

STAGE 2 STRATEGIC FLOOD RISK ASSESSMENT

FOR THE GORT LOCAL AREA PLAN 2013-2019

for: Galway County Council

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Section 1 Introduction and Policy Background

1.1 Introduction and Terms of Reference

Galway County Council has adopted the Gort Local Area Plan (LAP) 2013-2019 under the Planning and Development Act 2000 (as amended).

This document presents the results of the findings of the Strategic Flood Risk Assessment (SFRA) which was undertaken alongside the review of the Plan. The SFRA has been undertaken and prepared in accordance with 2009 *The Planning System and Flood Risk Management - Guidelines for Planning Authorities* Department of the Environment, Heritage and Local Government and Office of Public Works (see Section 1.2.4).

The SFRA is an assessment of flood risk within the Gort LAP area against which to assess the provisions of the Plan.

On adoption of the LAP the original version of this document which was placed on public display alongside the Draft Plan has been updated to provide this final document which will be made available alongside the adopted plan. Relatively minor changes have been made since the placing of the earlier version of this document on public display including changing the key that appears at Figure 3 Indicative Flood Risk Zone Map and changes to Section 3.6 'Recommendations and Mitigation'.

1.2 Flood Risk Management Policy

1.2.1 EU Floods Directive

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

- Carry out a preliminary assessment by December 2011 in order to identify the river basins and associated coastal areas where potential significant flood risk exists.
- Prepare flood hazard and risk maps for the identified areas by December 2013.
- Prepare flood risk management plans focused on prevention, protection and preparedness by December 2015. These plans are to include measures to reduce the probability of flooding and its potential consequences.

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

1.2.2 National Flood Policy

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

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

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

- Focus on managing flood risk, rather than relying only flood protection measures aimed at reducing flooding
- Taking a catchment-based approach to assess and manage risks within the whole-catchment context
- Being proactive in assessing and managing flood risks, including the preparation of flood maps and flood risk management plans.

1.2.3 National CFRAM Programme

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

The Programme comprises three phases as follows:

- The Preliminary Flood Risk Assessment (PFRA) in 2011;
- The CFRAM Studies and parallel activities, from 2011 to 2015; and
- Implementation and Review from 2016 onwards.

The Programme provides for three main consultative stages as follows:

- PFRAs in 2011;
- Flood Hazard Mapping, in 2013; and
- Flood Risk Management Plans in 2015.

The Office of Public Works is the lead agency for flood risk management in Ireland. The coordination and implementation of Government policy on the management of flood risk in Ireland is part of its responsibility. The European Communities (Assessment and Management of Flood Risks) Regulations 2010 (S.I. No. 122) identifies the Commissioners of Public Works as the 'competent authority' with overall responsibility for implementation of the Floods Directive 2007/60/EC which includes requirements to prepare a preliminary assessment by 2011, flood risk mapping by 2013 and flood risk management plans by 2015. It is the principal agency involved in the preparation of Flood Risk Assessment and Management studies (FRAMs).

The PFRAs identified areas at risk of significant flooding and includes maps showing areas deemed to be at risk. The areas deemed to be at significant risk, where the flood risk that is of particular concern nationally, are identified as Areas for Further Assessment (AFAs) and more detailed assessment on the extent and degree of flood risk will be required in these areas.

1.2.4 DEHLG and OPW Flood Risk Management Guidelines

1.2.4.1 Introduction

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

The core objectives of the Guidelines are to:

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

1.2.4.2 Principles of Flood Risk Management

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

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

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

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

1.2.4.3 Stages of SFRA

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

Stage 1 Flood risk identification – to identify whether there may be any flooding or surface water management issues related to either the area of regional planning guidelines, development plans and LAP's or a proposed development site that may warrant further investigation at the appropriate lower level plan or planning application levels;

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

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

1.2.4.4 Flood Zones

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

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

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

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

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

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

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

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

Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

Section 2 Stage 1 SFRA - Flood Risk Identification

2.1 Introduction

Stage 1 SFRA (flood risk identification) was undertaken in order to identify whether there may be any flooding or surface water management issues within the Gort LAP area and consequently whether Stage 2 SFRA (initial flood risk assessment) should be proceeded to for the Draft Plan.

2.2 Data Considered

The Stage 1 SFRA was a desk-based exercise based on existing information on flood risk indicators and involved consulting with a range of sources as detailed on Table 1 below. Maps of the sources of flood risk indicators for the LAP area are provided as Figure 1 and Figure 2.

Information Source	Description	Is flood related information included for the LAP area?
Aerial Photography/ Local Knowledge	Aerial photographs were taken during the November 2009 flood event. The aerial photography covers a time period significantly after the flood peak which local verbal reports suggest was at least 1m higher again.	Yes.
OPW Preliminary Flood Risk Assessment (PFRA) Fluvial, Coastal, Groundwater and Pluvial flood maps	<p>The Draft OPW Preliminary Flood Risk Assessment (PFRA) mapping dataset has been arrived at by:</p> <ul style="list-style-type: none"> • Reviewing records of floods that have happened in the past; • Undertaking analysis to determine which areas might flood in the future, and what the impacts might be; and • Extensive consultation with each local authorities and other Government departments and agencies. <p>This assessment has considered all types of flooding, including that which can occur from rivers, the sea and estuaries, heavy rain, groundwater, the failure of infrastructure, and so on. It has also considered the impacts flooding can have on people, property, businesses, the environment and cultural assets.</p>	Yes fluvial, pluvial and groundwater areas present. No coastal areas present.
National Coastal Protection Strategy Study flood and coastal erosion risk maps	<p>The predicted flood extents which were produced under the Irish Coastal Protection Strategy Study (ICPSS) are based on analysis and modelling. The project included:</p> <ul style="list-style-type: none"> • Analysis of historic recorded sea levels • Numerical modelling and statistical analysis of combined tide levels and storm surges to estimate extreme water levels along the national coastline for defined probabilities • Calculation of the extent of the predictive flooding, by comparing calculated extreme tide and surge waters levels along the coast with ground level based on a Digital Terrain Model (DTM). <p>These indicative national coastal flood maps are included in the Draft PFRA Maps, provided in a separate volume, for the purposes of consultation on the PFRA.</p>	No.
Alluvium Soils	Mineral alluvial soil mapping is an AnTeagasc dataset indicative of recurrent or significant fluvial flooding at some point in the past.	Yes.

