alteration relates to an existing single dwelling site, the majority of which is zoned for residential use. A section of the rear garden is zoned for RA use and it is proposed to rezone this section to residential use to reflect the existing use on the site. No additional significant impact would be expected to result from this proposed zoning change.</td>
</tr>
<tr>
<td><strong>A23</strong> Rezone lands from R and RA to Cl (0.77ha) at Moneenageisha Cross (The Huntsman Inn site).</td>
<td>A significant portion of these lands are located within Flood Zone B. Refer to Section 8.6 of the SFRA- Lough Atalia –Less vulnerable and water compatible uses are appropriate... Any potential re-development proposals on the site must be subject to detailed FRA. Section 8.4 of the SFRA for further guidance and comment. Special consideration would need to be given to the design and layout of the site and any development proposal, to manage risk to the development site and not to increase flood risk elsewhere. Refer to Appendix B of the Planning System and Flood Risk Management Guidelines.</td>
</tr>
<tr>
<td><strong>A31</strong> Rezone lands from R to RA (2.17 ha) off the Headford Road.</td>
<td>Lands near Suan and Brookdale along the Headford Road. These lands are largely within Flood Zone A. Refer to Section 8.3 of SFRA. These lands have been deemed not to meet the justification test as set out in the Planning System and Flood Risk Management Guidelines for Planning Authorities (2009). The proposed Material Alteration to change the zoning to an RA Land Use Zoning reflects the significant flood risk on this site and the incompatibility of the site for residential use and replacement by an appropriate land use zoning.</td>
</tr>
<tr>
<td><strong>A33</strong> Insert Specific Development Objective for development of lands for sports facilities and an amphitheatre at Lough Atalia.</td>
<td>A significant portion of these lands are located within Flood Zone A and B. Refer to Section 8.6 of the SFRA- Lough Atalia –Less vulnerable and water compatible uses are appropriate... Amenity open space, outdoor sports and recreation and essential facilities associated with this use can be considered within Flood Zone A/B, they are considered water compatible uses. The site itself includes Flood Zone A, B and C. Special consideration would need to be given to the design of the site and the risk of flooding. Refer to Appendix B of the Planning System and Flood Risk Management Guidelines.</td>
</tr>
<tr>
<td>A38</td>
<td>Insert Specific Development Objective in Section 11.2.6 to consider an increase in the plot ratio to support the redevelopment/modernisation of hotel at Terryland adjacent to Sandy Road.</td>
</tr>
<tr>
<td>A49</td>
<td>Insert Chapter 3 Transportation.</td>
</tr>
<tr>
<td>A50</td>
<td>Mapping Transport Alterations to Land Use Zoning and Specific Objectives Map</td>
</tr>
<tr>
<td>A66</td>
<td>Insert new Policy in Policy 5.1 Enterprise for preparation of a masterplan for the regeneration of lands and buildings at Nuns Island.</td>
</tr>
<tr>
<td>Proposed Amendment to SFRA</td>
<td>Improve Mapping in section 8 of SFRA to enable better identification. Amendment is recommended to provide mapping at a larger scale in the SFRA appendix. Up to date detailed flood mapping is available at <a href="http://www.cfram.ie">www.cfram.ie</a></td>
</tr>
</tbody>
</table>