STAGE 2 STRATEGIC FLOOD RISK ASSESSMENT

FOR THE

HEADFORD LOCAL AREA PLAN 2015 – 2021

AS AMENDED ON FOOT OF MINISTERIAL DIRECTION ON 17TH DECEMBER 2015

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 a Local Area Plan (LAP) for Headford.

The preparation and adoption of the Plan has undergone an appropriate level of Strategic Flood Risk Assessment (SFRA) and this document presents the findings of the SFRA. The SFRA is an assessment of flood risk within Headford and includes mapped boundaries for Indicative Flood Risk Zones, taking into account factors including local knowledge, photography, site walkovers and flood risk indicators.

The SFRA has been undertaken and prepared in accordance with *The Planning System and Flood Risk Management - Guidelines for Planning Authorities* (Department of the Environment, Heritage and Local Government and Office of Public Works, 2009) and Department of the Environment, Community and Local Government Circular PL 2/2014.It has also taken into account submissions made by environmental authorities including the Department of the Environment, Heritage and Local Government and the Office of Public Works.

1.2 Summary of Conclusion and Recommendations

The purpose of this document is to detail the findings of the Stage 2 SFRA which has been undertaken alongside the preparation and adoption of the Plan. The SFRA has informed the Plan and enabled compliance with the Flood Risk Management Guidelines. All SFRA recommendations – including those related to land use zoning and flood risk management provisions – have been integrated into the Plan.

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

1.3.1 Flood Risk

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

Lands within Headford are vulnerable to flooding and this vulnerability can be exacerbated by changes in both the occurrence of severe rainfall events and associated flooding. Local conditions such as low-lying lands and slow surface water drainage increase the risk of flooding. This risk can be increased by, for example, human actions including clearing of natural vegetation and new built development in the flood plains of rivers as well as by changing weather patterns.

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

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

1.4 Flood Risk Management Policy

1.4.1 EU Floods Directive

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

- Carry out a preliminary assessment by 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 (these maps are currently – October 2015 – in the process of being finalised).
- Prepare flood risk management plans focused on prevention, protection and preparedness by (draft plans are currently scheduled for 2016). 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.

1.4.2 National Flood Policy

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

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

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

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

1.4.3 National CFRAM Programme

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

The Programme comprises three phases as follows:

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

The Programme provides for three main consultative stages as follows:

- PFRAs in 2011;
- Flood Hazard Mapping, in 2013 (these maps are currently – October 2015 – in the process of being finalised); and
- Flood Risk Management Plans, drafts of which are currently scheduled for 2016.

The OPW is the lead agency for flood risk management in Ireland. The coordination and implementation of Government policy on the management of flood risk in Ireland is part of its responsibility. The European Communities (Assessment and Management of Flood Risks) Regulations 2010 (S.I. No. 122) identifies the Commissioners of Public Works as the 'competent authority' with overall responsibility for implementation of the Floods Directive 2007/60/EC which includes requirements to prepare a preliminary assessment by 2011, flood risk mapping by 2013 (these maps are currently – October 2015 – in the process of being finalised) and flood risk management plans, drafts of which are currently scheduled for 2016. 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 is currently being undertaken in these areas with the objective of producing Flood Hazard Mapping. Headford was not deemed to be an AFA.

1.4.4 Flood Risk Management Guidelines

1.4.4.1 Introduction

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

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

1.4.4.2 Principles of Flood Risk Management

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

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

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

Development in areas 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.

1.4.4.3 Stages of SFRA

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

Stage 1 Flood risk identification – to identify whether there may be any flooding or surface water management issues related to either the area of regional 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.

1.4.4.4 Flood Zones

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

Flood risk = Likelihood of flooding x 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.

1.5 Emerging Information

It is important to note that compliance with the requirements of the Flood Risk Management Guidelines is currently based on emerging and incomplete data as well as estimates of the locations and likelihood of flooding. The assessment and mapping of areas of flood risk, in particular, still awaits the finalisation of both Flood Hazard and Risk Maps for Areas for Further Assessment (AFAs) (currently – October 2015 – in the process of being finalised) and for Flood Risk Management Plans (drafts of which are currently scheduled for 2016).

The purpose of the CFRAM Studies is to assess and map existing and potential future flood hazard and flood risk within the AFAs and to identify viable structural and non-structural flood risk management measures for the AFAs and within each river catchment as a whole (in catchment-based Flood Risk Management Plans). The implications of these plans for Headford, which is located within the Western River Basin District but not designated as an AFA, are uncertain at this point in time.

Future SFRAs undertaken for Headford will integrate other new and emerging data, including, when available, any relevant information contained in the Flood Risk Management Plans.

1.6 Content of the Plan

The Headford Local Area Plan consists of a written statement and accompanying appendices and maps including a land use zoning map. The most relevant parts of the Plan for this SFRA relate to the land use zoning map and provisions relating to flood risk management (recommendations with respect to these are provided under Section 4).

It is noted that, as part of the Plan preparation process, various Material Alterations were proposed to be made to the original Draft Plan which was placed on public display. Some of these proposals conflicted with the requirements contained in the Flood Risk Management Guidelines. The Elected Members were informed of this conflict and adopted a Plan (on the 28th of September 2015) which did not conflict with the provisions of the Flood Risk Management Guidelines. This Plan, however, included a number of Alterations which were contrary to the Chief Executive's recommendation. The land use zoning map from the Plan which was adopted on the 28th of September 2015 (and which came into effect on the 26th of October 2015) is provided at Figure 1 overleaf.

On the 17th of December 2015 a Section 31 Ministerial Direction was issued in respect of eleven amendments directing that the Plan be altered. The land use zoning map from the Plan as amended on the 17th of December 2015 is provided at Figure 2 overleaf. This amended Plan does not conflict with the provisions of the Flood Risk Management Guidelines.

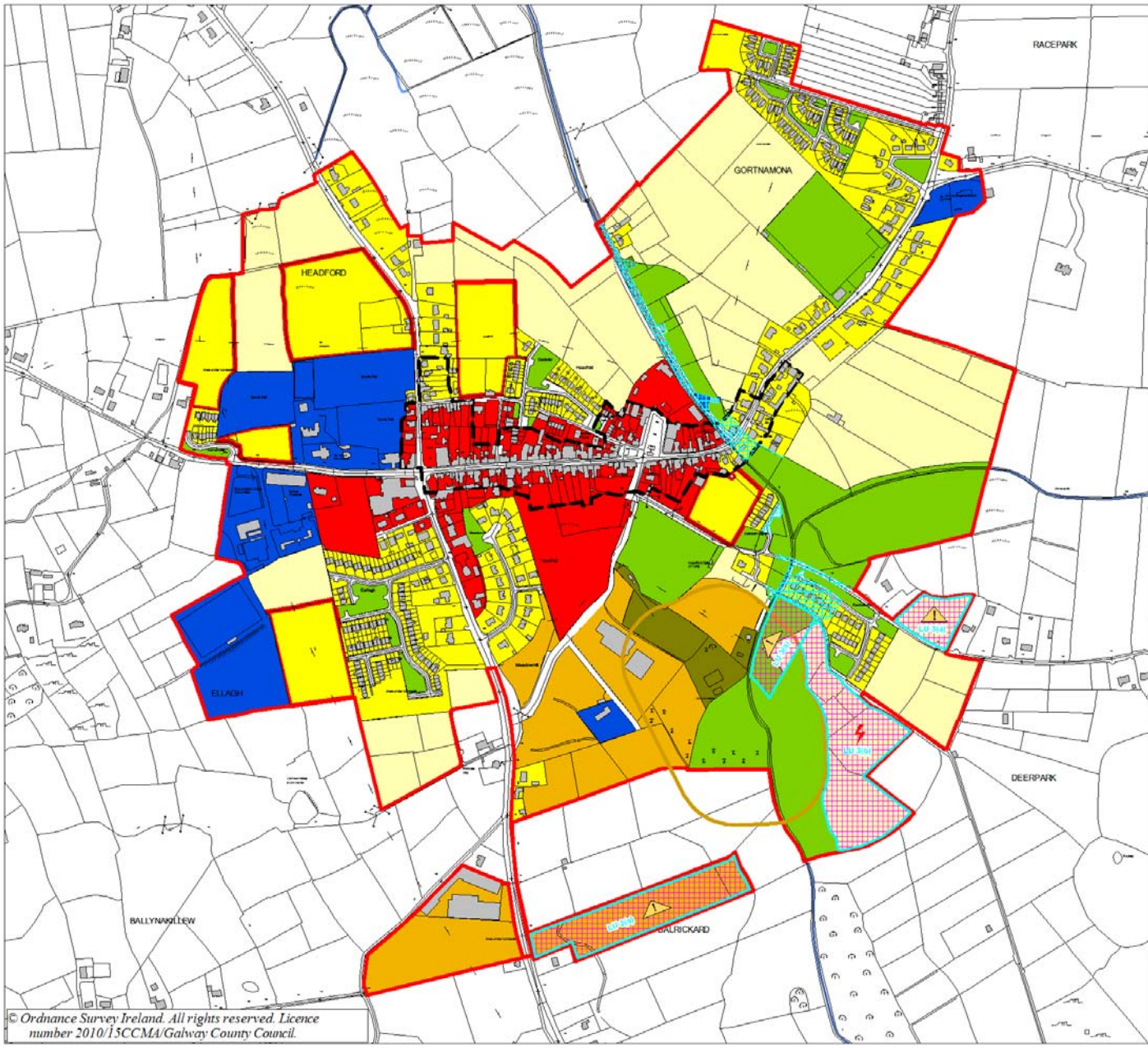

Figure 1 Land Use Zoning Map from the Plan as adopted on the 28th of September 2015