Information Source	Description	Is flood related information included for the LAP area?
Western CFRAM Flood Risk Review	The Western CFRAM Flood Risk Review (JBA for OPW, May 2011) was undertaken to help validate the findings of the PFRA, informing decisions on which sites will be taken forward as Areas for Further Assessment for a more detailed assessment within the CFRAM Programme. A key focus of the review was to provide a 'Recommended Extreme Flood Outline' estimation that replaces the existing PFRA fluvial outlines where the outlines are considered to be significantly in error. The guidelines for creating the 'Recommended Extreme Flood Outline' were simply for the assessor to amend existing outlines where they were considered to be either over or under estimated, or to create new outlines where flood probability is not presented by the PFRA outlines. The 'Recommended Extreme Flood Outline' is not linked to a specific return period but it is expected to be in or around the 1% AEP to 0.1% AEP event (1 in 100; 1 in 1000).	Yes.
Data from OPW: Recorded Flood Events or Extents	A flood event is the occurrence of recorded flooding at a given location on a given date. The Flood event is derived from different types of information (reports, photographs etc.). A flood extent is an inundated area as recorded at a certain moment in time.	Yes.
'Liable to flood' markings on the historic OSI '6 Inch' maps (and CAAS extrapolation of same)	The Ordnance Survey of Ireland (OSI) 6" mapping identifies broad areas as being <i>Liable to Floods</i> . These maps were based on survey work carried out from 1833-1844 with many updated in the 1930s and 40s.	Yes ¹ .
Flood Time Water Body November 2009 (Satellite Imagery)	This dataset was extracted using remote sensing of satellite data taken during the November 2009 flood event given to the OPW by SERTIT, France.	Yes.
OPW Flood Extents	This layer of information estimates areas which were inundated area at a certain moment in time during a flood (includes 1995 flood).	Yes.
Data from OPW: Benefitting lands	Benefitting lands mapping is a dataset identifying land that might benefit from the implementation of Arterial (Major) Drainage Schemes (under the Arterial Drainage Act 1945) and indicating areas of land estimated or reported to be subject to flooding or poor drainage.	No.
Data from OPW: Drainage Districts	This drainage scheme mapping dataset was prepared on behalf of the Drainage Districts (Local Authorities with statutory responsibility for maintenance under the Arterial Drainage Act, 1925). These maps identify land that might benefit from the implementation of Arterial (Major) Drainage Schemes and indicate areas of land subject to flooding or poor drainage.	No.
Data from OPW: Land Commission	This dataset indicates areas of land defended to some degree against flooding that were formerly the responsibility of the Land Commission.	No.

¹CAAS Extrapolation of Areas Liable to Floods digitised from 6" OSI mapping: For the purpose of the SFRA, areas liable to floods were extrapolated by CAAS and digitised from the 6" OSI mapping. *Liable to floods* text was identified on the map sheets and then surrounding field boundaries were used in order to delineate the areas liable to flood. The extrapolated areas include (as identified by the 6" field boundaries):

- a. Any field which is beneath '*Liable to Floods*' words;
- b. All contiguous fields (whole fields are included) containing an Ozier/Reed/Marsh symbol (these are vegetation symbols included on the 6" maps which are indicative of wet/water logged soil).

Information Source	Description	Is flood related information included for the LAP area?
River Basin Management Plans and reports	Implementation of the EU Floods Directive is required to be coordinated with the requirements of the EU Water Framework Directive and the current River Basin Management Plans.	No.
Previous Strategic Flood Risk Assessments	<p>For the purpose of implementing the WFD, Ireland has been divided into eight river basin districts or areas of land that are drained by a large river or number of rivers and the adjacent estuarine / coastal areas. The management of water resources will be on these river basin districts. The Gort area falls within the Western River Basin District (WRBD).</p> <p>Within each river basin district - for the purpose of assessment, reporting and management - water has been divided into groundwater, rivers, lakes, estuarine waters and coastal waters which are in turn divided into specific, clearly defined water bodies.</p> <p>The Local Authorities located in the WRBD - including Galway County Council - have prepared a River Basin Management Plan. The Plan identifies the status of water bodies within the RBD and provides objectives in order to implement the requirements of the WFD.</p>	Not applicable - no others have been prepared to date.
Regional Planning Guidelines for the West Region	The Regional Planning Guidelines for the West Region are accompanied by a Regional Flood Risk Appraisal which examines the relationship between the Draft Regional Planning Guidelines, flood risk in the West Region and the management of flood risk.	No.

Table 1 Information Sources Consulted with for the Identification of Flood Risk

2.3 Summary of Limitations of Data Used

A summary of the general limitations of the flood risk indicators present within the LAP area are provided on Table 2 below.

