

Draft Westmeath County **Development Plan** **2021 - 2027**



STRATEGIC FLOOD RISK ASSESSMENT

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Purpose

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1 Introduction

JBA Consulting was commissioned by Westmeath County Council (WMCC) to provide assistance in the preparation of the Strategic Flood Risk Assessment (SFRA) to inform the Draft Westmeath County Development Plan 2021-2027 (WMCDP).

The SFRA is a live document that is designed to be updated as further flood risk information becomes available and changes to the development plan are proposed under any future variations.

1.1 SFRA Legacy in County Westmeath

The 2021-2027 WMCDP SFRA represents an update to the previous version of the SFRA under the 2014 WMCDP (Appendix 5).

1.2 Terms of Reference

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

More specifically the SFRA will complete the following tasks;

1. Undertake a flood risk assessment for the settlements within the WMCDP,
2. Review the various sources of potential Flood Zone mapping,
3. Assist WMCC in the review of land use zoning objectives and the application of the sequential approach and justification test,
4. Prepare flood risk management policies, objectives and recommendations.

1.3 Report Structure

Section 2 provides an introduction to the study area. Section 3 provides an introduction to the Planning System and Flood Risk Management and covers important information on the philosophy and approach of the guidelines.

Section 4 provides a review of data collection, flood history and predicted flood extent (including climate change impacts) in each of the settlements. Section 5 discusses the different sources of flooding in Westmeath.

Section 6 provides policy guidance and suggested approaches to managing flood risk and development. Section 7 discusses the settlement review.

2 Westmeath Study Area

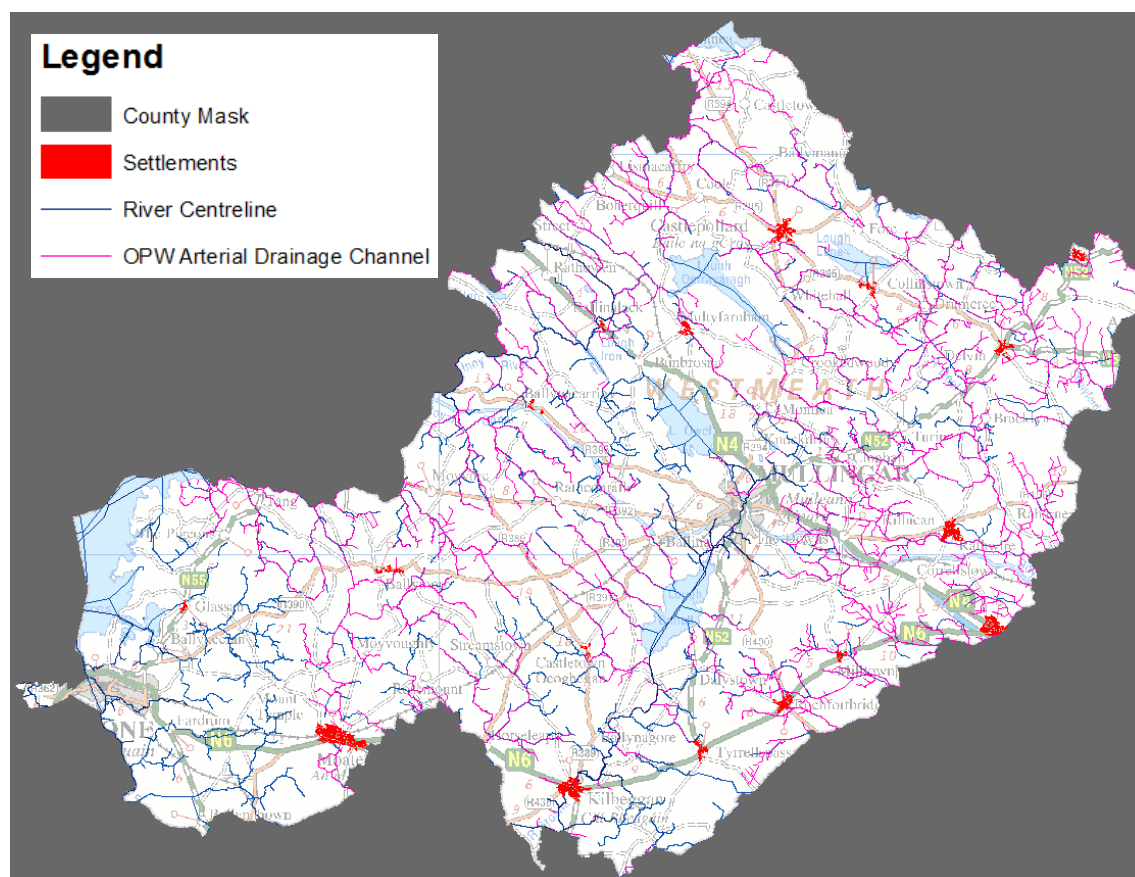
The study area is the County of Westmeath, with a focus on the land use zoning objectives of 17 settlements, which are defined in the plan and identified in Table 2.1. The Regional Growth Centre of

Athlone and the Key Town of Mullingar are excluded from the SFRA as these settlements will be subject to separate Urban Area and Local Area Plans and therefore are not considered in this Draft Plan.

Table 2.1 Settlements contained within the WMCDP 2021-2027

Position	Description	Settlement
Tier 3	Self-Sustaining Growth Towns	Castlepollard, Kilbeggan, Kinnegad, Moate
Tier 4	Self-Sustaining Towns	Rochfortbridge, Killucan/Rathwire
Tier 5	Towns & Villages	Clonmellon, Delvin, Tyrrellspass
Tier 6	Rural (Served)	Ballinalack, Ballinacarrigy, Ballymore, Castletown Geoghegan, Collinstown, Glasson, Milltownpass, Multyfarnham

Figure 2.1 Settlement Map



County Westmeath is geographically central to the island of Ireland. It covers an area of approximately 1,830km² and includes a range of topographies, soil and rock types and water bodies.

Westmeath is known as the Lakeland County, but its landscape includes a diversity of landscape types, ranging from rolling hills and lakes to peatlands, grasslands, woodlands, eskers and wetlands. Westmeath has a number of large lakes including Lough Ree, most of which are part of the River Shannon catchment, which includes the Rivers Inny and Brosna. In addition, Lough Lene, a limestone lake is situated in the Upper Boyne catchment in the county. The Royal Canal is fully navigable through Westmeath. It meanders around Mullingar on its way to the River Shannon, which runs southwards as it passes through the county.

There are two River Basin Districts in Westmeath, namely the Shannon River Basin District and the Eastern River Basin District.

2.1 Planning Policy

2.1.1 Ireland 2040 – National Planning Framework

A Strategic Flood Risk Assessment of the National Policy Objectives (NPO) within the Ireland 2040 – National Planning Framework was undertaken with the aim of ensuring that flood risk is a key consideration in delivering the proposed strategic sustainable land-use planning decisions. It sets out how all levels of the planning process, from national level strategic assessments to individual planning applications, should follow the sequential approach set out in the 2009 Guidelines on Planning and Flood Risk Management.

The NPF recognises that it is not always possible to avoid developing in flood risk areas due to spatial, economic, environmental and physical constraints. Development should be encouraged to continue, and in flood risk areas should follow the sequential approach and application of Justification Test set out in the Department’s Guidelines on the Planning System and Flood Risk Management. These guidelines will facilitate the integration of flood risk and land risk planning in the Eastern and Midland region, at all tiers of the planning hierarchy from national level through regional, city/county and local plans, masterplans and individual planning applications.

2.1.2 Regional Spatial & Economic Strategy (Eastern & Midland Regional Assembly)

The Regional Spatial & Economic Strategy (RSES) for the Eastern & Midland Regional Assembly included a Regional Flood Risk Appraisal Report, undertaken at a high level, but with a view to informing policy decisions within lower tier development plans. The RSES found that an integrated approach to river catchment management is essential to manage and avoid increasing flood risk. The RSES sets out how Development Plans should include Strategic Flood Risk Assessments and all future zoning of land for development in areas at risk of flooding should follow the sequential approach set out in the 2009 Guidelines on Planning and Flood Risk Management (DoEHLG). The inclusion of policies and actions to support Sustainable Urban Drainage Systems is recommended in future developments as a major component of flood management and prevention.

The settlement hierarchy selected by the RSES takes account of the fact that while Athlone and Mullingar, are vulnerable to fluvial flooding, wider, effective management of flood risk coupled with wider environmental, sustainability and economic considerations mean that it is possible to facilitate the continued consolidation of the development of the existing urban structure of the region. In line with the sequential and justification criteria set out in the Department's Guidelines on the Planning System and Flood Risk Management it is considered that these locations should be encouraged to continue to consolidate and to grow in order to bring about a more compact and sustainable urban development form while at the same time managing flood risk appropriately. These guidelines outline measures through which both the flood risk and the continued development of Westmeath's Gateway towns of Athlone and Mullingar, and county towns can be reconciled.

The RSES included a number of development plan implications:

- An integrated approach to river catchment management is essential to manage and avoid increasing flood risk. Local authorities should fully support the completion of CFRAM studies and jointly implement any actions identified.
- Development Plans shall include Strategic Flood Risk Assessments and all future zoning of land for development in areas at risk of flooding should follow the sequential approach set out in the 2009 Department Guidelines on Planning and Flood Risk Management.
- Development Plans should include policies on the requirement for Sustainable Drainage Systems (SuDS) in future developments as a major component of flood management and prevention.

2.1.3 Westmeath County Development Plan 2014-2020

As part of the Westmeath County Development Plan 2014-2020 a Strategic Flood Risk Assessment was undertaken. The purpose of the SFRA was to present and analyse flood related data at appropriate scales to identify flood risk management priorities for the county. Parts of County Westmeath are vulnerable to flooding and are mapped as part of the Westmeath County Development Plan 2014-2020. The vulnerability of these areas can be increased due to human actions such as clearing of vegetation and increased development in flood plains.

As flooding cannot be completely eliminated, the Westmeath County Development Plan 2014-2020 proposed to minimise its impacts through proactive and careful management of catchments and identified flood risk areas and by ensuring that any development does not individually or cumulatively give rise to new flood risk. The SFRA proposed this be completed by following the sequential approach and application of the Justification Test set out in the 2009 Guidelines on Planning and Flood Risk Management (DoEHLG) throughout the planning process.

3 The Planning System & Flood Risk Management

3.1 Introduction

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

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

This Section will firstly outline the definitions of flood risk and the Flood Zones used as a planning tool; a discussion of the principles of the planning guidelines and the management of flood risk in the planning system will follow.

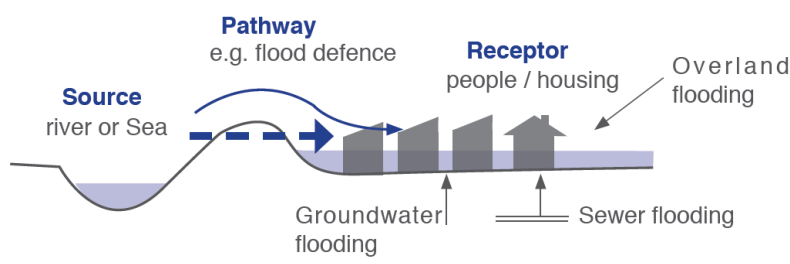
3.2 Definition of Flood Risk

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

Flood Risk = Probability of Flooding x Consequences of Flooding

The assessment of flood risk requires an understanding of the sources, the flow path of floodwater and the people and property that can be affected. The source - pathway - receptor model, shown below in Figure 3.1, illustrates this and is a widely used environmental model to assess and inform the management of risk.

Figure 3.1 Source Pathway Receptor Model



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

Principal sources of flooding are rainfall or higher than normal sea levels while the most common pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets. Receptors can include people, their property and the environment. All three elements must be present for flood risk to arise. Mitigation measures, such as defences or flood resilient construction,

have little or no effect on sources of flooding but they can block or impede pathways or remove receptors.

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

3.3 Likelihood of Flooding

Likelihood or probability of flooding of a particular flood event is classified by its annual exceedance probability (AEP) or return period (in years). A 1% AEP flood indicates the flood event that will occur or be exceeded on average once every 100 years and has a 1 in 100 chance of occurring in any given year.