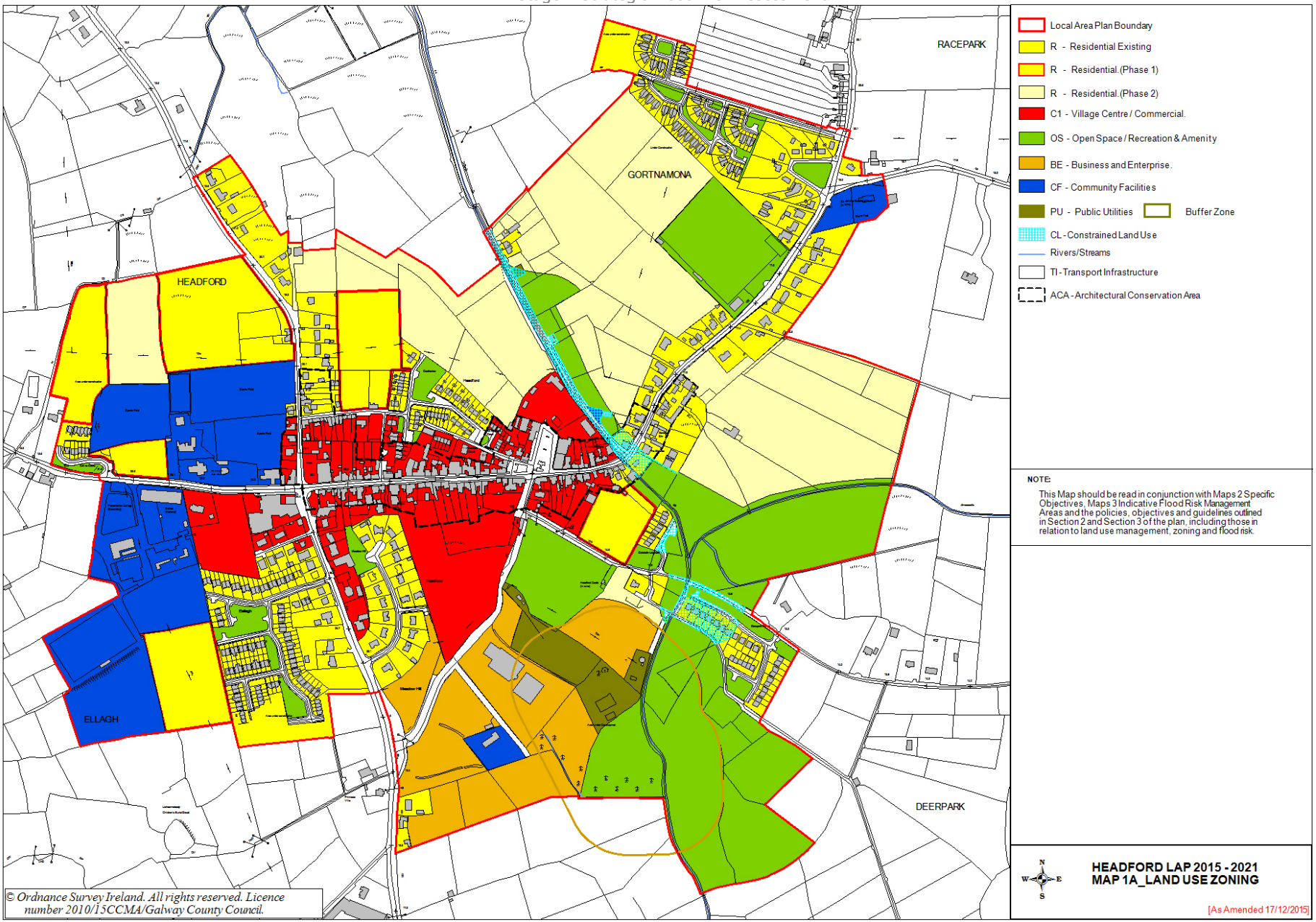

Figure 2 Land Use Zoning Map from the Plan as amended on the 17th of December 2015

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 town and consequently whether Stage 2 SFRA (initial flood risk assessment) should be proceeded to. The Stage 1 SFRA was based on existing information on flood risk indicators and involved consulting with a range of sources as detailed under Section 2.3 below. The information provided in this section clearly identifies a potential flood risk issue within the Plan area, a Stage 2 SFRA was proceeded to.

2.2 River Sub-Basin and Water Bodies[1]

Headford is located within River Sub Basin *WE_Corrib_Headford* (*European Code IE_WE_30_3484*) which has an area of 23.88km^2. The Headford River rises around one and a half kilometres to the north of Headford in the townland of Ballyfruit. It flows in a general south-eastward direction until approximately 200m after it passes through a culvert under after the N84; here it meets with the Annacoortia Stream (which rises approximately 3.5 km to the north of Headford at the townland of Coolnee) and flows in a southerly direction for approximately 2km towards the village of Cooleen. At Cooleen it is joined by the Cloghanower Stream, flowing into Lough Corrib approximately 2km to the south west of Cooleen at Lishsheennageeha.

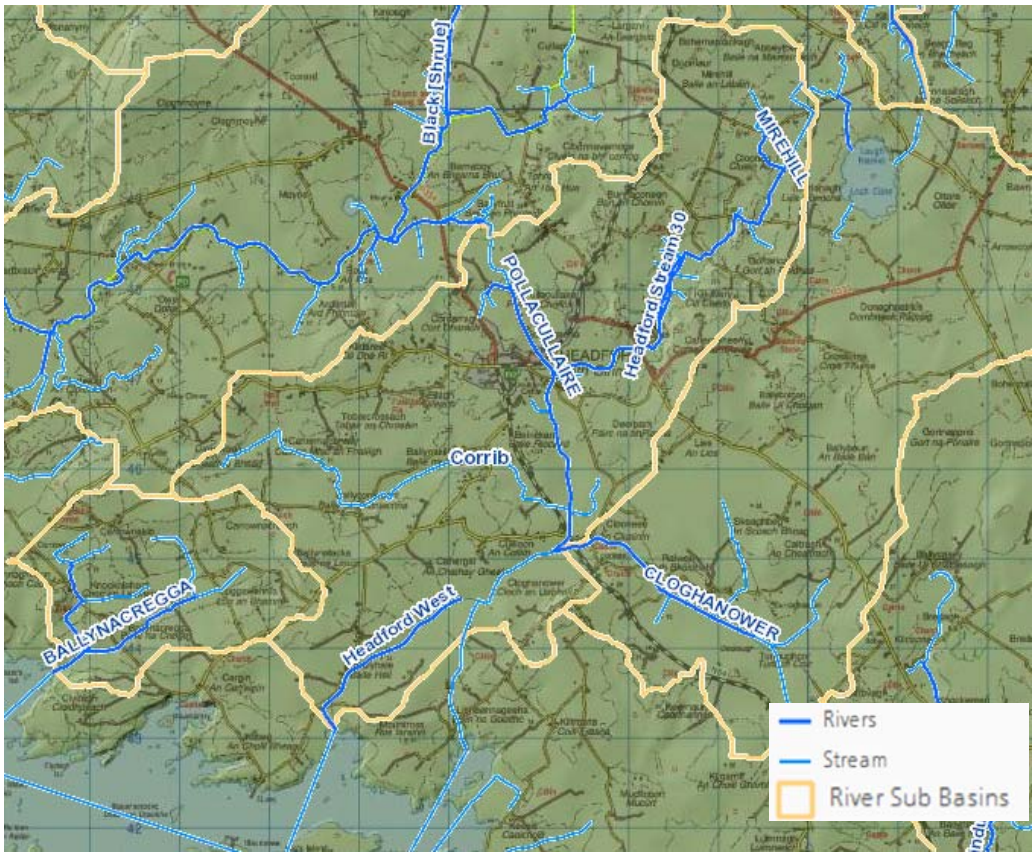

Figure 3 River Sub-Basin, Rivers and Streams
Source: Environmental Protection Agency

[1] The text of this report uses the following local names of rivers: the Headford River (referred to in Figure 2 as the Pollacullaire) and the Annacoortia Stream (referred to in Figure 2 as the Headford Stream).