Flood Risk Indicator	Summary of General Limitations
Aerial Photography/ Local Knowledge	Aerial photographs were taken during the November 2009 flood event. The aerial photography covers a time period significantly after the flood peak which local verbal reports suggest was at least 1m higher again.
OPW Preliminary Flood Risk Assessment (PFRA) Fluvial, Coastal and Pluvial flood maps	<p>The PFRA is only a preliminary assessment, based on available or readily derivable information. Analysis has been undertaken to identify areas prone to flooding, and the risks associated with such flooding, but this analysis is purely indicative and undertaken for the purpose of completing the draft PFRA. The mapping has been developed using simple and cost-effective methods and is based on broad-scale simple analysis and may not be accurate for a specific location/use.</p> <p>The prime source will ultimately be the flood zone maps produced by the OPW, but where these have not been prepared or are not on watercourses that will be covered by a CFRAM study then the planning body or developer will need to refer to alternative sources of information.</p> <p>Further information on the purpose, development and limitations of the OPW PFRA Maps are available in the available report (see www.cfram.ie).</p> <p>In general terms within the zoned environs of Gort the PFRA mapping appears to significantly understate the extent of flooding compared to that what was recorded as actually occurring in the aerial photography. It should be noted that the aerial photography covers a time period significantly after the flood peak which local verbal reports suggest was at least 1m higher again.</p> <p>Taken together this evidence strongly suggests that a very conservative approach needs to be employed when using any mapping to inform land-use planning.</p>
Alluvium Soils	This dataset does not provide full coverage and is found to provide a reasonable indicator of high-medium probability fluvial flood hazard.
'Liable to flood' markings on the historic OSI '6 Inch' maps (and CAAS extrapolation of same)	<p>The 'Liable to flood' markings were based on survey work carried out from 1833-1844 with many updated in the 1930s and 40s, they do not show or take any account of recent changes including changes in surface drainage, such as development in floodplains, road realignments or drainage works for forestry or agriculture. So there is significant potential that flood risk in some areas may have increased or reduced since they were prepared.</p> <p>The OSI maps simply show the text Liable to Floods without delineating the extent of these areas. For the purposes of the SFRA, a GIS system has been used to indicate the likely potential extent of these areas. This exercise is an extrapolation using available data and may include errors.</p>
Flood Time Water Body November 2009 (Satellite Imagery) and OPW Flood Extents	These data sources are based on individual events and do not incorporate a predictive component/return period.
Western CFRAM Flood Risk Review	The 'Recommended Extreme Flood Outline' is not linked to a specific return period although it is expected be in or around the 1% AEP to 0.1% AEP event (1 in 100; 1 in 1000).