Return period is often misunderstood to be the period between large flood events rather than an average recurrence interval. Annual exceedance probability is the inverse of return period as shown in Table 3.1

Table 3.1 Probability of Flooding

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

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

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

3.4 Consequences of Flooding

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

The Planning System and Flood Risk Management guidelines provide three vulnerability categories, based on the type of development, which are detailed in Table 3.1 of the Guidelines, and are summarised as:

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

3.5 Definition of Flood Zones

In the Planning System and Flood Risk Management guidelines, Flood Zones are used to indicate the likelihood of a flood occurring. These Zones indicate a high, moderate or low probability of flooding from fluvial or tidal sources and are defined below in Table 3.2.

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

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

Table 3.2 Definition of Flood Zones

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

3.6 Objectives and Principles of the Planning Guidelines

The Planning System and Flood Risk Management Guidelines describe good flood risk practice in planning and development management. Planning authorities are directed to have regard to the

guidelines in the preparation of Development Plans and Local Area Plans, and for development control purposes.

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

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

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

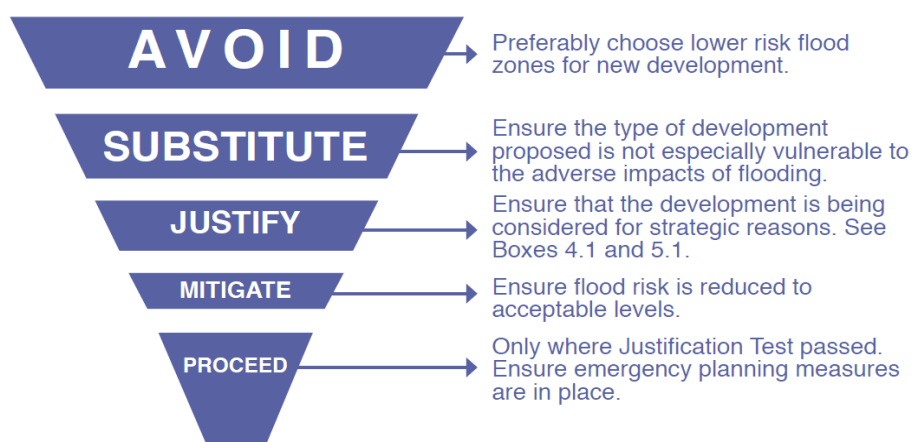
The 'Planning System and Flood Risk Management' works on a number of key principles, including:

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

3.7 The Sequential Approach & Justification Test

Each stage of the Flood Risk Assessment (FRA) process aims to adopt a sequential approach to management of flood risk in the planning process.

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

Figure 3.1 Sequential Approach Principles in Flood Risk Management

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

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

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

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

Table 3.3 Matrix of Vulnerability versus Flood Zone

	Flood Zone A High Probability	Flood Zone B Moderate Probability	Flood Zone C Low Probability
Highly vulnerable development (Including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

3.8 Scales and Stages of Flood Risk Assessment

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

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

4 Data Collection and Review

This section reviews the data collection and the flood history for the settlements so that any additional information on flooding can be included within this SFRA. It will confirm the extent of extreme flooding (through the Flood Zone mapping) and key sources of flood risk.

There are a number of valuable sources of flood data for County Westmeath, including major projects such as the CFRAM, and broadscale flood mapping such as the national PFRA study.

The sources of information from the previous iterations of the SFRA have been reviewed and relevant updates have been made using the CFRAM flood mapping.

Table 4.1 Available Flood Risk Data

Description	Coverage	Robustness	Comments on usefulness
Eastern CFRAM Study	<p>Areas for further assessment (AFAs), or settlements falling along modelled lengths, in County Westmeath are:</p> <p>Kilbeggan;</p> <p>(Athlone & Mullingar are not being considered under the WMCDP)</p> <p>Other settlements that are not AFAs but have CFRAM output (Medium Priority Watercourse) are:</p> <p>Ballinagore (no zoning),</p> <p>Glasson,</p>	<p>Flood Zones and flood extents for current and future scenarios provided by OPW.</p> <p>Modelling is 'best available' and outputs will allow informed decisions on zoning objectives. Design water levels will inform decisions relating to raising land and setting finished floor levels.</p>	<p>Very useful but undertaken at a catchment level. In general, CFRAM provides all information needed to apply the Justification Test (JT) for Plan Making under the SFRA.</p> <p>Site specific FRAs will still be required for planning applications, but information on water levels can form the basis of decision in relation to finished floor levels. However, it is important to note that CFRAM outputs should not be relied upon without review and consideration of appropriateness to the site in question, particularly for Medium Priority Watercourses (MPW).</p>
OPW Preliminary Flood Risk Assessment (PFRA) flood maps – Fluvial Used as County Development Plan Flood Map (2015-2021)	<p>The PFRA was a national screening exercise that was undertaken by OPW to identify areas at potential risk of flooding. Fluvial, coastal, pluvial and groundwater risks were identified at an indicative scale.</p> <p>Based on the on the PFRA, no verification or adjustment of this data.</p>	Moderate/Low	<p>Covers nearly all rivers (including non-CFRAM) previously used for development of base Flood Zones for SFRA.</p> <p>For purposes of SFRA and at Development Management level these cannot be used without validation through site. Further investigation may be needed to provide greater confidence in the outlines.</p>
Historical	Various, taken from	Indicative	Used indirectly to

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Description	Coverage	Robustness	Comments on usefulness
event outlines and point observations and reports	www.floodmaps.ie		validate flood zones and identify non-fluvial flooding in the SFRA. Useful background information for site specific FRAs, but note the database is not exhaustive, absence of a record does not necessarily mean absence of flood risk.
Arterial Drainage Benefitting land maps	Show land which would (or have) benefitted from a drainage scheme. This is not based on a 'design flood' (i.e. the events do not have a return period), but indicate low-lying, poorly drained land. It is not the same as lands which are protected by a flood relief scheme.	Low	Superseded by the data sources listed above, although may be used to cross check Flood Zones. Limited benefit to site specific FRAs. Given that many of the rivers in Westmeath have been subject to Arterial Drainage by OPW the benefitting lands maps are most likely to be an overestimation of risk.
Flood relief schemes	There are no completed OPW Flood Relief Schemes that are in place within County Westmeath. Athlone Flood Relief Scheme is in construction. Kilbeggan has some OPW embankments but these are part of an arterial drainage scheme and as such provide an agricultural standard of protection.	n/a	n/a
Site Specific FRAs	Settlement or sub-settlement – used in Kilbeggan, Kinnegad, Milltownpass.	Moderate	Helpful for additional verification of PFRA and/or Benefitting Lands mapping.
Site Visits	Castlepollard, Collinstown, Kilbeggan, Kinnegad,	Moderate	Site visits used to verify flood extents where there were potential conflicts

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Description	Coverage	Robustness	Comments on usefulness
	Milltownpass, Moate & Rochfortbridge,		with predicted flood extent and undeveloped land uses with highly or less vulnerable land use zoning objectives.

Table 4.2 Other Data Available

Description	Coverage	Robustness	Comment on usefulness
Alluvial Soil Maps	Full Study Area	Low	Used in the Regional FRA Report to provide initial assessment of risks. Not used in SFRA and little or no value to FRA.
Groundwater vulnerability maps	Broadscale, County wide	Moderate	Initial assessment of groundwater vulnerability. Provides a screening tool for use in FRA.
Historic Flood Records including photos, aerial photos and reports.	Broad, spot coverage	Various	Yes, indirectly to validate Flood Zones & identify other flood sources. Review of such sources will be required for all site specific FRAs.

4.1 Flood Zone Development

As set out in the RSES Regional Flood Risk Appraisal Report, and under the Planning Guidelines, the Flood Zone mapping for the County is principally derived from the CFRAM where possible. However, most settlements in the WMCDP are not covered by the CFRAM and in this case a range of other datasets, as shown in Table 4.2 were used as supplementary information to inform this SFRA.

Due to recent guidance from OPW regarding the use of the first generation PFRA mapping and the indicative nature of the flood extents, the approach used under the Westmeath SFRA has been precautionary. All sources of available flood mapping were reviewed in cases where proposed undeveloped lands are zoned for highly or less vulnerable use (where CFRAM was not available). As such, a single dataset of County Flood Zones has not been prepared, but in each settlement specific guidance is provided based on the data review and a JBA site visit.

When the second generation PFRA mapping is issued to Local Authorities the data will be used in conjunction with the other available datasets and site visits to provide a countywide Flood Zone dataset, subject to further verification.

The review of the suite of flood risk data has been developed as a spatial planning tool to guide WMCC in making land-use zoning and development management decisions and it is recognised that site specific information may contradict the Flood Zones, either to demonstrate a greater or lesser level of flood risk. However, the data has been deemed appropriate for the planning decisions being made at this stage of the plan making process.

In general, where CFRAM modelling has been carried out, flood levels are available at selected node points along the watercourse. Once an appropriate level of validation has been undertaken as part of the site-specific FRA, these flood levels may be used to form the basis of the development design.

5 Sources of Flooding

This SFRA has reviewed flood risk from fluvial, pluvial and groundwater sources. Flooding events have become more pronounced in Ireland, and County Westmeath, in recent years. Climate change risks also need to be considered at a strategic and site-specific scale. Climate change is discussed in Section 7 in relation to incorporation of climate change into the flood risk assessment. A comment on the likely impacts of climate change, on a settlement basis, has been provided in Section 8.

5.1 Fluvial Flooding

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

In a large, relatively flat catchment, flood levels will rise slowly and natural floodplains may remain flooded for several days or even weeks, acting as the natural regulator of the flow. This is typical of the River Shannon and its tributaries. In small, steep catchments local intense rainfall can result in the rapid onset of deep and fast-flowing flooding with little warning. Such “flash” flooding, which may only last a few hours, can cause considerable damage and possible risk to life. This type of catchment is not prevalent within Westmeath.

5.2 Arterial Drainage Schemes

A third form of fluvial regime is much more common within the County and this is related to rivers that have been subject to an OPW Arterial Drainage Scheme (ADS). The OPW carried out a number of Arterial Drainage Schemes on catchments under the Arterial Drainage Act, 1945. The main purpose of the ADSs was to improve land drainage and reduce the frequency and extent of overland flooding. ADSs can involve embankment construction, river straightening, lake storage development, and, most commonly, the deepening and widening of river channels. Through the implementation of ADSs the

hydraulic conveyance efficiency of a catchment is increased, thereby leading to a reduction in overland flood storage. Although it has been found that ADS generally achieve their main objectives, this increase in discharge-carrying capacity leads to an acceleration of the response to rainfall with flood peaks of increased intensity and more rapid recessions.

Three arterial drainage schemes, Brosna, Inny and Boyne, were completed within Westmeath. The Brosna ADS was undertaken between 1948 and 1955, the Inny ADS was undertaken between 1960 and 1968, and the Boyne ADS was undertaken between 1948 and 1955.

5.3 Fluvial Summary

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

The watercourses of Westmeath are generally split between those within the low-lying Shannon Basin to the west and those that have Arterial Drainage Schemes (Inny, Brosna and Boyne) which are maintained and managed by the OPW. These watercourses have increased conveyance at lower return periods and present a challenge for the interpretation of existing Benefitting Lands and PFRA fluvial mapping.

Flood risk to specific settlements is discussed in Section 8 and has been used to inform the zoning objectives for the Development Plan.

5.4 Flooding from Defence Overtopping or Breach

Apart from the ongoing work in Athlone and the previous flood relief works in Mullingar (both settlements not considered for zoning within the WMCDP), the only other record of OPW flood embankments protecting a settlement within County Westmeath are the embankments along the River Brosna in Kilbeggan. They are not flood embankments that form part of a Flood Relief Scheme to protect property but are agricultural defences that are guaranteed only as an agricultural standard of protection. In common with many other locations across Ireland, they do provide protection to parts of Kilbeggan.

In addition to the OPW embankments there will also be a number of walls and other structures which, whilst not designed to act as flood defences, provide a level of protection against flood water.