2.3 Flood Risk Indicators

Indicators of flood risk that are based on historical flooding events are identified and described on Table 2 below.

Indicators of flood risk that are based on computational models are identified and described on Table 3 below.

Table 2 Historical Flood Risk Indicator Mapping

Information Source	Description	Spatial Spread	Strategic Limitations	Figure No. in this report
Benefitting lands (OPW)	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.	For Headford, these lands have been identified at various locations across the current Plan area. Various channels within the Plan area are part of the Corrib – Headford Arterial Drainage Scheme	Identifies broad areas - low resolution for flood risk management	Figure 4
Drainage Districts (OPW)	This drainage scheme mapping dataset was prepared on behalf of the Drainage Districts (Local Authorities with statutory responsibility for maintenance under the Arterial Drainage Act, 1925). These maps identify land that might benefit from the implementation of Arterial (Major) Drainage Schemes and indicate areas of land subject to flooding or poor drainage.	For Headford, these lands have been identified in the northern edge of the current Plan area.	Identifies large broad areas - very low resolution for flood risk management	Figure 4
Alluvium Soils	Mineral alluvial soil mapping is indicative of recurrent or significant fluvial flooding at some point in the past and was generated by Teagasc with co-operation of the Forest Service, EPA and GSI. This project was completed May 2006.	Mineral Alluvium soil is identified in the northern fringes of the current Plan area.	Drainage may have changed significantly since these soils were deposited.	Figure 4
Road Closures & Lengths November 2009	This dataset has been prepared by Galway County Council's Roads Department and identifies the road closures and major roads closed during the November 2009 event. The road lengths (lines) which have been drawn are approximate and are compiled entirely of eye witness, anecdotal evidence mainly noted over the phone from area staff and members of the public i.e. no surveying was involved.	Road closure along the south eastern boundary of the current plan area	Potential errors in evidence and approximated closed roads lengths	Figure 4
Photographs	The OPW provided aerial photography capturing lands within and outside of the Plan area during the 2009 flood.	Coverage limited to certain areas	Coverage limited to certain areas	OPW file of photographs used in the assessment but not reproduced in this document.

Entries from the following information sources have not been identified within the existing Plan area.				
Information Source	**Description**	**Spatial Spread**	**Strategic Limitations**	**Figure No. in this report**
Flood Events and Flood Extents from the OPW	A flood event is the occurrence of recorded flooding at a given location on a given date. The flood event is derived from different types of information (reports, photographs etc.). A flood event that has occurred more than once at a certain area is named a recurring flood event. A flood extent is an inundated area as recorded at a certain moment in time.	There are no flood events within the existing Plan area recorded on the floodmaps.ie dataset.	This dataset only provides a spot location and does not list flood events which have not been recorded as part of the dataset.	Not applicable.
'Liable to flood' markings on the historic OSI '6 Inch' maps	The Ordnance Survey of Ireland (OSI) 6" mapping identifies broad areas as being *Liable to Floods.*	There are no 'Liable to flood' areas identified within the existing Plan area (although some exist outside this area).	The OSI maps simply show the text Liable to Floods without delineating the extent of these areas. For the purposes of these draft maps a GIS system has been used to indicate the likely potential extent of these areas. As these maps 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.	Not applicable.

Table 3 Modelled Flood Risk Indicator Mapping

Information Source	Description	Spatial Spread	Strategic Limitations	Figure No. in this report
OPW Preliminary Flood Risk Assessment (PFRA) Fluvial, Groundwater and Pluvial flood maps	The OPW PFRA mapping dataset has been arrived at by: • 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. This assessment has considered all types of flooding, including that which can occur from rivers, the sea and estuaries (not relevant for Headford), heavy rain, groundwater, the failure of infrastructure, and so on. It has also considered the impacts flooding can have on people, property, businesses, the environment and cultural assets. Further information on the purpose and development of the OPW PFRA Maps are available on www.cfram.ie.	PFRA fluvial mapping includes lands adjacent to the Headford River and the Annacoortia Stream as they flow through the current Plan area. PFRA groundwater mapping does not include areas within the current Plan area. Pockets of PFRA pluvial mapping are found at a number of locations within the Plan boundary	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.	PFRA Fluvial is provided on Figure 5 while PFRA for pluvial and groundwater is provided on Figure 6

Emerging data from the Western CFRAM Study	Emerging data from the Western CFRAM Study - such as that contained in the Flood Risk Reviews for certain settlements - may inform lower tier plans or planning applications. The Western CFRAM Flood Risk Review was undertaken to help validate the findings of the PFRA, informing decisions on which sites will be taken forward as Areas for Further Assessment (AFAs) for a more detailed assessment within the CFRAM Programmes. The Flood Risk Review recommended "non-AFA Status" for the settlement of Headford; Headford was not subsequently identified as an AFA.	General comments about village and specific comments with respect to flood risk at and north of N84 culvert[2]. Note that the N84 bridge was upgraded since the publication of the Flood Risk Review[3]. There are other culverts upstream of this culvert.	Study was to examine whether area presented a significant enough risk as to be taken forward as an AFA – not focused upon flood hazard in all undeveloped areas.	Not applicable.

[2]

Western CFRAM Study Flood Risk Review general comments:

- Likely errors in predictive mapping, and no other strong evidence to indicate that the area is prone to significant flood risk.
- Flood outlines same for 1% and 10% events but no history of flooding in village.
- Galway County Council Area Engineer knows of no history of flooding in this location.
- OPW office located adjacent to watercourse and regional engineers based here know of no history of flooding.
- No formal flood defences.

Western CFRAM Study Flood Risk Review comments with respect to flood risk at and north of N84 culvert:

- Culvert under the N84 may have hydraulic influence during high flows and cause flooding onto the road and surrounding property.
- Upstream of the N84 the watercourse is very small and overgrown with vegetation. The channel is relatively large for the flow and flooding is unlikely.
- The N84 culvert and some nearby small bridges may exacerbate flooding problems but there is no history of flooding.
- The 10% AEP (1 in 10) flood outline showing many properties at risk in this area is therefore considered unrealistic. The 1% (1 in 100) outline is however more realistic.

[3] **Note on N84 bridge (over Headford River) upgrade**

- The N84 Headford Bridge over Headford River was upgraded since the publication of the Western CFRAM Study Flood Risk Review in 2012. The supporting information that was submitted with the Section 50 estimates that Headford Bridge would have a soffit freeboard of 1360 mm in a 1 in 100 year (high end future scenario) event.