Table 2 Summary of Limitations of Data Used

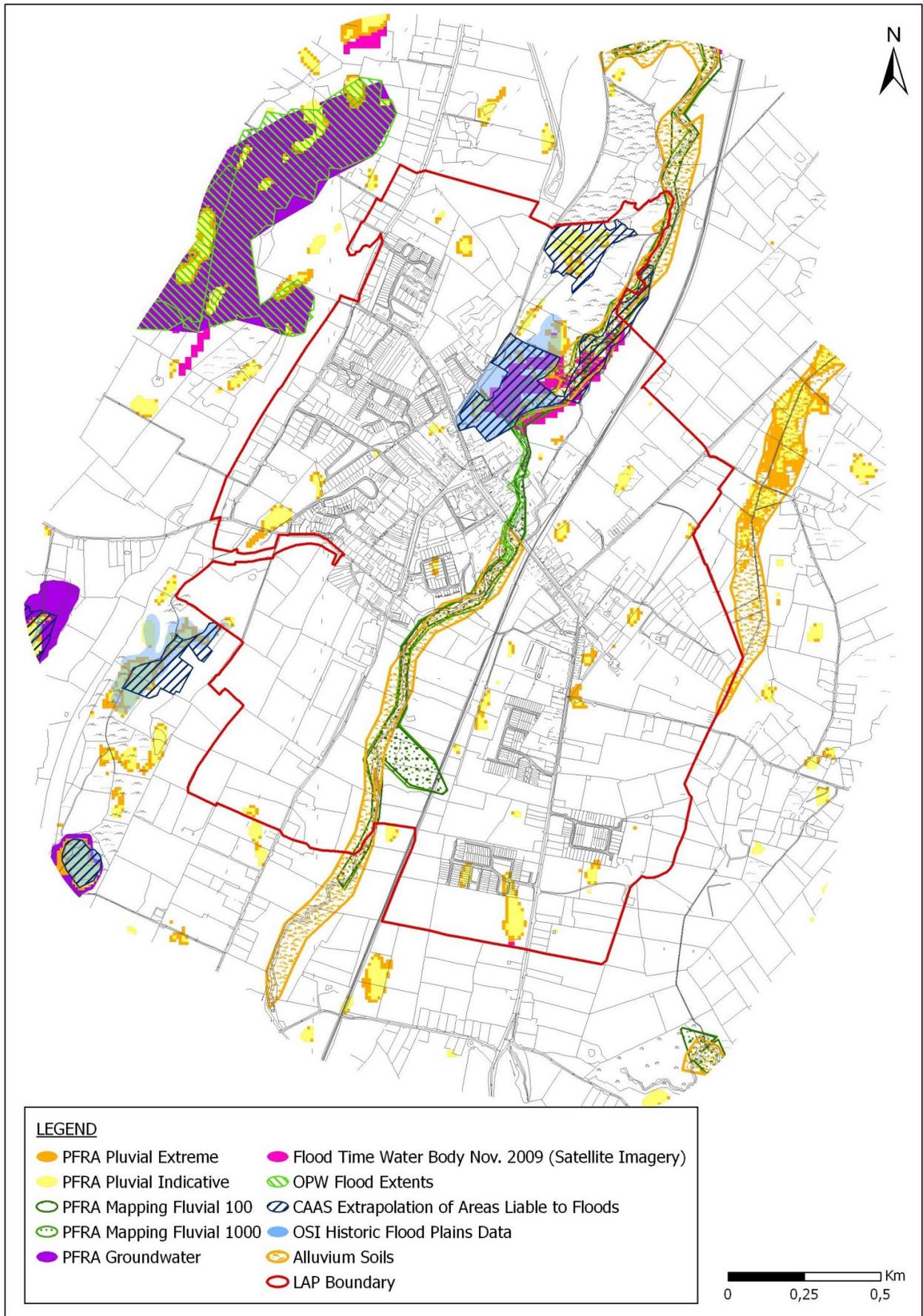


Figure 1 Flood Risk Indicators Map 1

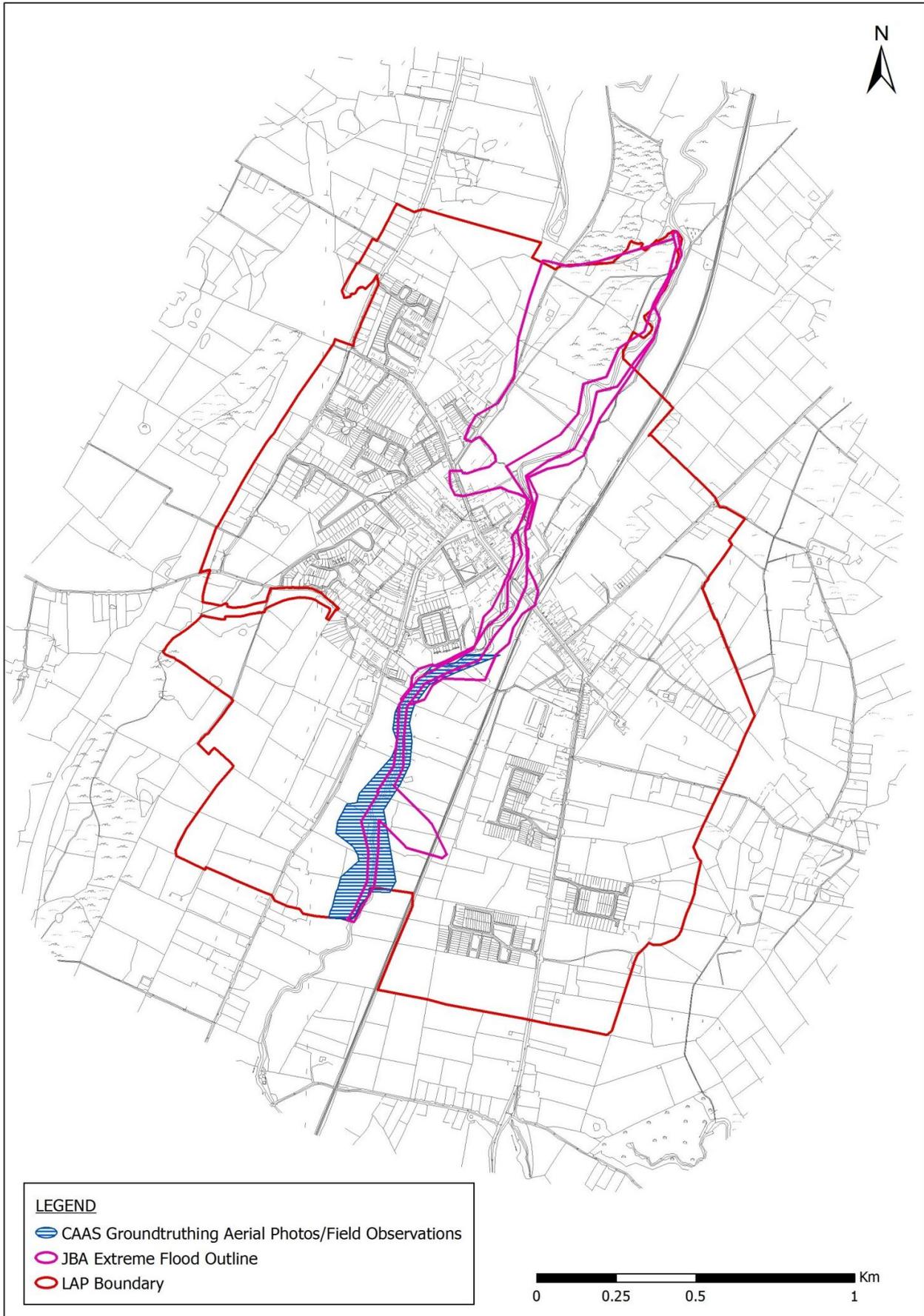


Figure 2 Flood Risk Indicators Map 2

2.4 Conclusion

After considering available information the planning authority considered that there was a potential flood risk issue and the SFRA proceeded to Stage 2.

Section 3 Stage 2 SFRA - Initial Flood Risk Assessment

3.1 Introduction

A Stage 2 SFRA (initial flood risk assessment) was undertaken to:

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

3.2 Site Walkovers

In order to inform the Stage 2 assessment, the settlement and its zoned environs were inspected on foot to examine, inter alia, the potential sources of flooding (including that from Cannahowna/Gort River), locations of topographic and built features that coincide with the flood indicator related boundaries and to identify vegetation associated with standing water (including flag iris).

3.3 Flood Risk Indicator Information Considered

Flood risk indicator information which was considered during the Stage 2 SFRA including the site walkovers included the following (the sources for this information are described in more detail under Section 2).

- Aerial Photography of the November 2009 event and Local Knowledge;
- Alluvium Soils Mapping;
- CAAS Extrapolation of Areas Liable to Floods digitised from 6" OSI mapping;
- Flood Time Water Body November 2009 (Satellite Imagery);
- OPW Flood Extents;
- OPW Preliminary Flood Risk Assessment (PFRA) Mapping:
 - Fluvial Indicative 100 and Fluvial Extreme 1000 mapping (Fluvial 1% and .1% Annual Exceedance Probabilities or AEPs);
 - Pluvial Indicative and Pluvial Extreme mapping; and
 - Groundwater mapping.
- Western CFRAM Flood Risk Review:
 - 'Recommended Extreme Flood Outline' (expected to be in or around the 1% AEP to 0.1% AEP event).

3.4 Adequacy of Existing Information and Site Walkover Findings

A significant discrepancy between the aerial photographs of flooding upstream and downstream of Gort from the November 2009 event and the mapping of flood indicators was identified. In general terms, within the zoned environs of Gort, the mapping appears to significantly understate the extent of flooding compared to that what was recorded as actually occurring in the aerial photography. It should be noted

that the aerial photography covers a time period significantly after the flood peak which local verbal reports suggest was at least 1m higher again. Taken together this evidence strongly suggests that a very conservative approach needs to be employed when using any mapping to inform land-use planning.