Existing development clearly benefits from the construction of defences, and new defences will be considered as one means of facilitating the redevelopment of the settlements. However, it is against sustainability objectives, and the general approach of the OPW, to construct defences with the intention of releasing green field land for development. It is also not appropriate to consider the benefits of schemes which have not been constructed or which may only be at pre-feasibility or design stage.

Residual risk is the risk that remains after measures to control flood risk have been carried out. Residual risk can arise from overtopping of flood defences and / or from the breach from structural failure of the defences.

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

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

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

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

Whilst it is important that residual risks are recognised and appropriate management measures put in place, it is also important to acknowledge the benefits that a flood relief scheme provides to those living and working behind it. In this regard, although 'The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009' requires flood zones to be undefended, consideration should be given to the benefit provided by flood defences, but only once the Justification Test has been applied and passed.

5.5 Pluvial Flooding

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

The PFRA study considered pluvial flood risk and produced a national set of pluvial flood maps. This dataset was reviewed and used to identify development areas at particular risk of surface water and pluvial flooding. However, the level of detail contained in the PFRA map, and the widespread distribution of areas at risk did not allow a commentary relating to pluvial flood risk to be developed, or for particularly high risk areas to be identified. Instead, an overall strategy for the management of pluvial risk is presented and should be implemented across all development proposals. This, and recommendations for the assessment of surface water risks, are provided in the Flood Risk Management Policy section.

5.6 Flooding from Drainage Systems

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

Flooding in urban areas can also be attributed to sewers. Sewers have a finite capacity which, during certain load conditions, will be exceeded. In addition, design standards vary and changes within the catchment areas draining to the system, in particular planned growth and urban creep, will reduce the level of service provided by the asset. Sewer flooding problems will often be associated with regularly occurring storm events during which sewers and associated infrastructure can become blocked or fail. This problem is exacerbated in areas with under-capacity systems. In the larger events that are less frequent but have a higher consequence, surface water will exceed the sewer system and flow across the surface of the land, often following the same flow paths and ponding in the same areas as overland flow.

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

5.7 Groundwater Flooding

Groundwater flooding is caused by the emergence of water originating from underground and is particularly common in karst landscapes. This can emerge from either point or diffuse locations. The occurrence of groundwater flooding is usually very local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas and pose further risks to the environment and ground stability. Groundwater flooding is not considered to be a significant risk in Westmeath and was screened out by the Regional Flood Risk Appraisal Report. Further investigation at the CDP scale reveals that there are some small areas of predicted groundwater flooding to the south west of Mount Temple and to the north east of Baylin. Neither areas impact any settlements/significant development and the individual risk to settlements is reviewed, in line with other sources, in Section 8.

6 Flood Risk Management Policy

The implementation of the Planning Guidelines throughout the county is achieved through the application of the policies and objectives contained within the WMCDP 2021-2027.

The use and application of the policies and guidelines constitutes the formal plan for flood risk management in County Westmeath. This approach has been achieved in the development plan making process in the settlements contained within the plan and covered in this SFRA.

The specific management of risk is discussed for each settlement in Section 8.

6.1 Flood Risk Policy WMCDP

The policies contained within Section 10.15 of the WMCDP 2021-2027 are as follows:

Flood Risk Policy Objectives	
It is a policy of Westmeath County Council to:	
CPO 10.96	Implement and comply fully with the recommendations of the Strategic Flood Risk Assessment prepared as part of the Westmeath County Development Plan 2021-2027.
CPO 10.97	Have regard to the Guidelines for Planning Authorities on the Planning System and Flood Risk Management (DoEHLG/OPW 2009) and Circular PL2/2014, through the use of the sequential approach and application of the Justification Tests in Development Management.
CPO 10.98	Ensure that a flood risk assessment is carried out for any development proposal, in accordance with the Planning System and Flood Risk Management (DoEHLG/OPW 2009). This assessment shall be appropriate to the scale and nature of risk to the potential development.
CPO 10.99	Support the implementation of recommendations in the CFRAM Programme to ensure that flood risk management policies and infrastructure are progressively implemented.
CPO 10.100	Support the implementation of recommendations in the Flood Risk Management Plans (FRMP's), including planned investment measures for managing and reducing flood risk.
CPO 10.101	Consult with the OPW in relation to proposed developments in the vicinity of drainage channels and rivers for which the OPW are responsible, and to retain a strip on either side of such channels where required, to facilitate maintenance access thereto.

CPO 10.102	Assist the OPW in developing catchment-based Flood Risk Management Plans for rivers in County Westmeath and have regard to their provisions/recommendations.
CPO 10.103	Protect and enhance the County's floodplains and wetlands as 'green infrastructure' which provides space for storage and conveyance of floodwater, enabling flood risk to be more effectively managed and reducing the need to provide flood defenses in the future, subject to normal planning and environmental criteria.
CPO 10.104	Protect the integrity of any formal (OPW or Westmeath County Council) flood risk management infrastructure, thereby ensuring that any new development does not negatively impact any existing defense infrastructure or compromise any proposed new infrastructure.
CPO 10.105	Ensure that where flood risk management works take place that the natural and cultural heritage, rivers, streams and watercourses are protected and enhanced.
CPO 10.106	Ensure each flood risk management activity is examined to determine actions required to embed and provide for effective climate change adaptation as set out in the OPW Climate Change Sectoral Adaptation Plan Flood Risk Management applicable at the time.
CPO 10.107	Consult, where necessary, with Inland Fisheries Ireland, the National Parks and Wildlife Service and other relevant agencies in the provision of flood alleviation measures in the County.

6.2 Stormwater Policy

The management of surface and storm water is important so as to avoid increased flood or pollution risk in the storm water network, rivers and streams in the county's towns, villages and rural areas. The Council will require compliance with best practice guidance for the collection, reuse, treatment and disposal of surface waters for all future development proposals.

Traditionally, rain falling on impervious surfaces was directed into a receiving watercourse through surface water drainage systems. While such drainage systems are effective at transferring surface water quickly, they provide only limited attenuation causing the volume of water in the receiving watercourse to increase more rapidly, thereby increasing flood risk.

Sustainable Drainage Systems, commonly known as SuDS is an approach that seeks to manage the water as close as possible to its origin by various engineering solutions that replicate natural drainage processes, before it enters the watercourse. The incorporation of SuDS techniques allows surface water to be either infiltrated or conveyed more slowly to water courses using porous surface treatments, ponds, swales, filter drains or other installations.

SuDS provide an integrated approach which addresses water quantity, water quality, amenity and habitat. The Council will require the application of SuDS in development proposals, for example through reducing the extent of hard surfacing, and using permeable pavements. The following stormwater management policies have been included in the WMCDP 2021-2027

Stormwater Management Policy Objectives	
It is a policy of Westmeath County Council to:	
CPO 10.108	Support in conjunction with Irish Water the improvement of storm water infrastructure to improve sustainable drainage and reduce the risk of flooding in urban environments.
CPO 10.109	Implement policies contained in the Greater Dublin Strategic Drainage Study (GSDS) in relation to SUDS and climate change.
CPO 10.110	Ensure new development is adequately serviced with surface water drainage infrastructure which meets the requirements of the Water Framework Directive, associated River Basin Management Plans and CFRAM Management Plans.
CPO 10.111	Require that planning applications are accompanied by a comprehensive SUDS assessment that addresses run-off quantity, run-off quality and its impact on the existing habitat and water quality.
CPO 10.112	Ensure that in public and private developments in urban areas, both within developments and within the public realm, seek to minimise and limit the extent of hard surfacing and paving and require the use of sustainable drainage techniques for new development or for extensions to existing developments, in order to reduce the potential impact of existing and predicted flooding risks.
CPO 10.113	Ensure appropriate maintenance of surface water drainage infrastructure to avoid flood risk.

For proposed development outside a settlement boundary (not subject to zoning) the Policies and Objectives of the WMCDP still apply.

6.3 CFRAM Recommendations

Following the publication of the final Flood Risk Management Plans for the CFRAM Study in May 2018 a 10 year €1billion programme of works (for 118 schemes) was announced by the OPW.

Viable future schemes in Westmeath were identified as Athlone only, Kilbeggan and Mullingar were investigated as AFAs but no viable scheme was identified in Kilbeggan and Mullingar was previously subject to a scheme. Both Athlone and Mullingar are outside the scope of SFRA for the WMCDP. In the settlements where there are no formal recommendations for a flood relief scheme, more generic measures such as flood forecasting and warning are recommended to assist with planning and preparedness. A National Forecasting Centre is being set up but is not yet fully operational. The

maintenance of Arterial Drainage Schemes are normal procedures that will maintain the existing level of flood risk.

Kilbeggan was investigated as an AFA as part of the CFRAM Study. It found that there is no fluvial flood risk to any properties within Kilbeggan for the 10% AEP, 1% AEP or 0.1% AEP flood events. As the flood risk to the area was deemed as low, no optioneering was carried out for the town, and therefore no viable scheme was identified. Although the level of flood risk is low, this does not infer that undeveloped lands in and around the community are not prone to flooding. The CFRAM recommends that continued monitoring and maintenance of the existing arterial drainage scheme and flood defence embankments in Kilbeggan be undertaken.

7 Development Management and Flood Risk

In order to guide both applicants and relevant council staff through the process of planning for and mitigating flood risk, the key features of a range of development scenarios have been identified (relating the flood zone, development vulnerability and presence or absence of defences). For each scenario, a number of considerations relating to the suitability of the development are summarised below.

It should be noted that this section of the SFRA begins from the point that all land zoned for development has passed the Justification Test for Development Plans, and therefore passes Part 1 of the Justification Test for Development Management – which states that the land has in the first instance been zoned accordingly in a development plan (that underwent an SFRA). In addition to the general recommendations in the following sections, Section 8 should be reviewed for specific recommendations for individual settlements, including details of the application of the Justification Test.

In order to determine the appropriate design standards for a development it may be necessary to undertake a site-specific flood risk assessment. This may be a qualitative appraisal of risks, including drainage design. Alternatively, the findings of the CFRAM, or other detailed study, may be drawn upon to inform finished floor levels. In other circumstances a detailed modelling study and flood risk assessment may need to be undertaken. Further details of each of these scenarios, including considerations for the flood risk assessment are provided in the following sections.

7.1 Requirements for a Flood Risk Assessment

As specified under CPO 10.98 assessment of flood risk is required in support of any planning application where flood risk may be an issue and this may include sites in Flood Zone C (low probability of flooding) where a watercourse or field drain exists nearby. The level of detail will vary depending on the risks identified and the proposed land use. As a minimum, all proposed development, including that in Flood Zone C, must consider the impact of surface water flood risks on drainage design, this is specified in CPO 10.112. In addition, flood risk from sources other than fluvial should be reviewed.

For sites within Flood Zone A or B (high/moderate probability of flooding), a site specific "Stage 2 - Initial FRA" will be required and may need to be developed into a "Stage 3 - Detailed FRA". The extents of Flood Zone A and B are delineated through this SFRA. However, future studies may refine the

extents (either to reduce or enlarge them) so a comprehensive review of available data should be undertaken once an FRA has been triggered.

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

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

7.2 Drainage Design

Under CPO 10.109 all proposed development, whether in Flood Zone A, B or C, must consider the impact of surface water flood risks on drainage design as specified by the surface water management policies in the Greater Dublin Strategic Drainage Study (GSDS) and this will be considered in the planning process. This may be in the form of a section within the flood risk assessment (for sites in Flood Zone A or B) or part of a surface water management plan.

Areas vulnerable to ponding are indicated on the OPW's PFRA mapping. Particular attention should be given to development in low-lying areas which may act as natural ponds for collection of run-off.

The drainage design should ensure no increase in flood risk to the site, or the downstream catchment. Where possible, and particularly in areas of new development, floor levels should at a minimum be 300mm above adjacent roads and hard standing areas to reduce the consequences of any localised flooding. Where this is not possible, an alternative design appropriate to the location may be prepared.

In addition, for larger sites (i.e. multiple dwellings or commercial units) master planning should ensure that existing flow routes are maintained, through the use of green infrastructure.