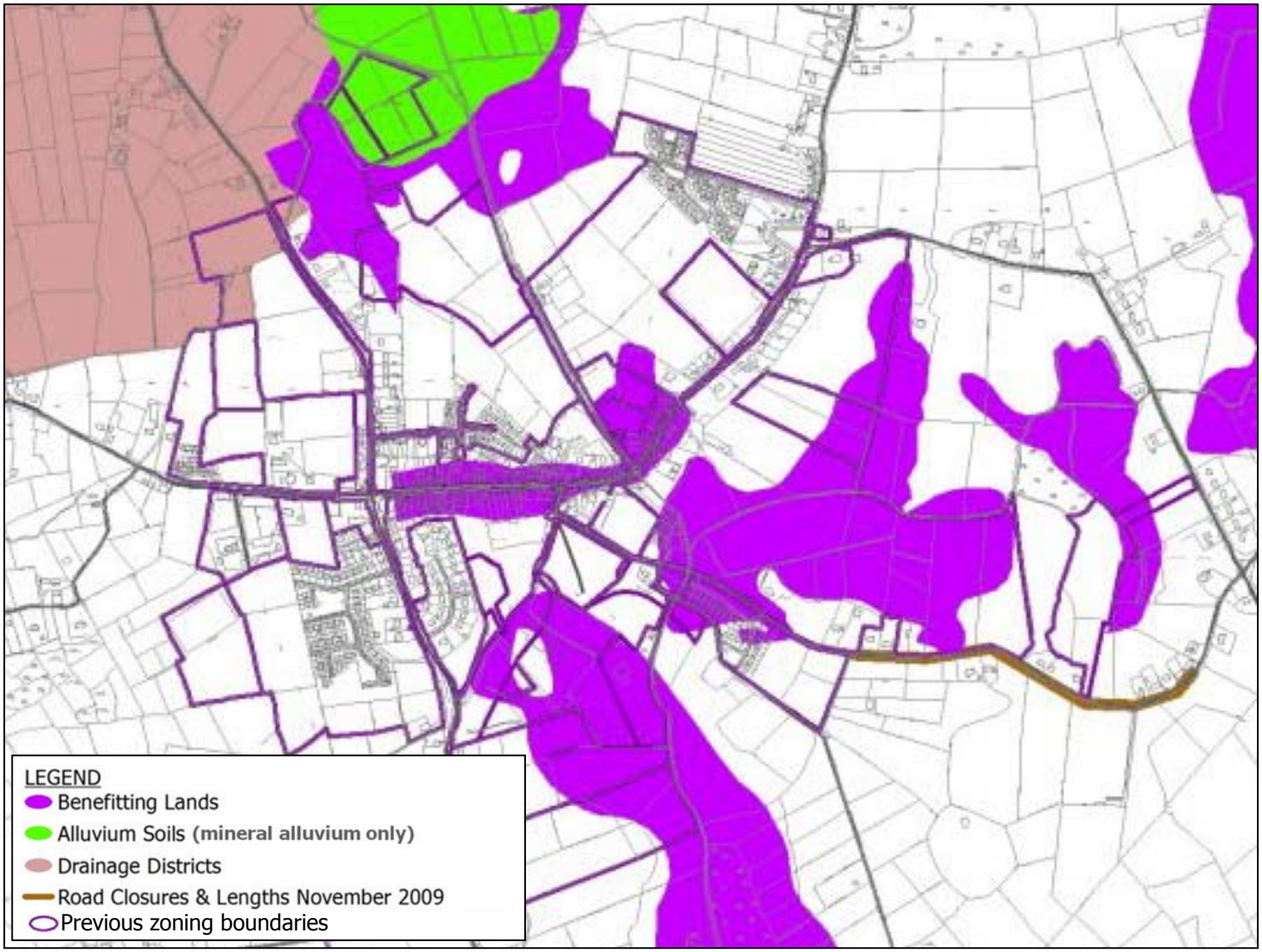

Figure 4 Benefitting Lands, Alluvium Soils, Drainage Districts and Road Closures
Sources: OPW, Galway County Council, Teagasc, GSI, Forest Service & EPA

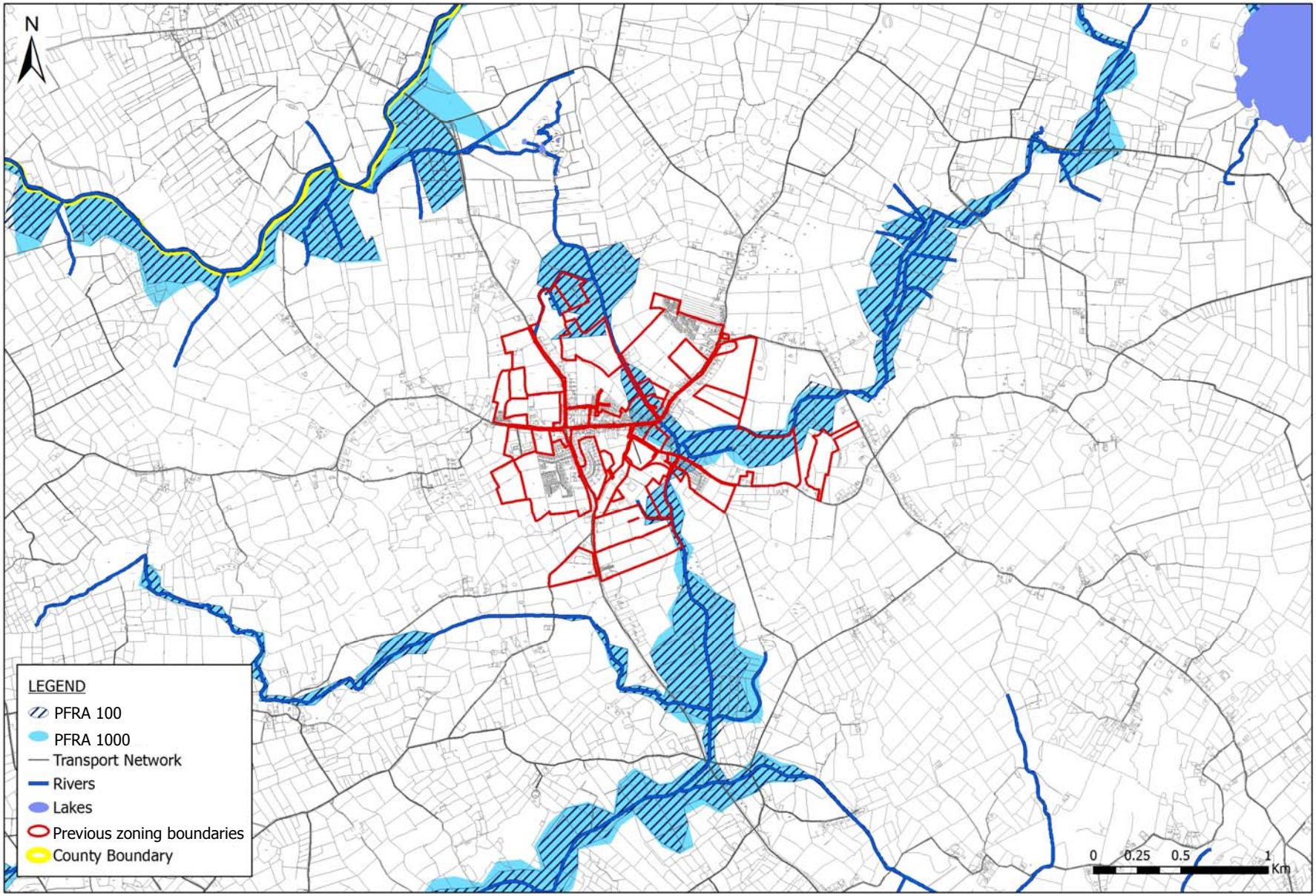

Figure 5 Preliminary Flood Risk Assessment Mapping (Fluvial)
Source: Galway County Council