The Western CFRAM Flood Risk Review (JBA for OPW, May 2011) was undertaken to help validate the findings of the PFRA, informing decisions on which sites will be taken forward as Areas for Further Assessment for a more detailed assessment within the CFRAM Programme. A key focus of the review was to provide a 'Recommended Extreme Flood Outline' estimation that replaces the existing PFRA fluvial outlines where the outlines are considered to be significantly in error. The guidelines for creating the 'Recommended Extreme Flood Outline' were simply for the assessor to amend existing outlines where they were considered to be either over or under estimated, or to create new outlines where flood probability is not presented by the PFRA outlines. The 'Recommended Extreme Flood Outline' is not linked to a specific return period but it is expected to be in or around the 1% AEP to 0.1% AEP event (1 in 100; 1 in 1000). Mapping from the Review was considered by this study and was found to more closely match the observations made on the ground than other flood risk indicators.

In addition to these findings, it was identified by reference to the aerial photography that an area to the south of the town, between the Cannahowna/Gort River and the Tubber Road flooded during the November 2009 event.

3.5 Indicative Flood Risk Zone Maps²

An Indicative Flood Risk Zone (see Figure 3) map was produced taking into account the findings of the ground truthing, site walkovers and analysis of the aerial photography. The zones are comprised as follows:

Indicative Flood Risk Zone A (Dark Blue) is a combination of:

- PFRA Fluvial Indicative 100 mapping;
- Extreme Flood Outline boundary from the Western CFRAM Flood Risk Review; and
- An area to the south of the town, between the Cannahowna/Gort River and the Tubber Road which is shown by the aerial photography of the November 2009 event to have flooded.

Indicative Flood Risk Zone B (Light Blue) is a combination of Zone A plus:

- Areas of PFRA Fluvial Extreme 1000 mapping that is not covered by the area covered by the Extreme Flood Outline boundary from the Western CFRAM Flood Risk Review

For groundwater flooding, it was determined that it would not be possible to develop model-based flood maps for groundwater emergence due to a lack of data, and so alternative methods were required based on, inter alia, the use of existing mapping of past groundwater flood events and the delineation of flood extents around turloughs based on an assumed height of flooding of 4m above the base elevation of the turlough. No specific event probability was generated for the Groundwater PFRA mapping and the mapping is likely to represent 'quite extreme events'. A Technical Report³ available from the OPW describes the process for the development of these maps in detail.

For pluvial flooding, the process for developing the pluvial flood extent maps (Flood Risk Assessment and Management Programme: National Pluvial Screening Project for Ireland – Rep EX6335/2.0, HR

²In rivers with a well-defined floodplain or where the coastal plain is well defined at its rear, the limits of Zones A and B will virtually coincide. Zone B will only be significantly different in spatial extent from Zone A where there is extensive land with a gentle gradient away from the river or the sea. With regard to climate change flood extents these 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.

³ Preliminary Flood Risk Assessment, Groundwater Flooding, Mott Macdonald, 2010

Wallingford, November 2010) was based on 'dropping' various depths and intensities of rainfall over a range of durations, and modelling how that rainfall would flow over the land and, in particular, pond in low-lying areas. The rainfall events (depth, duration and intensity) were derived from the rainfall analysis undertaken by Met Éireann on behalf of the OPW for the Flood Studies Update research programme. The amount of rainfall that was absorbed by the ground or, in urban areas, drained by the urban storm-water drainage system, and hence deducted from the water that would flow overland and pond, was estimated. It must be noted however that process assumed a constant capacity of urban storm-water drainage systems and generally did not taken into account local drainage structures such as culverts through embankments or other local drainage that would not be resolved in the model used for the mapping at a national scale. In addition to the above limitations, there are further intrinsic uncertainties associated with pluvial flooding and it can be influenced by, for example, blocked drains.

Taking these issues into account, it is recommended the Council deal with pluvial and groundwater risk through a Plan policy or objective⁴. The mapping of the following layers is presented separately (see Figure 4);

- PFRA Pluvial Indicative; and
- PFRA Pluvial Extreme.

⁴Planning applications on lands identified within groundwater and pluvial PFRA areas shall be accompanied by a Site-specific Flood Risk Assessment that corresponds with that outlined under Chapter 5 'Flooding and Development Management' of the DEHLG Flood Guidelines (2009). Such assessments shall be prepared by suitably qualified experts with hydrological experience and shall quantify the risks and the effects of any necessary mitigation, together with the measures needed or proposed to manage residual risks.