7.3 Development Proposals in Flood Zone C

Where a site is within Flood Zone C, but adjoining or in close proximity to Flood Zone A or B there could be a risk of flooding associated with factors such as future scenarios (climate change) or in the event of failure of a defence, blocking of a bridge or culvert. Risk from sources other than fluvial must also be addressed for all development in Flood Zone C. As a minimum in such a scenario, a flood risk assessment should be undertaken which will screen out possible indirect sources of flood risk and where they cannot be screened out, it should present mitigation measures. The most likely mitigation measure will involve setting finished floor levels to a height that is above the 1 in 100 year fluvial flood level, with an allowance for climate change and freeboard, or to ensure a step up from road level to prevent surface water ingress. Design elements such as channel maintenance or trash screens may also be required. Evacuation routes in the event of inundation of surrounding land should also be detailed.

The impacts of climate change should be considered for all proposed developments. A development which is currently in Flood Zone C may be shown to be at risk when 0.5m is added to the extreme (1 in 200 year) tide. Details of the approach to incorporating climate change impacts into the assessment and design are provided in Section 7.6.

7.4 Applications for Developments in Flood Zone A or B

7.4.1 Minor Developments

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

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

Generally, the approach to deal with flood protection would involve raising the ground floor levels above the level of extreme river levels. If this leads to floor levels being much higher than adjacent streets it could create a hostile streetscape for pedestrians. This would cause problems for infill development sites if floor levels were required to be significantly higher than those of neighbouring properties. In this regard, it has been recognised that some flexibility could be allowed, in limited circumstances, on a site by site basis, for commercial and business developments. In these cases, the detailed design of the development should reflect the vulnerability of the site in terms of materials, fixtures and fittings and internal layout. For high risk areas, less vulnerable uses are encouraged at ground floor levels. A site-specific FRA will inform appropriate uses and detailed design and layout.

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

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

The requirement for providing compensatory storage for minor developments has been reviewed and can generally be relaxed, even where finished floor levels have been raised. This is because the development concerns land which has previously been developed and would already have limited

capacity to mitigate flooding. However, a commentary to this effect must be substantiated in the site-specific FRA.

7.4.2 Highly Vulnerable Development in Flood Zone A or B

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

7.4.2.1 New Development

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

For extant permissions in Flood Zone A/B if the site remains unconstructed and the planning application lapses, any future planning applications on the site should be subject to an appropriately detailed FRA specific to the new site layout and it may be found that the site cannot be developed as planned. As part of any future variation to the Development Plan or the preparation of a Local Area Plan (as applicable to the relevant settlement) lands with no extant permission should be considered in line with the sequential approach and Justification Test for Plan Making.

7.4.2.2 Existing Developed Areas

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

Minor/small scale infill housing, extensions or changes of use is discussed previously and, subject to site specific flood risk assessment, can generally be considered appropriate.

In cases where development has been justified, the outline requirements for a flood risk assessment and flood management measures have been detailed in this SFRA in the following sections and also the settlement review in Section 8. Of prime importance is the requirement to manage risk to the development site and not to increase flood risk elsewhere. This should give due consideration to safe evacuation routes and access for emergency services during a flood event.

7.4.2.3 Less Vulnerable Development in Flood Zone A or B

Less vulnerable development includes retail, leisure, warehousing, technology, enterprise and buildings used for agriculture and forestry a comprehensive categorisation of land uses and vulnerability is provided in Table 3..

The design and assessment of less vulnerable development should generally begin with 1% AEP fluvial event as standard, with climate change and a suitable freeboard included in the setting of finished floor levels. The site-specific FRA should ensure that the risks are defined, understood, and accepted.

Operability and emergency response should also be clearly defined. In a limited number of cases this may allow construction as low as the 1% AEP level to be adopted, provided the risks of climate change are included in the development through adaptable designs or resilience measures.

7.5 Key Points for FRA for all types of Development

- Finished floor levels to be set above the 1% AEP fluvial (0.5% AEP tide) level, with an allowance for climate change plus a freeboard of at least 300mm. The freeboard allowance should be assessed, and the choice justified.
- Flow paths through the site and areas of surface water storage should be managed to maintain their function and without causing increased flood risk elsewhere.
- Compensatory storage is to be provided to balance floodplain loss as a result of raising ground levels within Flood Zone A. The storage should be provided within the flood cell and on a level for level basis up to the 1% level.
- In a defended site, compensatory storage is not required, but the impact of removing the net reduction in floodplain storage should be assessed, and any impacts to existing development mitigated for the 0.1% event or a breach of these defences.
- A site is considered to be defended if the standard of protection is 1% AEP, within which a freeboard of at least 300mm is included. The FFL of the proposed development needs to take into account the impacts of climate change and other residual risks, including the 0.1% event, unless this has also been incorporated into the defence design. This may be assessed through breach analysis, overtopping analysis or projection of levels from the channel inland.
- For less vulnerable development, it may be that a finished floor level as low as the 1% AEP level could be adopted, provided the risks of climate change are included in the development through adaptable designs or resilience measures. This approach should reflect emergency planning and business continuity to be provided within the development. It may reflect the design life of the development, the proposed use, the vulnerability of items to be kept in the premises, the occupants and users, emergency plan and inclusion of flood resilience and recovery measures.

7.6 Incorporating Climate Change into Development Design

In all developments, climate change should be considered when assessing flood risk and in particular residual flood risk. Climate change may result in increased flood extents and therefore caution should be taken when zoning lands in transitional areas (i.e. on the edge of the floodplain). Consideration of climate change is particularly important where flood alleviation measures are proposed, as the design standard of the proposal may reduce significantly in future years due to increased rainfall and river flows (sea levels are not a pertinent consideration in Westmeath).

The 'Planning System and Flood Risk Management' recommends that a precautionary approach to climate change is adopted due to the level of uncertainty involved in the potential effects. A significant amount of research into climate change has been undertaken on both a national and international front, and updates are ongoing.

Advice on the expected impacts of climate change and the allowances to be provided for future flood risk management in Ireland is given in the OPW draft guidance. Two climate change scenarios are considered; these are the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). The MRFS is intended to represent a "likely" future scenario based on the wide range of future predictions available. The HEFS represents a more "extreme" future scenario at the upper boundaries of future projections. Based on these two scenarios the OPW recommended allowances for climate change are given in the table below. These climate change allowances are particularly important at the development management stage of planning and will ensure that proposed development is designed and constructed to take into account best current knowledge.

Table 7.1 Allowances for Future Scenarios (100-year Time Horizon)

Criteria	MRFS	HEFS
Extreme Rainfall Depths	+20%	+30%
Flood Flows	+20%	+30%
Mean Sea Level Rise	+500mm	+1000mm
Land Movement	-0.5mm / year*	-0.5mm / year*
Urbanisation	No General Allowance - Review on Case by Case Basis	No General Allowance - Review on Case by Case Basis
Forestation	-1/6 Tp**	-1/3 Tp** +10% SPR***
Notes: * Applicable to the southern part of the country only (Dublin - Galway and south of this) ** Reduce the time to peak (Tp) by a third; this allows for potential accelerated runoff that may arise as a result of drainage of afforested land *** Add 10% to the Standard Percentage Runoff (SPR) rate; this allows for increased runoff rates that may arise following felling of forestry		

Through the CFRAM Studies, both MRFS and HEFS model runs have been completed on all study watercourses, providing flood extent and depth maps. This information can be used to support flood risk assessments where the current CFRAM scenario has been deemed appropriate to the location.

For watercourses that are not part of the CFRAM programme, fluvial flood extents can be qualitatively assessed by using the Flood Zone B outline as a surrogate for 'Flood Zone A with allowance for the possible impacts of climate change', as suggested in the 'Planning System and Flood Risk Management'. Quantitative assessment of risks may require an additional model run to fully understand risks.

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

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

Conversely, there may be development which requires a higher-level response to climate change. This could include major facilities which are extremely difficult to relocate, such as hospitals, airports, Seveso sites or power stations, and those which represent a high-economic and long-term investment within the scale of development across the county. In such situations it would be reasonable to expect the high-end future scenario (30% increase in flow) to be investigated in the site-specific FRA and used as the design standard.

In general, climate change will be accounted for the setting of finished floor levels to a height which includes an allowance for climate change. However, climate change may also reveal additional flow paths which need to be protected or give rise to flows which exceed culvert capacity or overtop defences. These outcomes will need to be specifically investigated for each site, and an appropriate response provided.

Further consideration to the potential future impacts of climate change is given for each settlement in Section 8.

7.7 Flood Mitigation Measures at Site Design

For any development proposal in an area at moderate or high risk of flooding that is considered acceptable in principle (i.e. has passed the Plan Making Justification Test), the site specific FRA must demonstrate that appropriate mitigation measures can be put in place and that residual risks can be managed to acceptable levels. This may include the use of flood-resistant construction measures that are aimed at preventing water from entering a building and that mitigate the damage floodwater causes to buildings. Alternatively, designs for flood resilient construction may be adopted where it can be demonstrated that entry of floodwater into buildings is preferable to limit damage caused by floodwater and allow relatively quick recovery.

Various mitigation measures are outlined below and further detail on flood resilience and flood resistance are included in the Technical Appendices of the Planning Guidelines, The Planning System and Flood Risk Management.

7.7.1.1 Site Layout and Design

To address flood risk in the design of new development, a risk-based approach should be adopted to locate more vulnerable land use to higher ground while water compatible development i.e. car parking

(with appropriate flood management plan) and recreational space can be located in higher flood risk areas.

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

7.7.1.2 Ground Levels, Floor Levels and Building Use

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

- Development at the site must have been justified through this SFRA based on the existing (unmodified) ground levels.
- The FRA should establish the function provided by the floodplain. Where conveyance is a prime function then a hydraulic model will be required to show the impact of its alteration.
- The land being given over to storage must be land which does not flood in the 1% AEP fluvial event (i.e. Flood Zone B or C).
- Compensatory storage should be provided on a level for level basis to balance the total area that will be lost through infilling where the floodplain provides static storage.
- The provision of the compensatory storage should be in close proximity to the area that storage is being lost from (i.e. within the same flood cell).
- The land proposed to provide the compensatory storage area must be within the ownership / control of the developer.
- The compensatory storage area should be constructed before land is raised to facilitate development.
- Compensatory storage is generally not required for loss of floodplain in locations behind defences.

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

Raising finished floor levels within a development is an effective way of avoiding damage to the interior of buildings (i.e. furniture and fittings) in times of flood. Alternatively, assigning a water compatible use (i.e. garage / car parking) or less vulnerable use to the ground floor level, along with suitable flood resilient construction, is an effective way of raising vulnerable living space above design flood levels. It can however have an impact on the streetscape. Safe access and egress is a critical consideration in allocating ground floor uses.

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

7.7.1.3 Raised Defences

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

7.8 'Green Corridor'

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

- Retention of all, or some, of the natural floodplain;
- Potential opportunities for amenity, including riverside walks and public open spaces;
- Maintenance of the connectivity between the river and its floodplain, encouraging the development of a full range of habitats;
- Natural attenuation of flows will help ensure no increase in flood risk downstream;
- Allows access to the river for maintenance works;
- Retention of clearly demarcated areas where development is not appropriate on flood risk grounds, and in accordance with the Planning System and Flood Risk Management.

The width of this corridor should be determined by the available land, and topographically constraints, such as raised land and flood defences, but would ideally span the fully width of the floodplain (i.e. all of Flood Zone A).

8 Settlement Zoning Review

The purpose of land use zoning objectives is to indicate to property owners and members of the public the types of development the Planning Authority considers most appropriate in each land use category. Zoning is designed to reduce conflicting uses within areas, to protect resources and, in association with phasing, to ensure that land suitable for development is used to the best advantage of the community as a whole.

This section of the SFRA will:

- Outline the strategic approach to flood risk management.
- Consider the land use zoning objectives utilised within the WMCDP settlements and assess their potential vulnerability to flooding.
- Based on the associated vulnerability of the particular use, a clarification on the requirement of the application of the Justification Test is provided.

- The consideration of the specific land use zoning objectives and flood risk will be presented for the settlements. Comment will be provided on the use of the sequential approach and justification test. Conclusions will be drawn on how flood risk is proposed to be managed in the settlement.

8.1 The Strategic Approach to Flood Risk Management

A strategic approach to the management of flood risk is important in County Westmeath as the risks are varied and disparate, with scales of risk and scales of existing and proposed development varying greatly across the county.