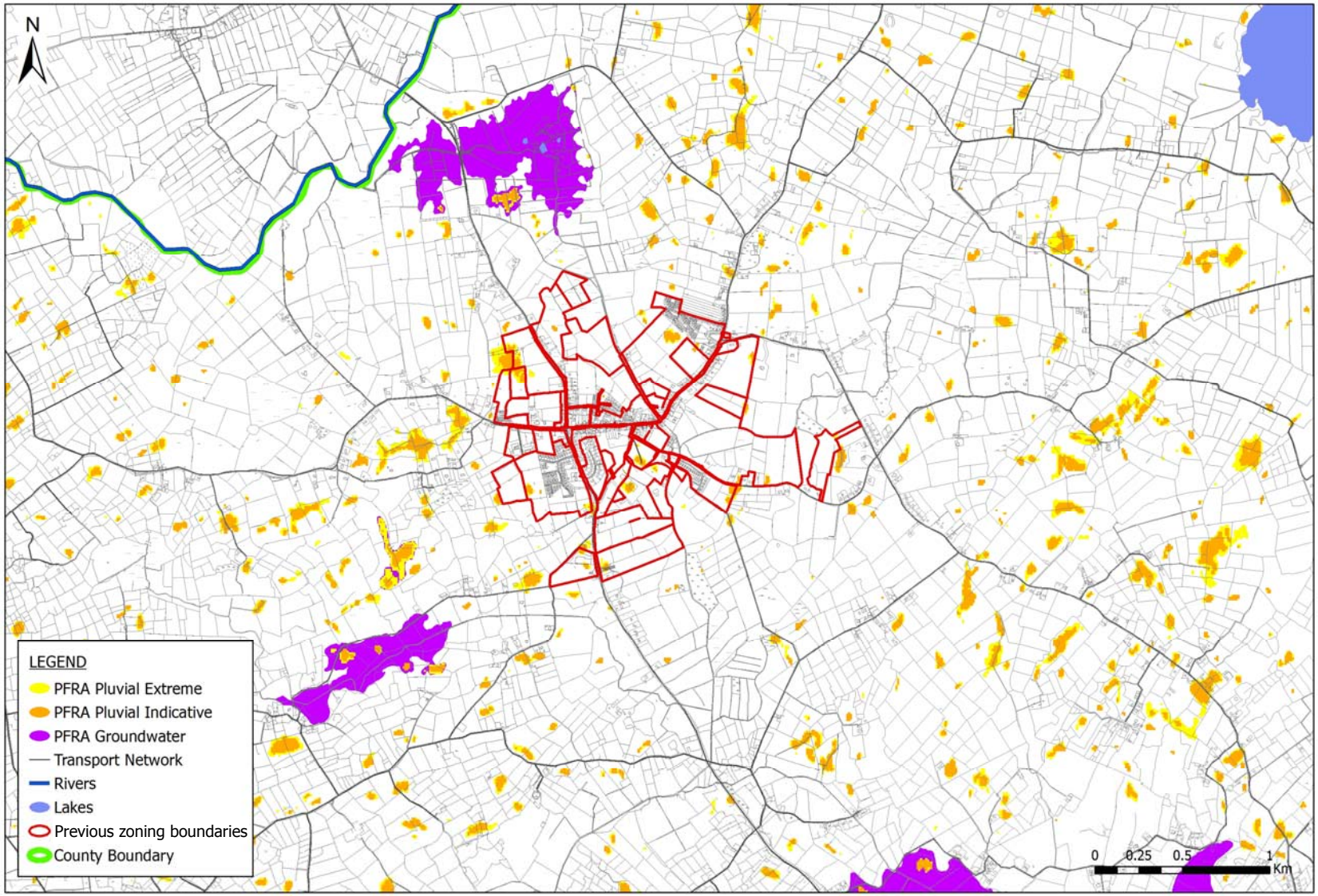

Figure 6 Preliminary Flood Risk Assessment Mapping (groundwater and pluvial[4])
Source: myplan.ie

[4] For lands identified to the east of the Gortnamona Road as having experienced pluvial flooding before please refer to Table 4 and Figure 6.

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

3.2 Site Walkovers and Groundtruthing

In order to inform the Stage 2 assessment, the Plan lands were inspected on foot by experienced professionals (lands were visited on both 21st and 22nd September 2014)[5] to examine, inter alia, the potential source and direction of flood paths from the Annacoortia Stream and its tributaries, locations of topographic and built features that coincide with the flood indicator related boundaries and to identify vegetation associated with a high frequency of inundation.

Local knowledge was provided Council Engineers. In addition, aerial photographs taken during the 2009 flood event which were provided by the OPW informed the assessment.

Flood risk indicator information which was considered during the Stage 2 SFRA is detailed under Section 2.

3.3 Site Walkover Findings and Adequacy of Existing Information and Delineation of Flood Zones

Table 4 overleaf details the findings of the groundtruthing at specific locations (see map at Figure 7 for locations) and the SFRA recommendation in respect of these locations.

3.4 Defence Assets and Structures

There are no formal flood defences within the town.

[5] Note that further field examination was undertaken on 22/07/2015 which confirmed the original SFRA findings and which informed the consideration of Material Alterations.

Table 4 Findings and Recommendations at Specific Locations

Map Ref.	Location Description	Local Knowledge	Flood Risk Indicators including Photography	Groundtruthing findings	Conclusion on delineation of Indicative Flood Risk Zone[6]
1	To the *north* of N84 culvert of Headford River in the east of the town close to OPW offices	No knowledge of river bursting its banks and flooding here.	The Flood Risk Review identifies that the N84 culvert and some nearby small bridges may exacerbate flooding problems but there is no history of flooding. Since the publication of the Western CFRAM Study Flood Risk Review in 2012 the N84 Headford Bridge over Headford River was upgraded. The supporting information that was submitted with the Section 50 estimates that Headford Bridge would have a soffit freeboard of 1360 mm in a 1 in 100 year (high end future scenario) event. There are other culverts upstream of this culvert. Aerial photography (see below) provides evidence of a significant amount of surface water on the left bank of the river. These lands are proximate to the river and have low lying topography.  PFRA fluvial mapping and benefitting lands cover lands here (see limitations of these information sources under Table 2 and Table 3).	There are a number of culverts which present the potential for blockages. Higher flows and/or blockages could cause the river to break its banks. Much of surrounding topography is flat and lower than the bank in places.	Informed by, inter alia, local topography and structures, flow path and direction, photography and other flood risk indicators, Flood Risk Zones were delineated.

[6] Note that there are various uncertainties associated with the delineation of flood zones; Local Area Plan Objective FL 8 'New and Emerging Data' requires future amendments to the plan to consider new and/or emerging data, as appropriate.

Map Ref.	Location Description	Local Knowledge	Flood Risk Indicators including Photography	Groundtruthing findings	Conclusion on delineation of Indicative Flood Risk Zone[7]
2	Greenfield area further north of no. 1 above	This area/area to north includes a spring and was used as a drinking source in the past [note GIS dataset does not identify this spring]. Water may flow both ways from this area. May be prone to flooding but details not known as location is outside of town.	PFRA fluvial mapping and benefitting lands cover lands here (see limitations of these information sources under Table 2 and Table 3).	Topography of this area is low in places. Vegetation associated with higher frequency of inundation in places. Soil wet, boggy, dark organic water. Prone to flooding.	Informed by, inter alia, local knowledge, local topography, flow path and direction, vegetation associated with higher frequency of inundation and other flood risk indicators, Flood Risk Zones were delineated.
3	To the *south* of N84 culvert of Headford River in the east of the town	No knowledge of N84 flooding at this point. Flood zone is too big to the south of the N84 - especially on the southern/western bank. Certain houses are not known to have previously flooded – local expert knowledge	PFRA fluvial mapping and benefitting lands cover lands here (see limitations of these information sources under Table 2 and Table 3).	Topography drops off to the back of the road frontage on both banks but rises for an extent with increased distance from channel. Channel has been deepened in places and mounds of soil were noted on river banks at Caisleán Laighean. Headford River meets the Annacoortia Stream to the east of Caisleán Laighean. There is no documented flooding or knowledge of flooding at Deerpark however the local topography and flow path/direction suggest flood risk.	Informed by, inter alia, local knowledge, local topography, flow path and direction, and other flood risk indicators, Flood Risk Zones were delineated.

[7] Note that there are various uncertainties associated with the delineation of flood zones; Local Area Plan Objective FL 8 'New and Emerging Data' requires future amendments to the plan to consider new and/or emerging data, as appropriate.

Map Ref.	Location Description	Local Knowledge	Flood Risk Indicators including Photography	Groundtruthing findings	Conclusion on delineation of Indicative Flood Risk Zone[8]
4	Seasonal spring at Deerpark woods to the east of R333	Seasonal spring flows across the road here and towards the Annacoortia Stream	Much of this section of the local road is identified in Galway County Council's "*Road Closures & Lengths November 2009*" dataset. PFRA fluvial mapping and benefitting lands (to a smaller extent) cover lands here (see limitations of these information sources under Table 2 and Table 3).	Vegetation associated with a high frequency of inundation including rushes and flag iris observed within much of the lands here. Dry path of seasonal spring observed.	Informed by, inter alia, local knowledge, local topography, flow path and direction, vegetation associated with a high frequency of inundation and other flood risk indicators, Flood Risk Zones were delineated. Note that this location is outside of the Plan boundary.
5	Southern and Northern Banks of Annacoortia Stream to the east of R333	In the south: possible drainage issues in winter In the north: deep channel but also patches of low wetland	PFRA fluvial mapping and benefitting lands cover lands here (see limitations of these information sources under Table 2 and Table 3).	In the south: locally low topography In the north: areas with vegetation associated with a high frequency of inundation	Informed by, inter alia, local knowledge, local topography, flow path and direction, vegetation associated with a high frequency of inundation and other flood risk indicators, Flood Risk Zones were delineated. Note that this location is outside of the Plan boundary.
6	Lands including and surrounding, upstream and downstream of waste water treatment plant	Waste water treatment plant not known to have flooded previously. No previous flooding known in the mart (which is at a higher level than the WWTP).	PFRA fluvial mapping and benefitting lands cover lands here (see limitations of these information sources under Table 2 and Table 3).	On site heavy machinery appears to be used in this area to undertake ongoing deepening of the channel. These areas are low lying. Willow forests observed in this area.	Informed by, inter alia, local knowledge, local topography, flow path and direction, vegetation associated with a high frequency of inundation and other flood risk indicators, Flood Risk Zones were delineated.

[8] Note that there are various uncertainties associated with the delineation of flood zones; Local Area Plan Objective FL 8 'New and Emerging Data' requires future amendments to the plan to consider new and/or emerging data, as appropriate.

3.5 Indicative Flood Risk Zone Mapping[9]

An Indicative Flood Risk Zone map was produced taking into account the findings of the Stage 1 SFRA and the Stage 2 groundtruthing and site walkovers, informed by local knowledge.

Both Figure 7 and Figure 8 show both:

- Indicative Flood Zone A – where the probability of flooding is highest (greater than 1% or 1 in 100); and
- Indicative Flood Zone B – where the probability of flooding is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100)

All other areas are considered to be Indicative Flood Zone C – where the probability of flooding from rivers is low (less than 0.1% or 1 in 1000).