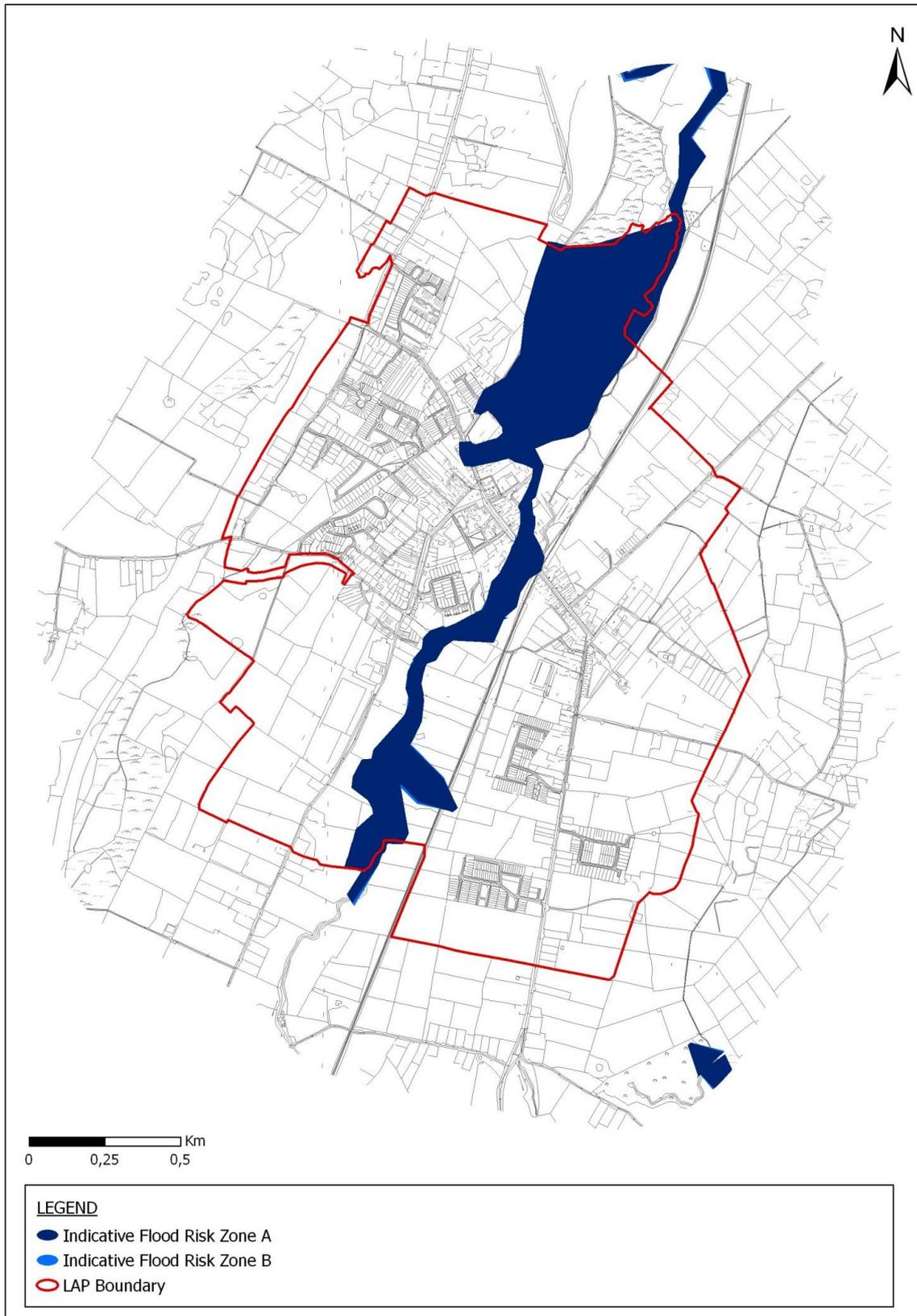


Figure 3 Indicative Flood Risk Zone Map⁵

⁵Indicative Flood Risk Zone A - Site visits, local knowledge and groundtruthing of flood indicators, including Western CFRAM Flood Risk Review, aerial photography and PFRA 100

Indicative Flood Risk Zone B - Site visits, local knowledge and groundtruthing of flood indicators, including aerial photography and PFRA 1000