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

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

A summary of flood risks associated with each of the zoning objectives has been provided in the following settlement reviews. The Flood Risk commentary indicates whether a certain land zoning, in Flood Zone A or B, will need to have the Plan Making Justification Test (JT) applied and passed.

When carrying out a site specific FRA, or when planning applications are being considered, it is important to remember that not all uses will be appropriate on flood risk grounds, hence the need to work through the Justification Test for Development Management on a site by site basis and with reference to Table 8.1. For example, a Mixed Use Town / Village Centre zoning objective is "to include for an integrated mix of residential, commercial, community and social uses" which have varying vulnerabilities and would not be equally permissible within Flood Zone A and B.

















Table 8.1 Zoning Objective Vulnerability

Zoning Objective	Indicative Vulnerability	Primary	Flood Risk Commentary
C - Commercial	Less / highly vulnerable		For highly vulnerable development in Flood Zone A or B. For less vulnerable development in Flood Zone A.
IE - Community/ Educational/ Institutional	Less / highly vulnerable		Consideration to be given to flood risks and sequential use of land to ensure highly vulnerable uses are located within areas at lowest risk of flooding.
CS - Consolidation Site	Less / highly vulnerable		For highly vulnerable development in Flood Zone A or B. For less vulnerable development in Flood Zone A.
EE - Enterprise & Employment	Less vulnerable		Appropriate use in Flood Zone B, but JT will be needed in Flood Zone A.
ER - Established Residential	Highly Vulnerable		JT required for within Flood Zone A and B.
ESC - Expanded Settlement Centre	Less / highly vulnerable		For highly vulnerable development in Flood Zone A or B. For less vulnerable development in Flood Zone A.
MU - Mixed Use	Less / highly vulnerable		For highly vulnerable development in Flood Zone A or B. For less vulnerable development in Flood Zone A.
OS - Open Space	Water compatible		JT not needed. Land use appropriate and should be retained.
PR - Proposed Residential	Highly Vulnerable		JT required for within Flood Zone A and B.
SSRC - Self Sustaining Rural Consolidation	Highly Vulnerable		JT required for within Flood Zone A and B.
SR - Sporting Recreational	Water compatible		JT not needed. Land use appropriate and should be retained.



The following sections review the land use zoning objectives for each settlement within the plan and provide a comprehensive summary of flood risk and justification where necessary.

The legend and Zoning Objectives are provided below, these apply to all settlements.

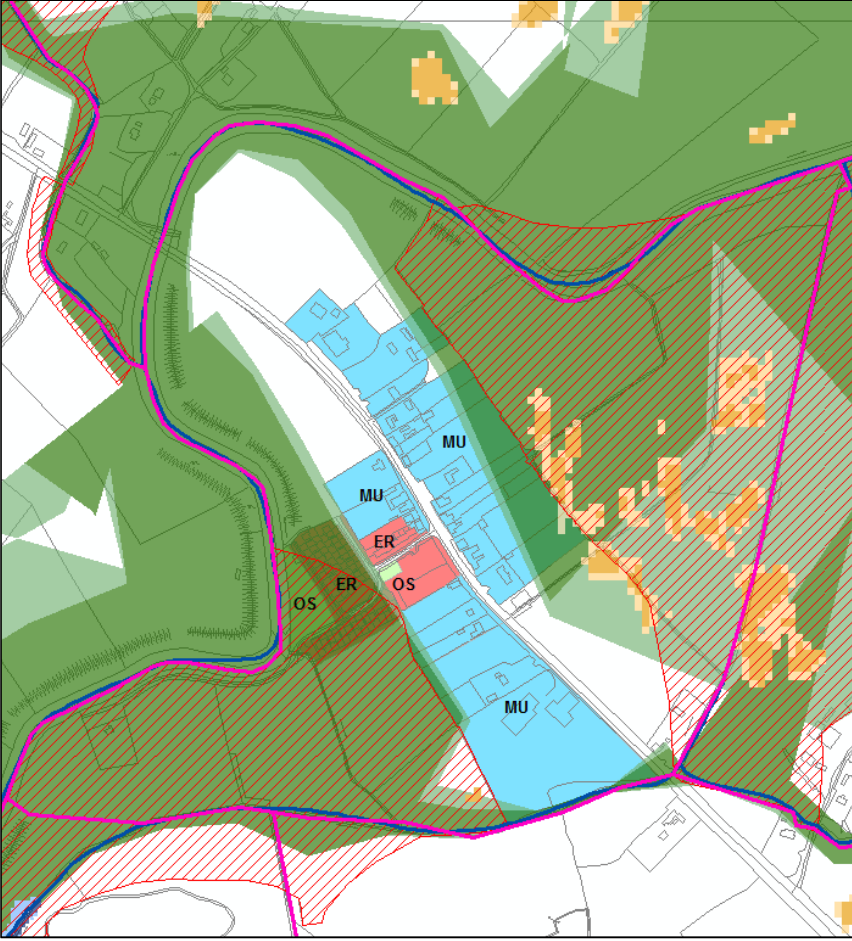
Maps Legend

-  CFRAME Flood Zone A
-  CFRAME Flood Zone B
-  PFRA Pluvial_Indicative
-  PFRA Pluvial_Extreme
-  PFRA 1% AEP Fluvial
-  OPW PFRA 0.1% Fluvial
-  OPW Benefitting Lands
-  Kilbeggan Site - Zone A
-  Kilbeggan Site - Zone B
-  OPW Arterial Drainage Channel
-  Non-Drained River Network
-  OPW Embankments
-  Westmeath Rivers
-  Historic Flood Point
-  Historic Flood Extent
-  WMCC_Lakes

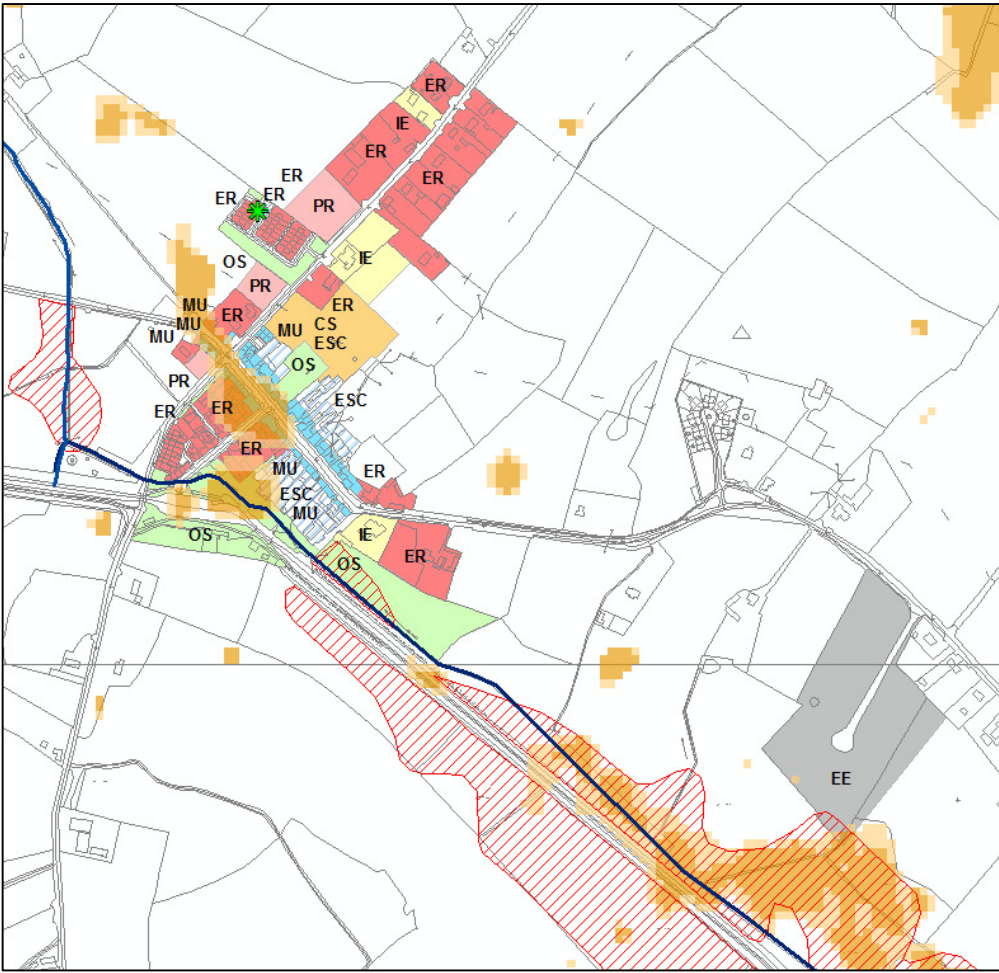
Land Use Zoning Objective

-  C - Commercial
-  CS - Consolidation Site
-  EE - Enterprise & Employment
-  ER - Established Residential
-  ESC - Expanded Settlement Centre
-  IE - Community, Educational & Institutional
-  MU - Mixed Use
-  OS - Open Space
-  PR - Proposed Residential
-  SR - Sporting Recreational
-  SSRC - Self Sustaining Rural Consolidation

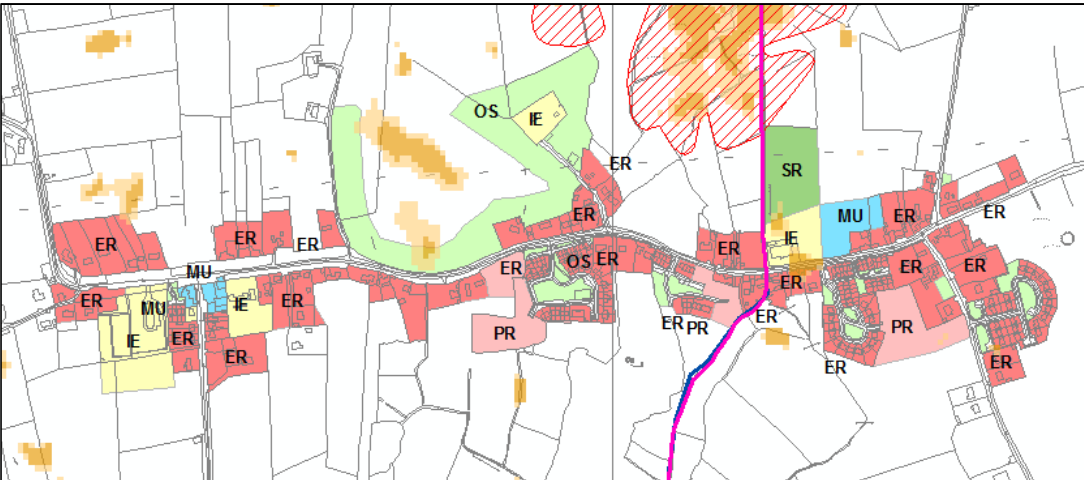
8.2 Ballinalack

Hierarchy/Tier	Rural (Served) Tier 6
Area for Further Assessment under CFRAM programme?	No
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Flood Zone Data	OPW PFRA PLUVIAL + FLUVIAL (Flood Zone A/B represented by PFRA fluvial) BENEFITTING LANDS
Historic Flooding	None found
Comment	The River Inny is subject to an OPW Arterial Drainage scheme and meanders around the western and northern periphery of the village. Most of the development is on higher ground circa 4m above the riverbank. The available flood mapping predicts a significant amount of flooding around the periphery of the existing developed lands, within which the Inis Glora Estate is located. It is likely that the flood extents are currently overestimated by the PFRA and Benefitting Lands mapping, but this is currently the best available data.
Climate Change	Sensitive to fluvial increases in flow.
Conclusion	Risk is limited to existing development and should be managed in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.