[9] In rivers with a well-defined floodplain, 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.

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. The Flood Zone Mapping does not incorporate a factor for climate change in accordance with guidelines set out by the OPW.

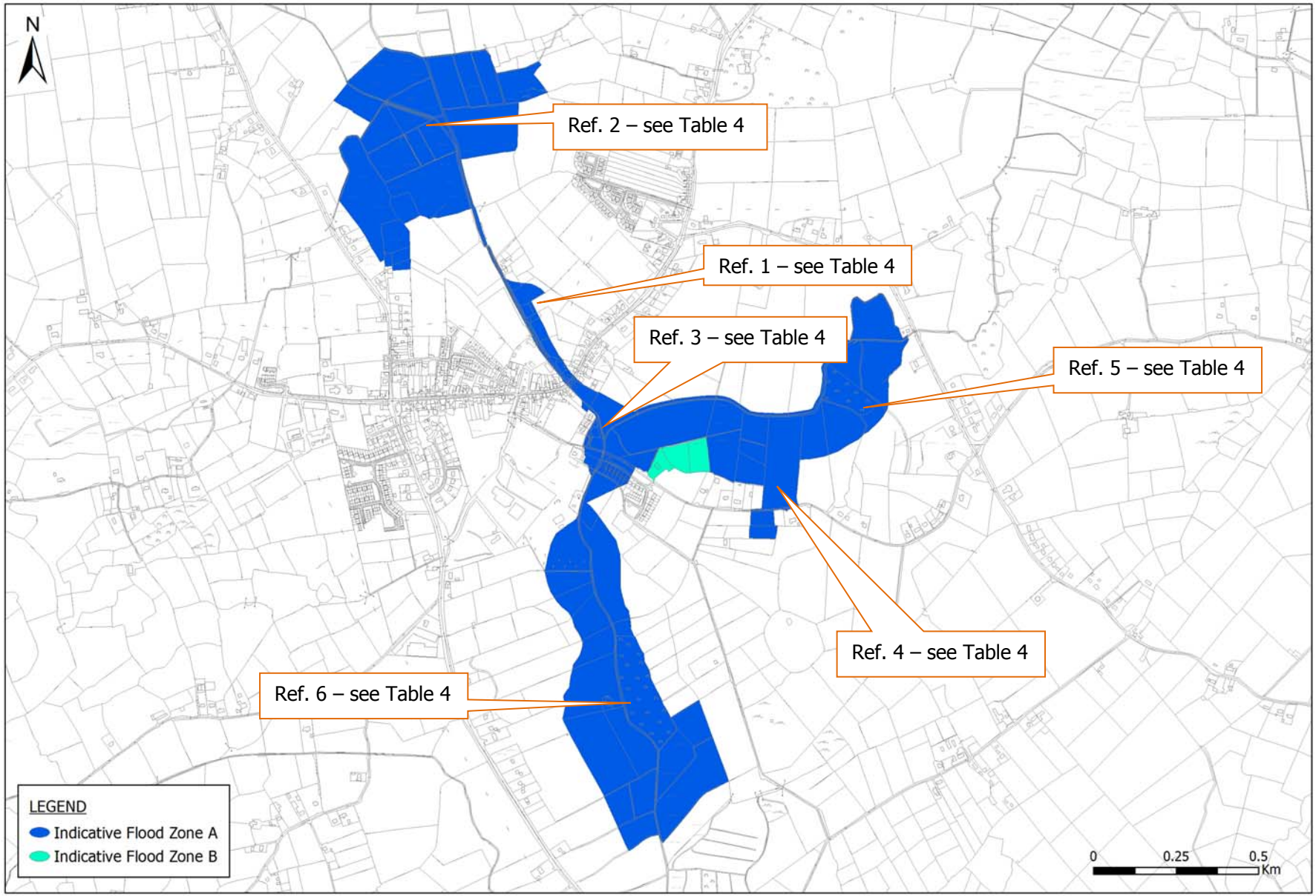

Figure 7 Indicative Flood Risk Zones with locations covered in Table 4 inserted

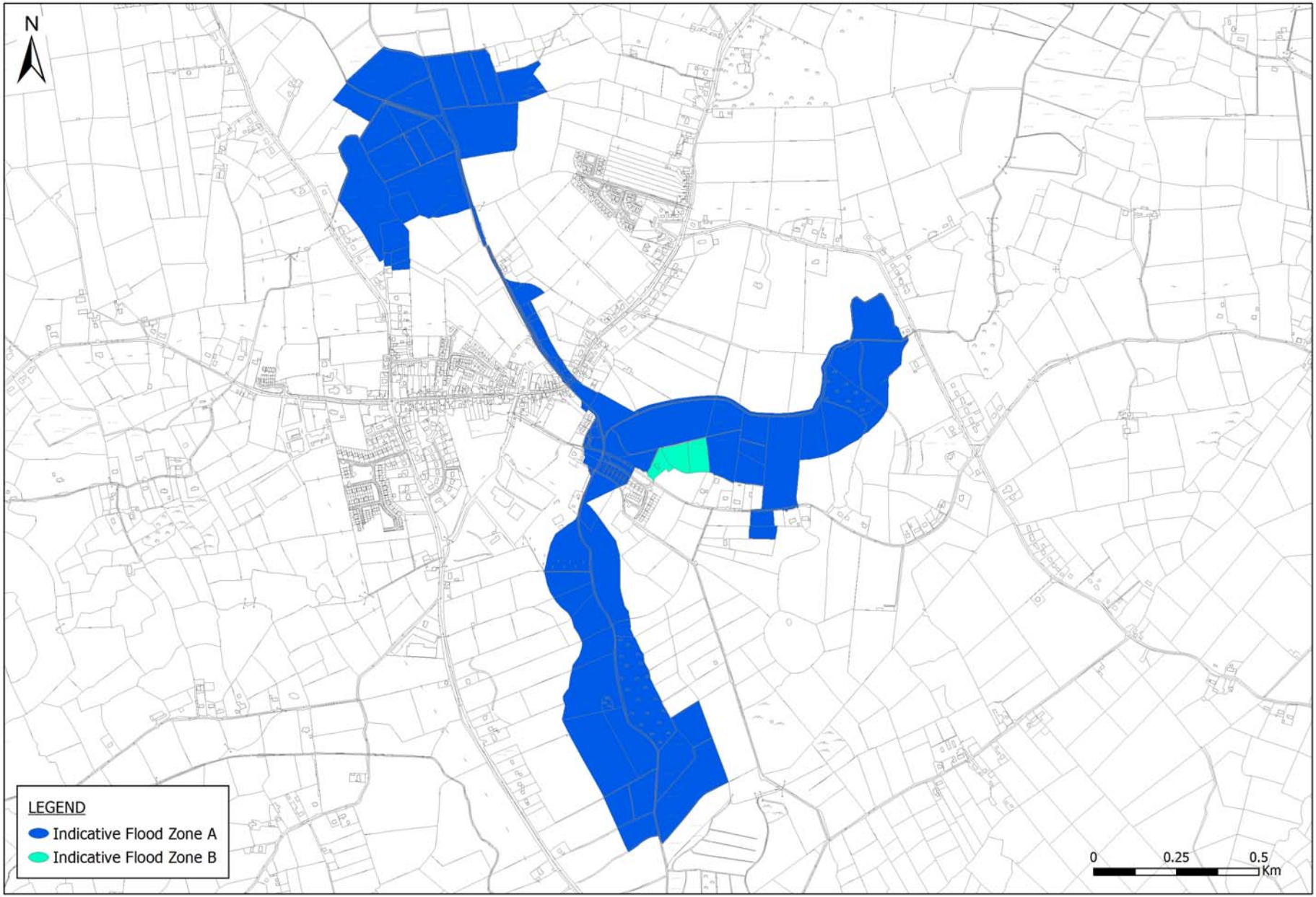

Figure 8 Indicative Flood Risk Zones only

Section 4 Conclusions and Recommendations

4.1 Conclusion

A Stage 2 Strategic Flood Risk Assessment (SFRA) has been undertaken to inform the preparation and adoption of the Plan. The requirement for SFRA is provided under 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' (DEHLG, 2009). The SFRA has mapped boundaries for Indicative Flood Risk Zones, taking into account factors including flow path and direction, local knowledge, photography, vegetation, site walkovers and flood risk indicators.