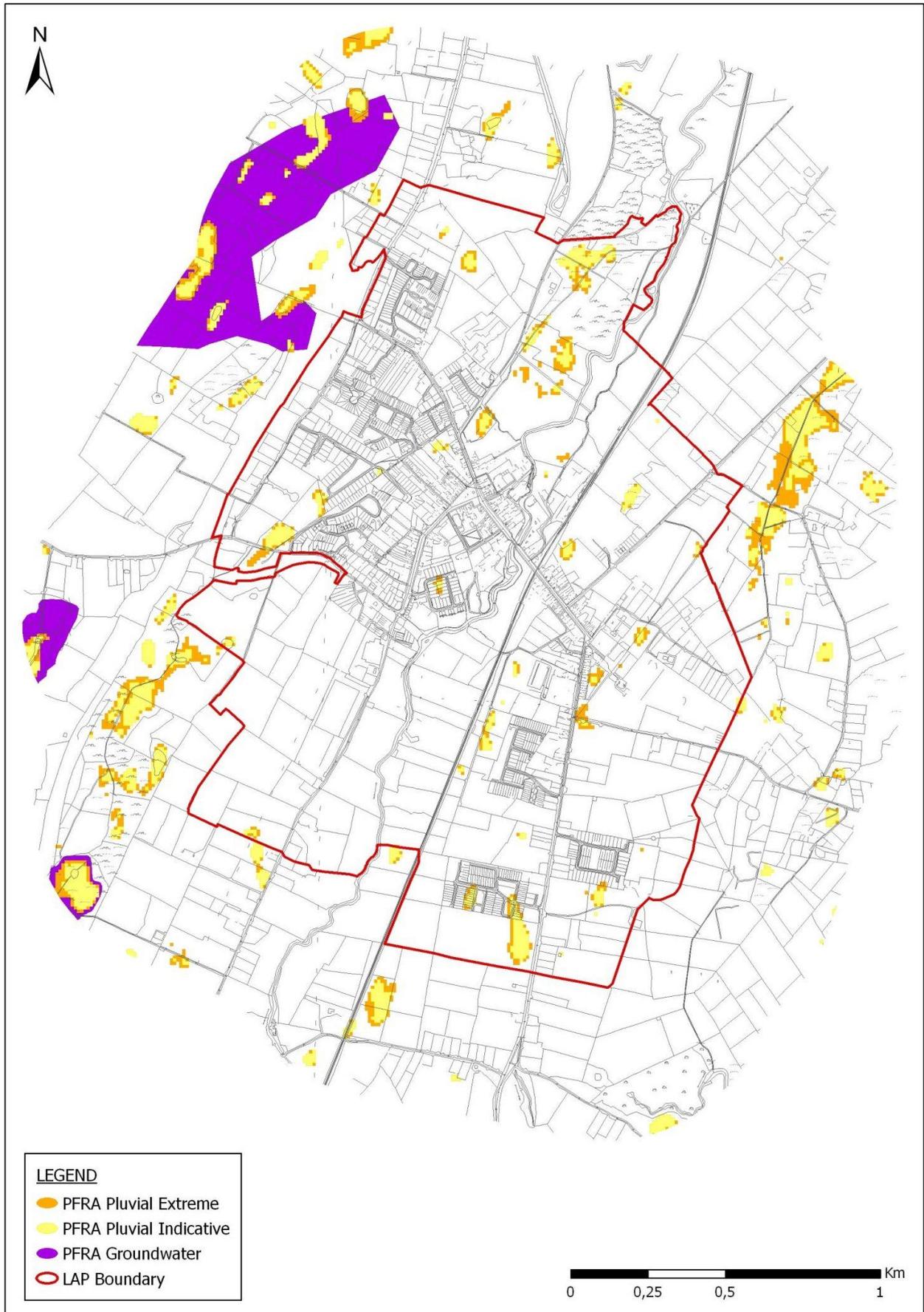


Figure 4 PFRA Pluvial and Groundwater Areas

3.6 Recommendations and Mitigation

Recommendations have been made in order contribute towards the avoidance and reduction of flood risk.

The following measures have been integrated into the Draft Plan:

Measure	Plan reference
<p>Protect Flood Zone A and Flood Zone B from inappropriate development and direct developments/ land uses into the appropriate Flood Zone in accordance with the Flood Risk Management Guidelines 2009 (or any superseding document) and the guidance contained in DM Standard UI 1- Flood Zones and Appropriate Land Use. Where a development/land use is proposed that is inappropriate within the Flood Zone, then the development proposal will need to be accompanied by a Development Management Justification Test and Site-Specific Flood Risk Assessment in accordance with the criteria set out under the Flood Risk Management Guidelines 2009.</p> <p><i>Refer to the summary of provisions of the Guidelines in Appendix I of the Stage 2 SFRA for the Gort LAP which is a separate supporting document.</i></p>	<p>Objective UI9 – Flood Zones and Appropriate Land Uses</p>
<p>It is the policy of Galway County Council to support, in co-operation with the OPW, the implementation of the EU Flood Risk Directive (2007/60/EC), the Flood Risk Regulations (SI No. 122 of 2010) and the DEHLG/OPW publication Flood Risk Management Guidelines 2009 (and any updated/superseding legislation or policy guidance). Galway County Council will also implement the relevant aspects of the Western Catchment Flood Risk Assessment and Management Study (Western CFRAMS, the output of which will be a Flood Risk Management Plan for the catchment), along with the mitigation measures and recommendations arising from the associated SEA and Appropriate Assessment. Galway County Council will also take account of the Preliminary Flood Risk Assessment (PFRA) and the Stage 2 Strategic Flood Risk Assessment for the Gort LAP Area and any recommendations and outputs arising from same that relate to or impact on the Plan Area.</p>	<p>Policy UI2 – Flood Risk Management</p>
<p>Ensure the implementation of the DEHLG/OPW publication Flood Risk Management Guidelines 2009 (or any updated/superseding document) in relation to flood risk management within the Plan Area. This will include the following:</p> <ul style="list-style-type: none"> a) Avoid, reduce and/or mitigate, as appropriate in accordance with the Flood Risk Management Guidelines 2009, the risk of flooding within the flood risk areas indicated on Flood Zone A and Flood Zone B, including fluvial, pluvial and groundwater flooding, and any other flood risk areas that may be identified during the period of the Plan or in relation to a planning application. b) Development proposals in areas where there is an identified or potential risk of flooding (including pluvial and/or groundwater flooding) or that could give rise to a risk of flooding elsewhere may be required to carry out a Site-Specific Flood Risk Assessment, and Justification Test where appropriate, in accordance with the provisions of The Planning System and Flood Risk Management Guidelines for Planning Authorities 2009, (or any superseding document). Any flood risk assessment should include an assessment of the potential impacts of climate change, such as an increase in the extent or probability of flooding, and any associated measures necessary to address these impacts c) Development that would be subject to an inappropriate risk of flooding 	<p>Objective UI8– Flood Risk Management and Assessment</p>

<p>or that would cause or exacerbate such a risk at other locations shall not normally be permitted.</p> <p>d) Galway County Council shall work with other bodies and organisations, as appropriate, to help protect critical infrastructure, including water and wastewater, within the plan area, from risk of flooding. Where certain measures proposed to mitigate or manage the risk of flooding associated with new developments/critical infrastructure are likely to result in significant effects to the environment or European sites downstream, such measures will undergo environmental assessment and Habitats Directive Assessment, as appropriate.</p>	
<p>Planning applications on lands identified within groundwater and pluvial PFRA areas shall be accompanied by a Site-specific Flood Risk Assessment that corresponds with that outlined under Chapter 5 'Flooding and Development Management' of the DEHLG Flood Guidelines (2009). Such assessments shall be prepared by suitably qualified experts with hydrological experience and shall quantify the risks and the effects of any necessary mitigation, together with the measures needed or proposed to manage residual risks.</p>	<p>Objective UI11 – Groundwater and Pluvial Flood Risk</p>
<p>Where the probability of flooding from rivers is low (less than 0.1%, flood zone C) the developer should satisfy him or herself that the probability of flooding is appropriate to the development being proposed. Among other things, mapping including the OPW's Pluvial and Groundwater Preliminary Flood Risk Assessment mapping should be considered for this purpose.</p>	<p>Policy UI3 – Flood Risk in Pluvial and Groundwater Flood Areas</p>
<p>In the case of lands transected by the outer boundary of Indicative Flood Zone A or B, where it can be demonstrated to the satisfaction of the Planning Authority (by more detailed local topographic survey information) that the outer boundary does not reflect local topographical and /or flood path conditions, the Planning Authority may consider the extension of uses allowed in an adjacent land use zone into the Indicative Flood Zone area. The proposal will also be subject to the submission of a Site Specific Flood Risk Assessment and Justification Test as appropriate and the developer satisfying the Planning Authority and him/herself that the probability of flooding is appropriate to the development being proposed and will not increase flood risk elsewhere.</p>	<p>Integrated into Objective UI12 – Boundaries of Flood Zones</p>