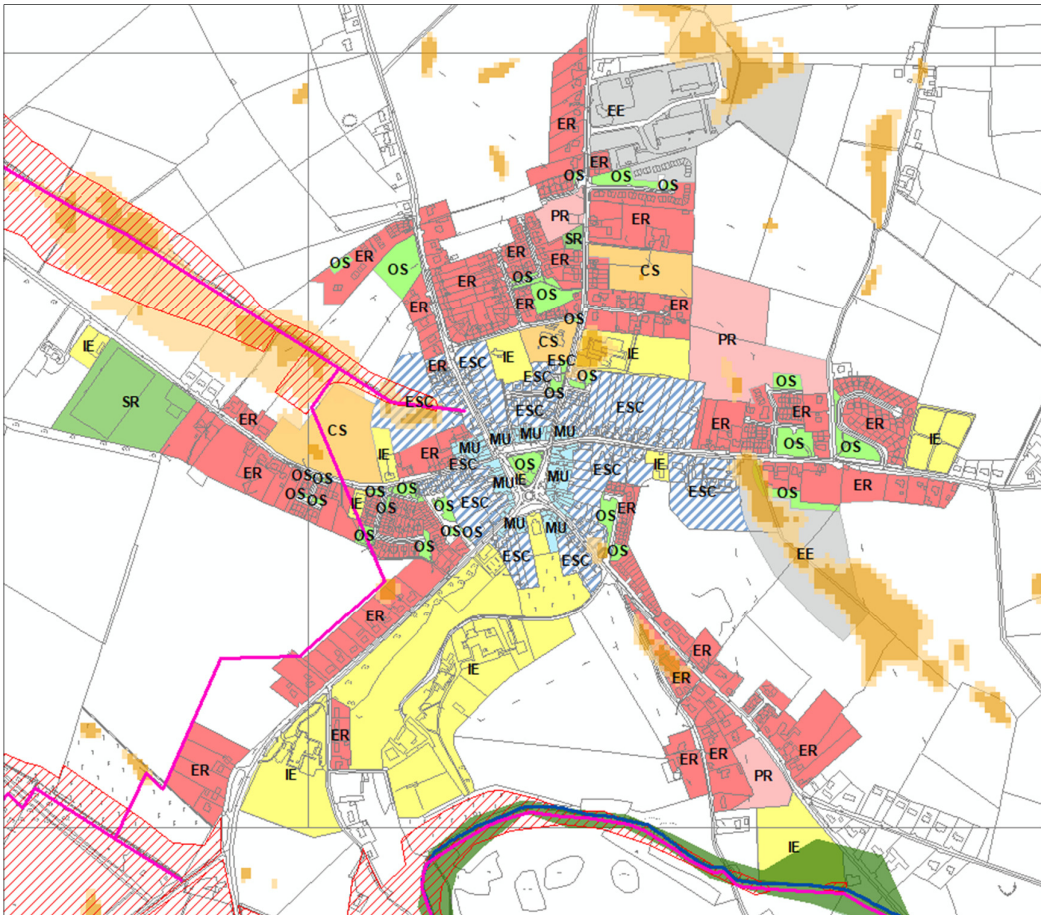
8.3 Ballynacarrigy

Hierarchy/Tier	Rural (Served) Tier 6
Area for Further Assessment under CFRAM programme?	No
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Flood Zone Data	OPW PFRA PLUVIAL BENEFITTING LANDS (taken to represent Flood Zone A/B)
Historic Flooding	Recurring surface water flooding, Carrickmore Estate, inadequate surface water drainage issue.
Comment	Risk from the canal is low and an adjacent stream is mapped only by Benefitting Lands extents. Risk from the stream is still only predicted to impact adjacent open space and there are no undeveloped zoned lands adjacent to the watercourse. There is some predicted pluvial flooding which is based on an analysis of topographic low points, actual surface water drainage may mitigate these areas. There is recurring surface water flooding following heavy rainfall in Carrickmore Estate and this is acknowledged as a known drainage issue.
Climate Change	Minimal fluvial impacts expected, potential increase in runoff would increase surface water risk.
Conclusion	Manage flood risk and development in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk. Surface water management is a key priority in this settlement.

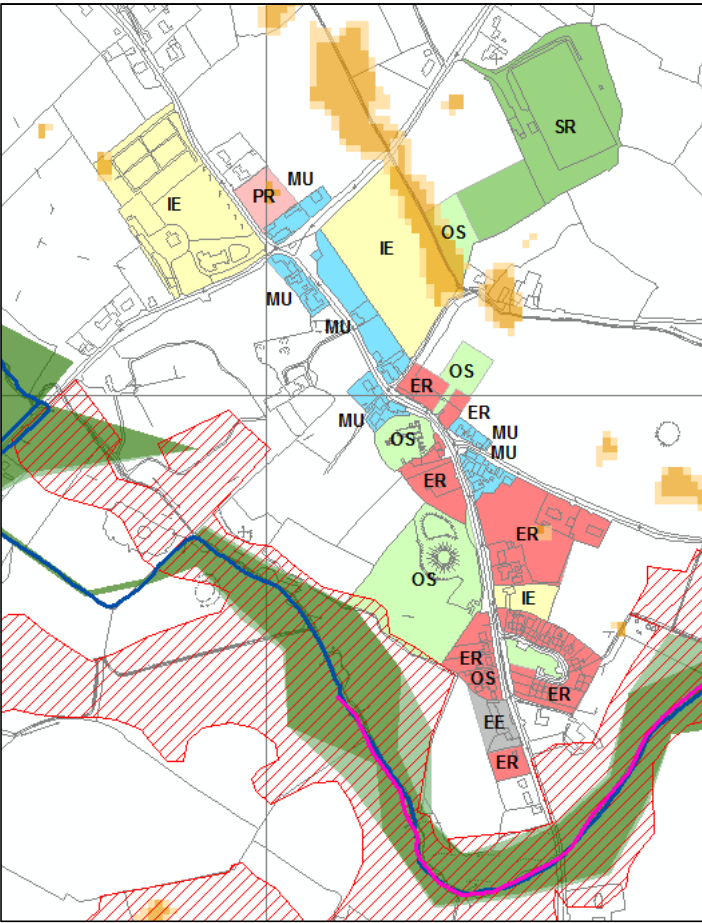
8.4 Ballymore

Hierarchy/Tier	Rural (Served) Tier 6
Area for Further Assessment under CFRAM programme?	No
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Flood Zone Data	OPW PFRA PLUVIAL BENEFITTING LANDS (taken to represent Flood Zone A/B)
Historic Flooding	None found
Comment	Predicted flood risk from the Benefiting Lands mapping is low and there are no significant undeveloped zoned lands close to the watercourse. Some small areas of pluvial flooding are noted, but there is no recorded flood history.
Climate Change	No fluvial impacts.
Conclusion	Risk is not significant. Any extensions/redevelopment should be managed in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.

8.5 Castlepollard

Hierarchy/Tier		Self-Sustaining Growth Town Tier 3
Area for Further Assessment under CFRAM programme?		No
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Flood Zone Data	OPW PFRA PLUVIAL + FLUVIAL (southern watercourse only) BENEFITTING LANDS (taken to represent Flood Zone A/B)	
Historic Flooding	None found	
Comment	The principal risk to the settlement is from the Arterial Drainage channel to the west. A site visit confirmed that the watercourse enters a culvert adjacent to the Proposed Residential (PR) zoning and this has a very deep invert (flows to south). The CS zoning does not encroach within Benefitting Lands and the risk from the culverted section of the watercourse is low. Through the length of the culvert under the PR lands the levels gradually rise to the south where it borders the R395 road. Elsewhere in the settlement there are isolated areas of surface water ponding identified by the PFRA.	
Climate Change	Potential increase/sensitivity to fluvial and pluvial risk.	
Conclusion	Risk is not significant. PR zoning is appropriate in the west of the above settlement but must be subject to FRA at Development Management stage. Pluvial flooding is a potential risk to undeveloped Enterprise & Employment (EE) lands but again, the risk can be managed by appropriately designed stormwater systems to be detailed at Development Management stage. Risk can be managed in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.	

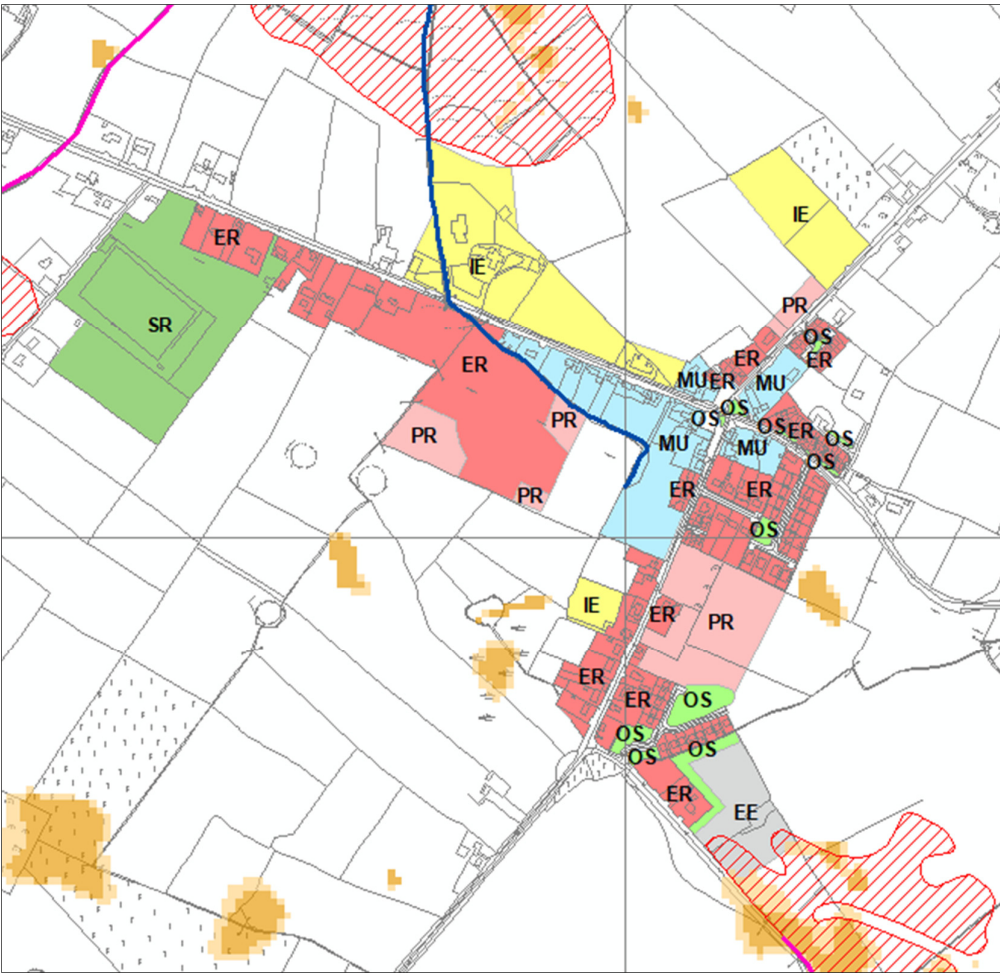
8.6 Castletown Geoghegan

Hierarchy/Tier		Rural (Served) Tier 6
Area for Further Assessment under CFRAM programme?		No
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Flood Zone Data	OPW PFRA PLUVIAL + FLUVIAL BENEFITTING LANDS (taken to represent Flood Zone A/B)	
Historic Flooding	None found	
Comment	An OPW drainage channel meanders around the southern periphery of the settlement and fluvial flood risk is limited to lands that are outside of the settlement. Predicted pluvial flooding impacts undeveloped Community, Educational & Institutional (IE) land.	
Climate Change	No fluvial impacts likely to affect settlement, potential increase in runoff.	
Conclusion	Pluvial risk to IE land should be managed at Development Management stage by the implementation of an appropriately designed stormwater system in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.	