It is noted that, as part of the Plan preparation process, various Material Alterations were proposed to be made to the original Draft Plan which was placed on public display. Some of these proposals conflicted with the requirements contained in the Flood Risk Management Guidelines. The Elected Members were informed of this conflict and adopted a Plan (on the 28th of September 2015) which did not conflict with the provisions of the Flood Risk Management Guidelines. This Plan, however, included a number of Alterations which were contrary to the Chief Executive's recommendation. The land use zoning map from the Plan which was adopted on the 28th of September 2015 (and which came into effect on the 26th of October 2015) is provided at Figure 1 on page 7.

On the 17th of December 2015 a Section 31 Ministerial Direction was issued in respect of eleven amendments directing that the Plan be altered. The land use zoning map from the Plan as amended on the 17th of December 2015 is provided at Figure 2 on page 8. This amended Plan does not conflict with the provisions of the Flood Risk Management Guidelines.

All SFRA recommendations (see below) have been integrated into the current version of the Local Area Plan.

4.2 Recommendations

In order to comply with *The Planning System and Flood Risk Management - Guidelines for Planning Authorities* (Department of the Environment, Heritage and Local Government and Office of Public Works, 2009) the following recommendations were made which were integrated into the Plan:

4.2.1 Land Use Zoning

That the Indicative Flood Zones identified by the SFRA are used in line with the provisions contained in the Flood Risk Management Guidelines which are summarised in Appendix I. Undeveloped land should not be zoned for incompatible uses.

The potential conflict between zonings and *highly* and *less vulnerable* development (see Tables 5 and 6 in Appendix I) will be avoided by introducing a 'Constrained Land Use Zone' objective to be applied to existing zonings such as Town Centre zoning/Residential zoning etc. in Flood Risk Zones A and B, with a hatch applied on the land use zone mapping in order to differentiate that there is a flood risk issue.

The land use zoning objective for 'Constrained Land Use Zone' is as follows:

> **Objective LU 8 – Constrained Land Use (CL)**
> To facilitate the appropriate management and sustainable use of flood risk areas.
>
> This zoning limits new development, while recognising that existing development uses within these zones may require small scale development, as outlined below, over the life of the Local Area Plan, which would contribute towards the compact and sustainable urban development of the village.

The underlying zoning or the existing permitted uses are deemed to be acceptable in principle for minor developments to existing buildings (such as small extensions to houses, most changes of use of existing buildings), which are unlikely to raise significant flooding issues, provided they do not obstruct important flow paths, introduce a significant additional number of people into flood risk areas or entail the storage of hazardous substances.

Development proposals within this zone shall be accompanied by a detailed Flood Risk Assessment, carried out in accordance with *The Planning System and Flood Risk Assessment Guidelines & Circular PL 2/2014* (or as updated), which shall assess the risks of flooding associated with the proposed development.

Proposals shall only be considered where it is demonstrated to the satisfaction of the Planning Authority, that they would not have adverse impacts or impede access to a watercourse, floodplain or flood protection and management facilities, or increase the risk of flooding to other locations. The nature and design of structural and non- structural flood risk management measures required for development in such areas will also be required to be demonstrated, so as to ensure that flood hazard and risk will not be increased. Measures proposed shall follow best practice in the management of health and safety for users and residents of the development.

Specifications for developments in flood vulnerable areas as set out in this Plan shall be complied with as appropriate.

Specifications referred to in Objective LU 8 (as set out in DM Guideline FL2-Structural and Non-Structural Risk Management Measures in Flood Vulnerable Zones, Please also refer to Objective FL 3 and DM Guideline FL2)

Applications for developments in flood vulnerable zones shall provide details of structural and non-structural risk management measures to include, but not be limited to specifications of the following:

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

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

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

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

With the exception of single storey extensions to existing properties, new single storey accommodation shall not be deemed appropriate where predicted flood levels are above design floor levels.

In all cases, specifications for safe access, refuge and evacuation shall be incorporated into the design of the development.

Flood-Resistant Construction

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

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

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

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

Flood-Resilient Construction

Developments in flood vulnerable zones that are at risk of occasional inundation shall incorporate design and specification for flood resilient construction which accepts that floodwater will enter buildings and provides for this in the design and specification of internal building services and finishes. These measures limit damage caused by floodwater and allow relatively quick recovery.

This can be achieved by specifying wall and floor materials such as ceramic tiling that can be cleaned and dried relatively easily, provided that the substrate materials (e.g. blockwork) are also resilient. Electrics, appliances and kitchen fittings shall also be specified to be raised above floor level, and one-way valves shall be incorporated into drainage pipes.

Emergency Response Planning

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

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

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

- Awareness of risks and evacuation procedures and the need for family flood plans.

Access and Egress During Flood Events

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

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

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

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

The following provisions have been integrated into the Plan:

No.	Local Area Plan Reference	Provision
1	**Policy FL 1 – Flood Risk Management**	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 DoEHLG/OPW publication *The Planning System and Flood Risk Management Guidelines for Planning Authorities* (2009) and Departmental *Circular PL2/2014* (or any updated/superseding legislation or policy guidance). Galway County Council will also take account of the OPW Catchment Flood Risk Management Plans (CFRAMs) as appropriate, the Preliminary Flood Risk Assessment (PFRA), the Strategic Flood Risk Assessment for County Galway 2012 and the Strategic Flood Risk Assessment carried out for Headford and any recommendations and outputs arising from same that relate to or impact on the plan area.
2	**Objective FL 1 – Flood Risk Management and Assessment**	Ensure the implementation of the DoEHLG/OPW publication *The Planning System and Flood Risk Management Guidelines for Planning Authorities 2009,* including the Department of the Environment, Heritage & Local Government's *Circular PL 2/2014* (or any updated/superseding document) in relation to flood risk management within the Plan Area. This will include the following: 1. Avoid, reduce and/or mitigate, as appropriate in accordance with *The Planning System and Flood Risk Management Guidelines for Planning Authorities 2009* (and as updated), the risk of flooding within the flood risk areas indicated on Map 3 – *Flood Risk Management*, 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. 2. Development proposals in areas where there is an identified or potential risk of 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. 3. Development that would be subject to an inappropriate risk of flooding or that would cause or exacerbate such a risk at other locations shall not normally be permitted. Where certain measures proposed to mitigate or manage the risk of flooding associated with new developments are likely to result in significant effects to the environment or Natura 2000 sites, such measures will undergo environmental assessment and Habitats Directive Assessment, as appropriate.

No.	Local Area Plan Reference	Provision
3	**Objective FL 2 – Flood Zones and Appropriate Land Uses**	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 Planning System and Flood Risk Management Guidelines for Planning Authorities 2009 (or any superseding document)* and the guidance contained in DM Guidance FL 1- Flood Zones and Appropriate Land Uses. 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 with *The Planning System and Flood Risk Management Guidelines for Planning Authorities 2009* & *Circular PL2/2014 (as updated/superseded).* In Flood Zone C, (Please also refer to DM Guidelines FL1) where the probability of flooding 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. (& Refer to Map 3 - *Flood Risk Management*)
4	**Objective FL 3 – Structural and Non-Structural Risk Management Measures in Flood Vulnerable Zones**	Ensure that applications to existing developments in flood vulnerable zones shall provide details of structural and non-structural risk management measures to include, but not be limited to specifications of the following - floor levels, internal layout, flood resilient construction, flood resistant construction, emergency response planning, access and egress during flood events. (Please Refer to Objective LU 8 & DM Guideline FL 2)
5	**Objective FL 4 – Flood Risk Assessment for Planning Applications and CFRAMS**	Ensure that site specific Flood Risk Assessment s(FRA) accompany all planning applications in Flood Zones A and B, even for developments appropriate to the particular Flood Zone. The detail of the site specific FRAs will depend on the level of risk and scale of development. A detailed site specific FRA should quantify the risks and effects of selected mitigation and the management of residual risks. Galway County Council shall have regard to the results of the CFRAMS in the assessment of planning applications.
6	**Objective FL 5 – Strategic Flood Risk Assessment and Flood Risk Assessments**	Ensure that Strategic Flood Risk Assessments and site specific Flood Risk Assessments consider and provide information on the implications of climate change with regard to flood risk in relevant locations. The 2009 OPW Draft Guidance on Assessment of Potential Future Scenarios for Flood Risk Management (or any superseding document) shall be consulted with to this effect.
7	**Objective FL 6 – Environmental Impact Assessment/Statement (EIA/EIS) & Flood Risk Assessment**	Flood risk may constitute a significant environmental effect of a development proposal that in certain circumstances may trigger a sub-threshold EIS, therefore Galway County Council shall ensure that Flood Risk Assessment would form an integral part of any EIA undertaken for projects within the village.
8	**Objective FL 7 – Pluvial and Groundwater Flood Risk**	Planning applications on lands identified within pluvial and/or groundwater flood risk shall be accompanied by a Site Specific Flood Risk Assessment that corresponds with that outlined under Chapter 5 'Flooding and Development Management' of The Planning System and the Flood Risk Management Guidelines for Planning Authorities (2009) (or any updates to same). 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.
9	**Objective FL 8 – New and Emerging Data**	Future amendments to the plan shall consider, as appropriate any new and/or emerging data, including, when available, any relevant information contained in the Flood Risk Management Plans.
10	**Objective FL 9 – Water Bodies and Watercourses**	Protect water bodies and watercourses within the plan area from inappropriate development, including rivers, streams, associated undeveloped riparian strips, wetlands and natural floodplains. This will include a general 10 metre protection buffer from rivers within the plan Area, as measured from the near river bank (this distance may be increased and decreased on a site by site basis, as appropriate). In addition, promote the sustainable management and uses of water bodies and avoid culverting or realignment of these features. (& Refer to Map 2 - *Specific Objectives)*
11	**Objective FL 10 – Arterial Drainage Scheme (*&Refer to* Map 2 - *Specific Objectives)***	Facilitate access to the channels that the Office of Public Works maintain and ensure that, in general no development takes place within 10 metres of these maintenance channels. (This distance may be increased and decreased on a site by site basis, as appropriate). The OPW shall be consulted with regard to any proposed development in or adjacent to these watercourses.