Appendix I: Summary of Related Provisions contained in the DEHLG Flood Guidelines for Indicative Flood Zones A and B

- The Sequential Approach, including the Justification test -

The key principles of the risk-based sequential approach (see Figure 5) to managing flood risk in the preparation of plans are set out in Chapter 3 of the DEHLG Flood Guidelines and should be followed for the review of the Gort Local Area Plan. These principles are:

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

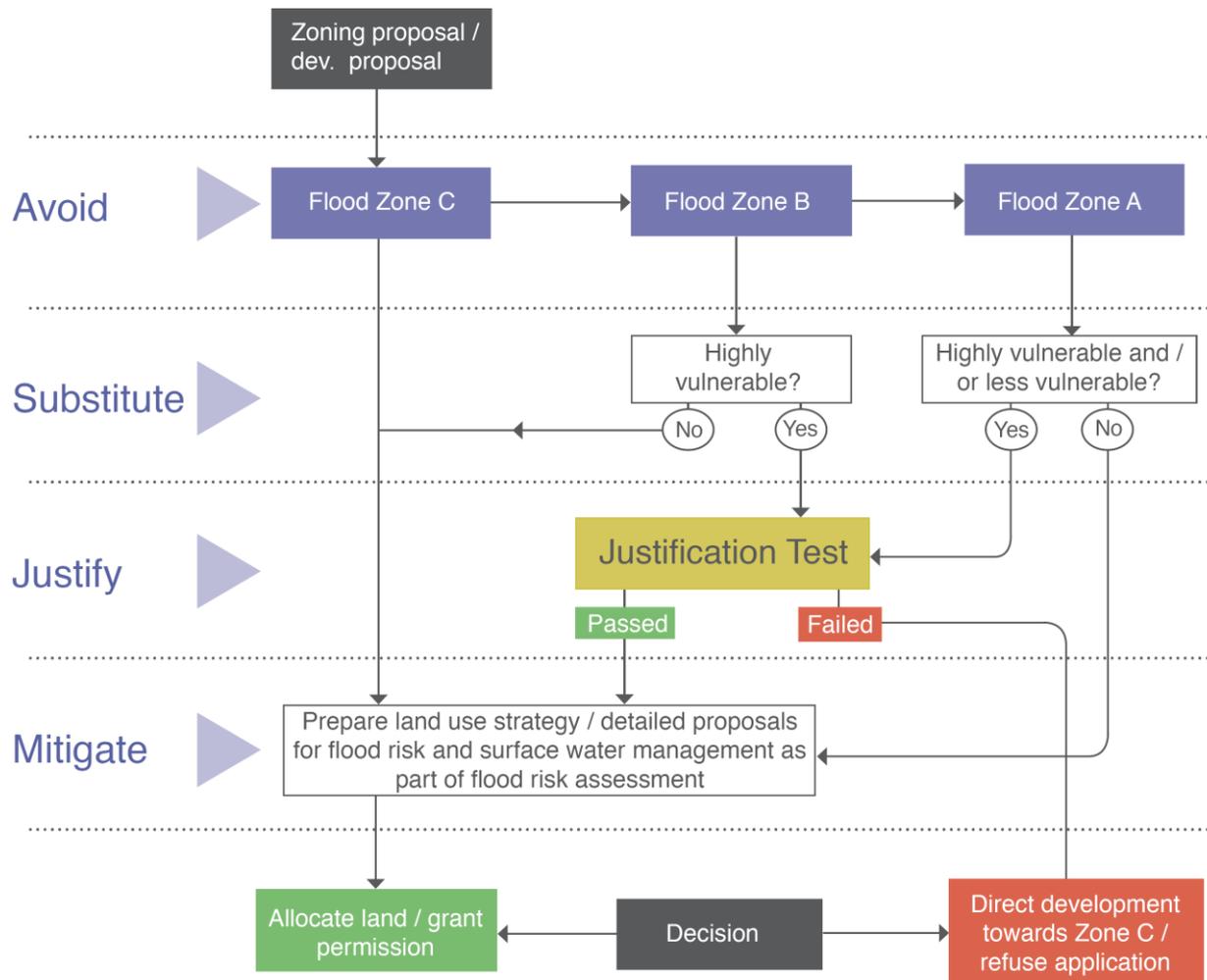


Figure 5 Sequential Approach Process⁶

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

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

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

Zone C - Low probability of flooding. Development in this zone is appropriate from a flood risk perspective (subject to assessment of flood hazard from sources other than rivers and the coast) but

⁶ Flood Zone C covers all areas outside of Zones A and B

would need to meet the normal range of other proper planning and sustainable development considerations.

Table 3 overleaf classifies the vulnerability of different types of development while Table 4 identifies the appropriateness of development belonging to each vulnerability class within each of the flood zones as well as identifying what instances in which the Justification Test should be undertaken. Inappropriate development that does not meet the criteria of the Justification Test should not be considered at the plan-making stage or approved within the development management process.

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

Table 3 Classification of vulnerability of different types of development

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

Table 4 Vulnerability Classes and Flood Zones

The **Justification Test** which is referred to as part of the Sequential Approach is an assessment of whether a development proposal within an area at risk of flooding meets specific criteria for proper planning and sustainable development and demonstrates that it will not be subject to unacceptable risk nor increase flood risk elsewhere.

The justification test should be applied only where development is within flood risk areas that would be defined as inappropriate under the screening test of the sequential risk based approach outlined above. This Justification Test is shown on the table below

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

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

N.B. The acceptability or otherwise of levels of any residual risk should be made with consideration for the proposed development and the local context and should be described in the relevant flood risk assessment.

Figure 6 Justification Test