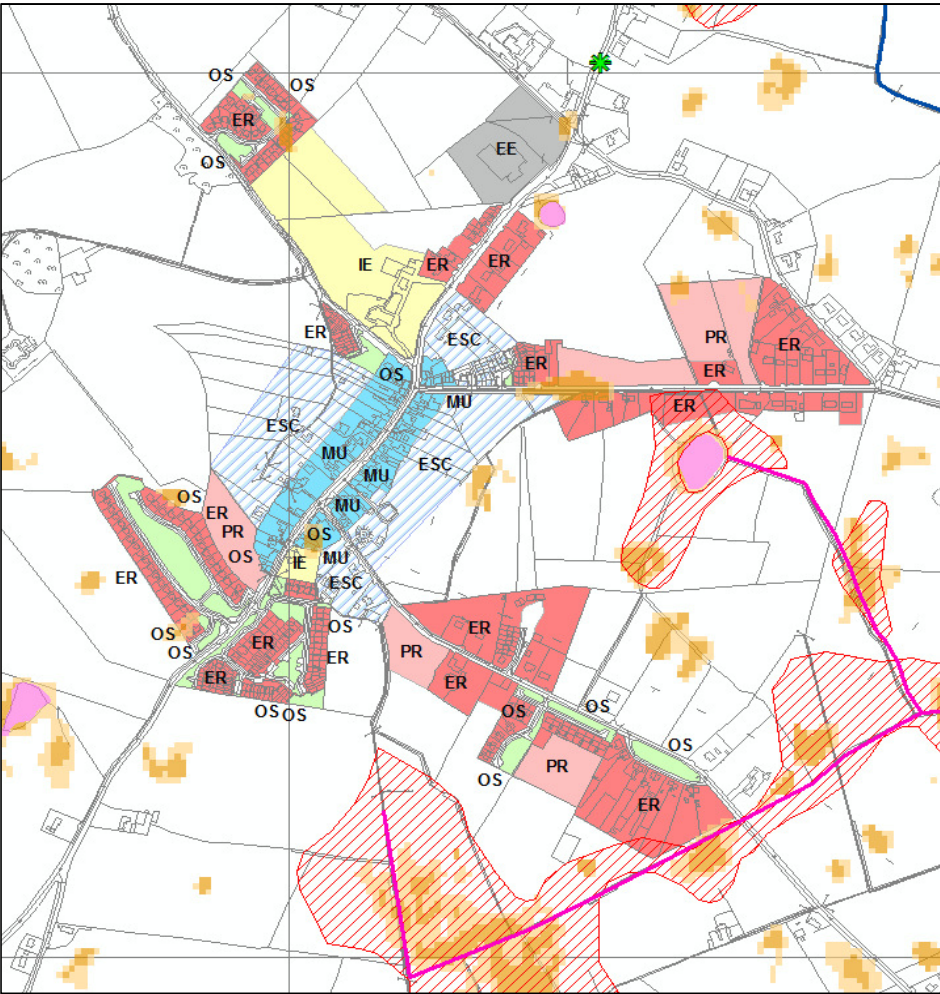
8.7 Clonmellon

Hierarchy/Tier	Towns & Villages Tier 5
Area for Further Assessment under CFRAM programme?	No
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Flood Zone Data	OPW PFRA PLUVIAL + FLUVIAL (taken to represent Flood Zone A/B) BENEFITTING LANDS
Historic Flooding	None found
Comment	An OPW drainage channel flows around the southern and eastern periphery of the settlement and fluvial flood risk is limited to lands that are outside of the settlement, with the exception of a small overlap with Existing Residential (ER) land on the southern extent of the land. It is likely that this extent is overestimated given that the watercourse is subject to arterial drainage. Isolated areas are subject to predicted pluvial flooding, these have been identified as small topographic hollows and the modelling does not consider the existing stormwater system. Most development appears to be circa 2m above floodplain levels and fluvial risk is predominantly low. The EE lands are outlying the main settlement and avoid the predicted risk from the OPW PFRA study, a site-specific FRA will be required at planning application stage as per WMCDP Policy.
Climate Change	Potential increase in floodplain but development is on higher ground, low vulnerability. Pluvial risk may increase.
Conclusion	Manage flood risk and development in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.

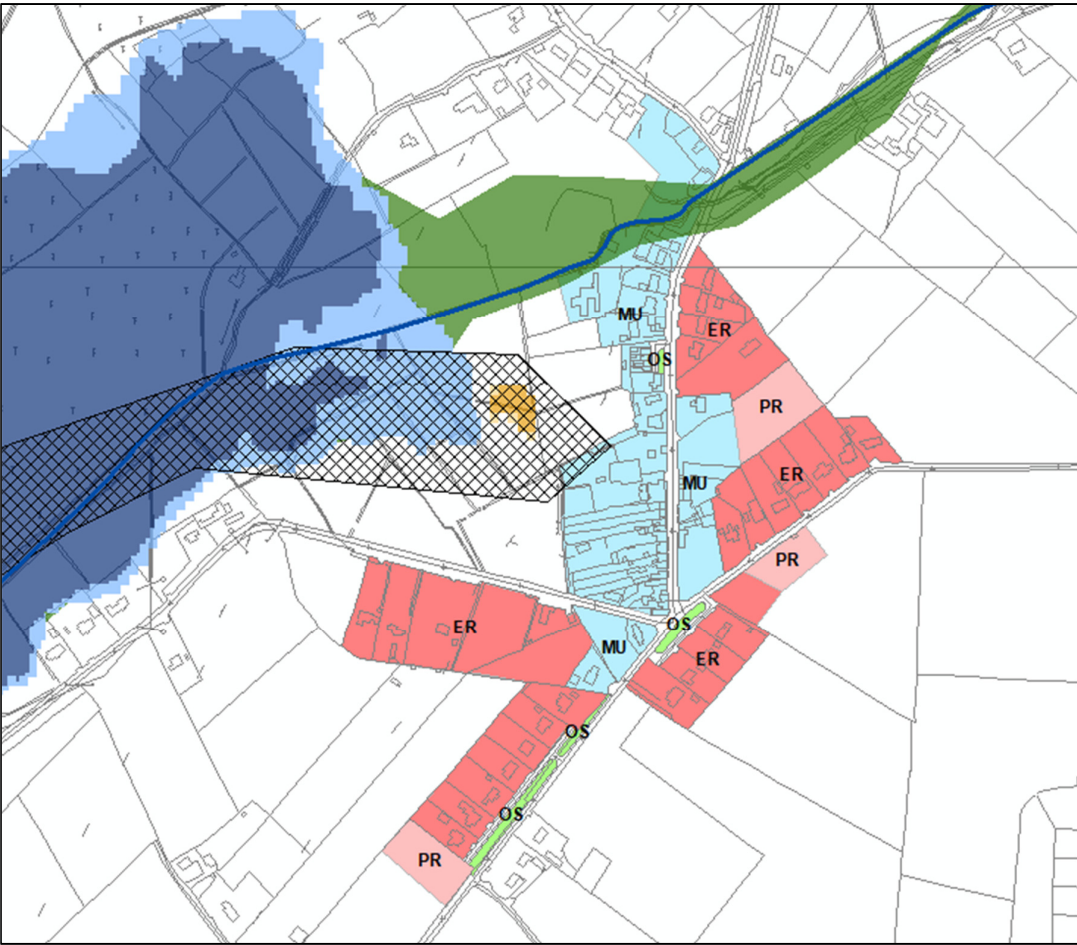
8.8 Collinstown

Hierarchy/Tier	Rural (Served) Tier 6
Area for Further Assessment under CFRAM programme?	No
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Flood Zone Data	OPW PFRA PLUVIAL BENEFITTING LANDS (taken to represent Flood Zone A/B)
Historic Flooding	None found
Comment	A drainage channel originates just to the west of the village centre (crossroads). The watercourse is subsequently piped under the proposed residential land and new housing estate in a 1m diameter pipe. Site visit has verified the watercourse and risk is low to surrounding development. The only other potential source of risk is predicted by Benefitting Lands mapping to the south and this impacts an undeveloped EE site. An OPW Arterial Drainage channel is located 100m south east of the site and most likely provides effective mitigation to the lands. Prior to any development the extent of flooding should be confirmed by an appropriately detailed site specific FRA and the approach set out in the Development Management and Flood Risk section of this SFRA should be followed.
Climate Change	Minor increase in fluvial risk.
Conclusion	Risk is generally low. Manage flood risk and development in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.

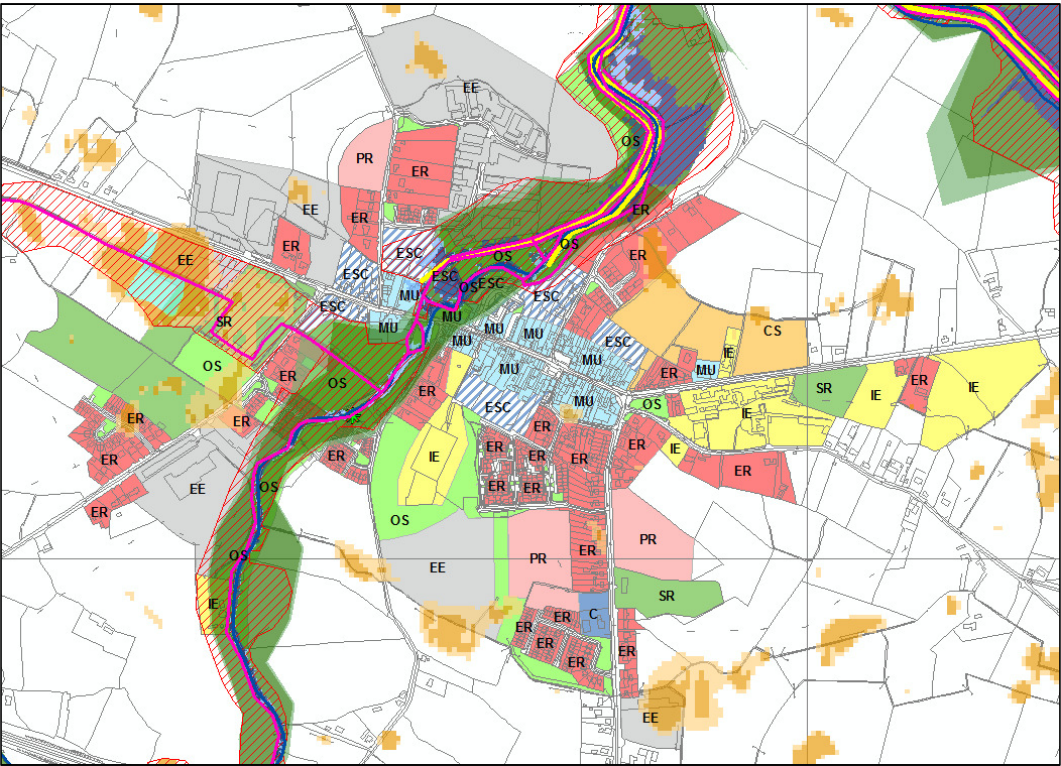
8.9 Delvin

Hierarchy/Tier	Towns & Villages Tier 5
Area for Further Assessment under CFRAM programme?	No
	
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Flood Zone Data	OPW PFRA PLUVIAL BENEFITTING LANDS (taken to represent Flood Zone A/B)
Historic Flooding	Pluvial event in 2009, Mart Junction, Delvin. Surface water from surrounding land and road inundated a dip in the road. No indication of property flooding in the core settlement.
Comment	OPW Arterial Drainage channels are located to the south and east of zoned land. The associated Benefitting Lands flood mapping indicates that there is some overlap with Existing Residential (ER) land. There are some groundwater fed ponds that are located outside of zoned lands in topographic low spots. Given the Arterial Drainage works it is anticipated that the Benefitting lands extents are overestimating risk to the ER lands. Overall the fluvial risk to the settlement is low and the majority of predicted pluvial flooding is outside of the zoned land.
Climate Change	Low sensitivity from fluvial events to current zoned land. Pluvial risk may increase, particularly in isolated low spots, but these are predominantly outside zoned land.
Conclusion	Risk is generally low. Manage flood risk and development in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.