<table>
<tr><th>No.</th><th>Local Area Plan Reference</th><th>Provision</th></tr>
<tr><td>12</td><td>Objective FL 11 – Improvement &/Or Restoration of Natural Flood Risk Management Functions</td><td>Where resources are available and subject to compliance with the Habitats and Birds Directives, Galway County Council will contribute towards the improvement and/or restoration of the natural flood risk management functions of flood plains.</td></tr>
<tr><td>13</td><td>DM Guideline FL 1 – Flood Zones and Appropriate Land Uses</td><td>The table below indicates the types of land uses that are appropriate in each of the Flood Zones identified within the plan area, in accordance with The Planning System and Flood Risk Management Guidelines 2009 (and as updated). Where developments/land uses are proposed that are considered inappropriate to the Flood Zone, then a Development Management Justification Test and Site-Specific Flood Risk Assessment will be required in accordance with The Planning System and Flood Risk Management Guidelines 2009 (and as updated).
<table>
<tr><th>Land Uses</th><th>Flood Zone A</th><th>Flood Zone B</th><th>Flood Zone C</th></tr>
<tr><td>HVD – Highly Vulnerable Development</td><td>Inappropriate (if proposed then Justification Test & detailed FRA required)</td><td>Inappropriate (if proposed then Justification Test & detailed FRA required)</td><td>Appropriate (screen for flood risk)</td></tr>
<tr><td>LVD – Less Vulnerable Development</td><td>Inappropriate (if proposed then Justification Test & detailed FRA required)</td><td>Inappropriate due to climate change (if proposed then Justification Test & detailed FRA required)</td><td>Appropriate (screen for flood risk)</td></tr>
<tr><td>WCD – Water-Compatible Development</td><td>Appropriate (detailed FRA may be required)</td><td>Appropriate (detailed FRA may be required)</td><td>Appropriate (screen for flood risk)</td></tr>
</table>
Notes (refer to Flood Risk Management Guidelines 2009 for additional detail):
1. HVD – Houses, schools, hospitals, residential institutions, emergency services, essential infrastructure, etc.
2. LVD – Economic uses (retail, leisure, warehousing, commercial, industrial, non-residential institutions, etc.), land and buildings used for agriculture or forestry, local transport infrastructure, etc.
3. WCD – Docks, marinas, wharves, water-based recreation and tourism (excluding sleeping accommodation), amenity open space, sports and recreation, flood control infrastructure, etc.

Please refer to separate supporting document ‘Stage 2 Strategic Flood Risk Assessment for the Headford Local Area Plan 2015-2021’,</td></tr>
</table>

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 9) to managing flood risk in the preparation of plans are set out in Chapter 3 of the DEHLG Flood Guidelines and Departmental Circular PL2/2014 and should be adhered to. 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.

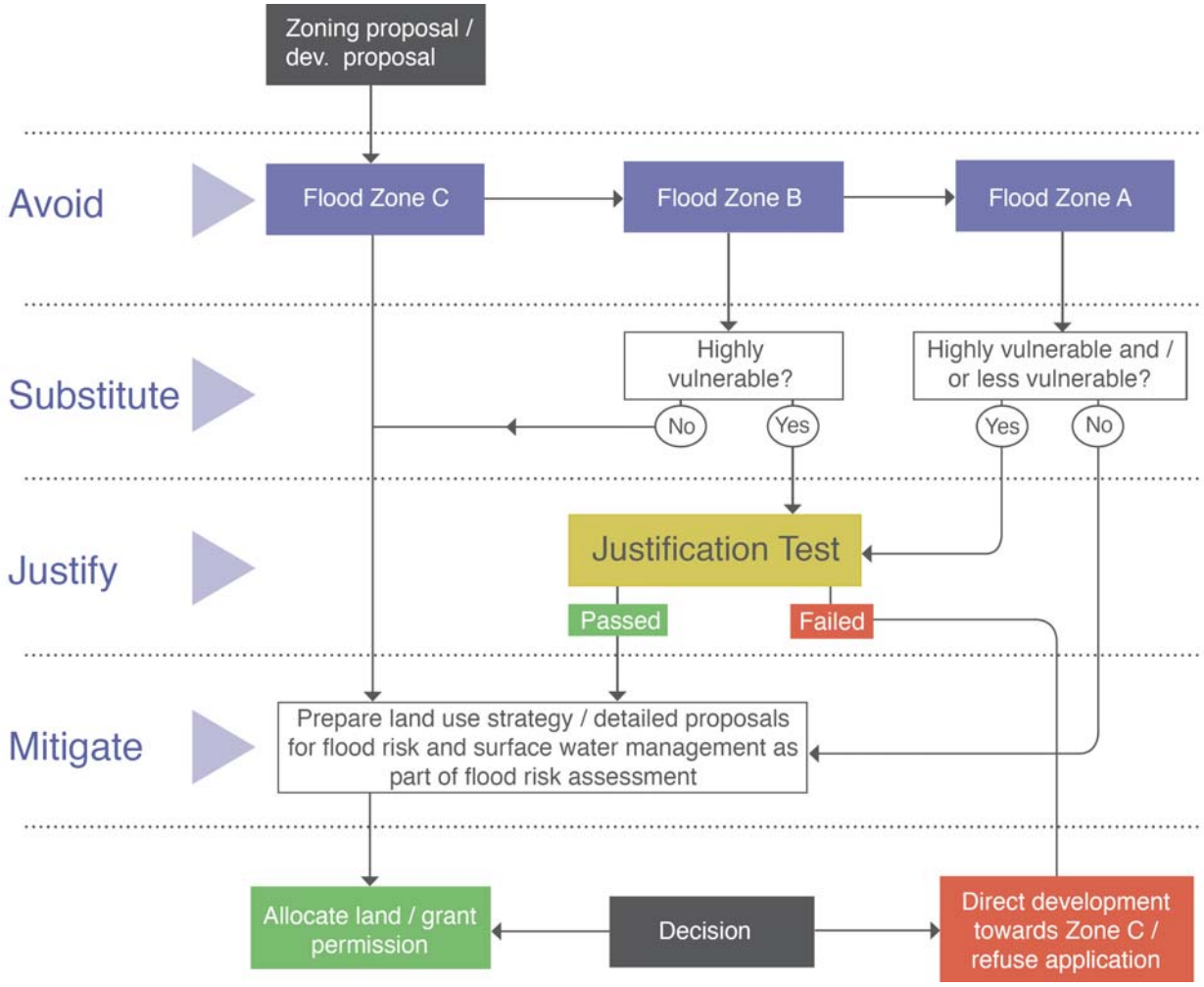

Figure 9 Sequential Approach Process[10]

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

[10] 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 5 overleaf classifies the vulnerability of different types of development while Table 6 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)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).
*Uses not listed here should be considered on their own merits	

Table 5 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 6 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 below.

Where, as part of the preparation and adoption or variation and amendment of a development/local area plan[1], a planning authority is considering the future development of areas in an urban settlement that are at moderate or high risk of flooding, for uses or development vulnerable to flooding that would generally be inappropriate as set out in Table 3.2, all of the following criteria must be satisfied:

1 The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans as defined above or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act, 2000, as amended.

2 The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular:

(i) Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement[2];

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

(iii) Is within or adjoining the core[3] of an established or designated urban settlement;

(iv) Will be essential in achieving compact and sustainable urban growth; and

(v) There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement[4]

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 10 Justification Test [11]

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