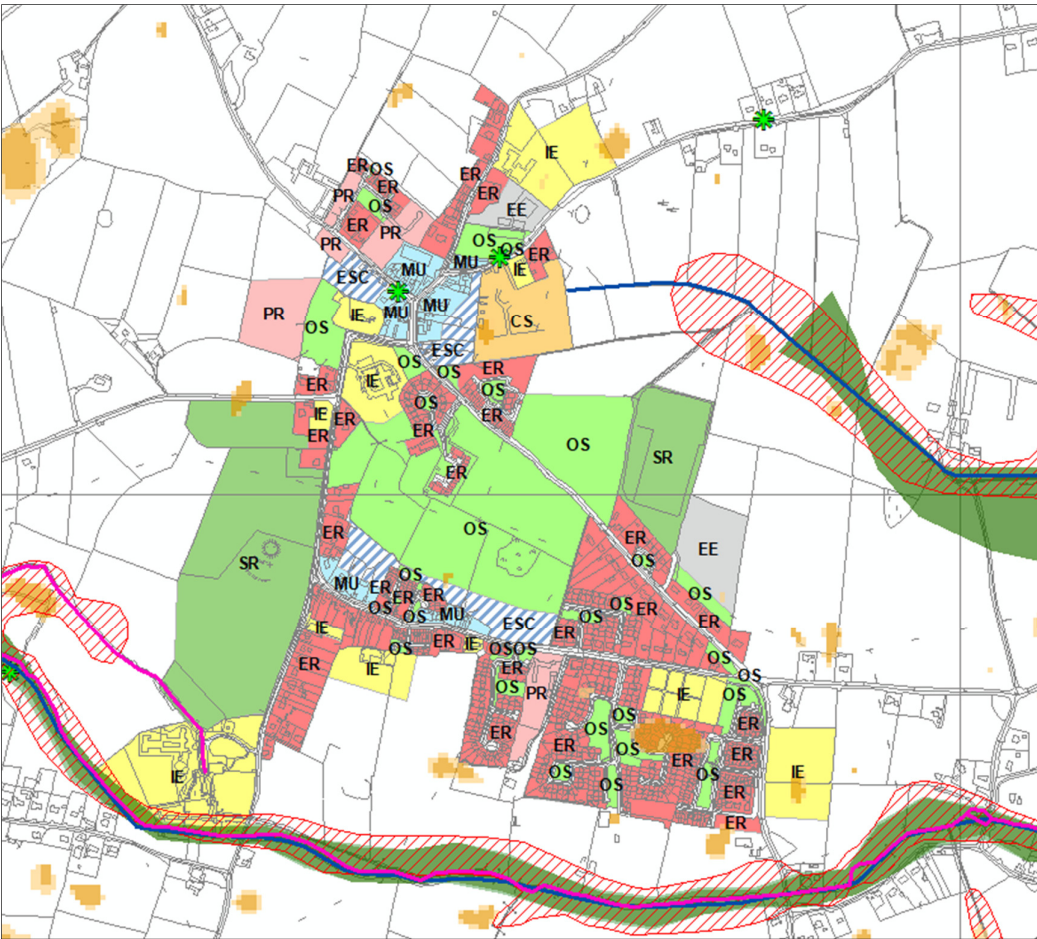
8.10 Glasson

Hierarchy/Tier	Rural (Served) Tier 6
Area for Further Assessment under CFRAM programme?	No
	
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Flood Zone Data	OPW CFRAM to west OPW PFRA PLUVIAL & FLUVIAL (taken to represent Flood Zone A/B)
Historic Flooding	Hatched polygon represents historic flood extent from the 1954 Shannon flood event.
Comment	Glasson is located to the east of Lough Ree. A watercourse flows in a westerly direction under the road to the north of the Mixed Use (MU) existing developed land. There is a circa 4m drop in ground level to historically flooded areas from the Shannon (Lough Ree) to the west of the site. CFRAM mapping is available from the Shannon (from Lough Ree) to west, the OPW PFRA fluvial extents provide the only estimate moving upstream on the fluvial watercourse. Impacts from the PFRA are limited to a small amount of existing development. There is no undeveloped zoned land at risk of flooding.
Climate Change	Moderate sensitivity from fluvial events to current zoned land. Pluvial risk is generally low.
Conclusion	Risk is generally low with the exception of the developed MU land bordering the single watercourse flowing through the settlement. Any extensions/change of use/redevelopment of these properties must have an appropriately detailed FRA. Manage flood risk and development in line with approved WDCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.

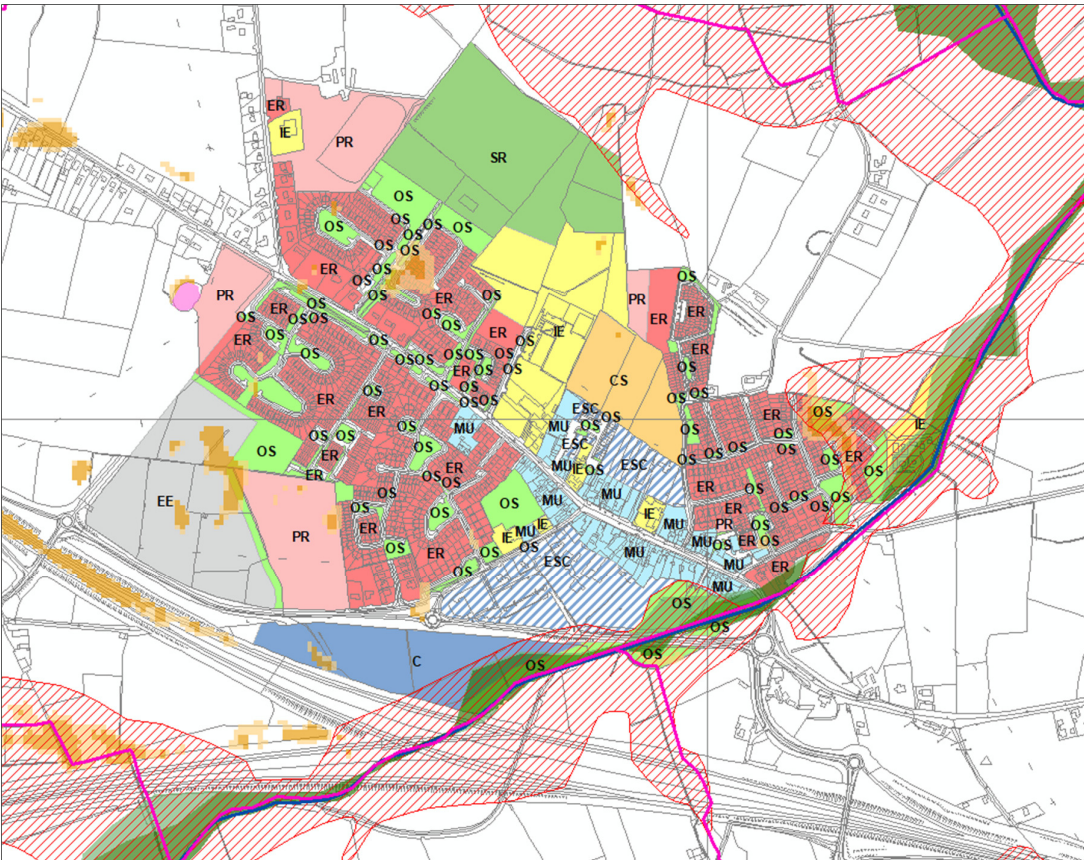
8.11 Kilbeggan

Hierarchy/Tier	Self-Sustaining Growth Towns Tier 3
Area for Further Assessment under CFRAM programme?	Yes
	
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Flood Zone Data	<p>OPW CFRAM for River Brosna (taken to represent Flood Zone A/B)</p> <p>OPW PFRA PLUVIAL</p> <p>BENEFITTING LANDS</p> <p>SITE SPECIFIC FRA for drain to west of centre</p>
Historic Flooding	Brosna View Estate historic recurring pluvial flooding. The Brosna overflows at Coola Bridge every year (assumed this does not impact property).
Comment	<p>The CFRAM analysis confirmed that there is no fluvial flood risk from the River Brosna to any properties within Kilbeggan for the 10% AEP, 1% AEP or 0.1% AEP flood events, as such there is no requirement for a flood relief scheme. The CFRAM did not map the drain that approaches from the west of the settlement along the R446 Moate Road. Benefitting Lands mapping provides an initial estimate of risk, however a site specific FRA provides a detailed assessment of risk and this is displayed on the map above as supplementary information. EE land is situated within Flood Zone C and is appropriate. Pluvial risk is focussed in the lands subject to the site specific FRA, these have now been raised and the low spot has been removed. Site specific measures will manage pluvial risk here.</p>
Climate Change	Moderate sensitivity from fluvial events on the River Brosna, no significant risk to property. Pluvial risk is generally low but could increase with predicted increases in rainfall intensity.
Conclusion	<p>Risk is generally low as confirmed by the OPW CFRAM. Risk adjacent to the western drain has been more well defined but any development within the Benefitting Lands extents and any extensions/change of use/redevelopment in this area must have an appropriately detailed FRA. Manage flood risk and development in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.</p>

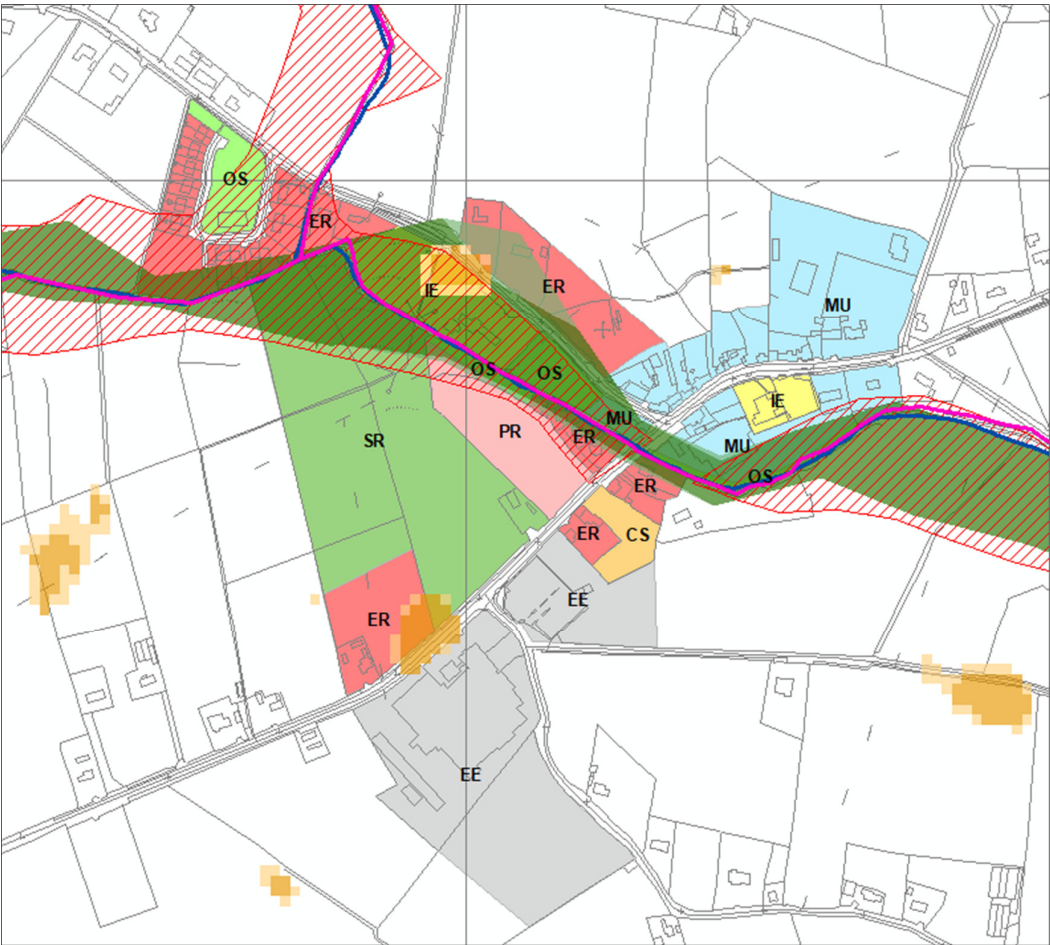
8.12 Killucan/Rathwire

Hierarchy/Tier	Self-Sustaining Towns Tier 4
Area for Further Assessment under CFRAM programme?	No
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Flood Zone Data	OPW PFRA PLUVIAL & FLUVIAL BENEFITTING LANDS (taken to represent Flood Zone A/B)
Historic Flooding	After heavy rain, every year water flows down the road into the village and the surface water drainage is unable to cope. Road is liable to flood and properties are affected. A stream is also noted to overflow its banks with road and low lying area flooding, no property mentioned.
Comment	Flood extents (from Benefitting Lands) are limited to areas outside of the settlement with the exception of the IE land adjacent to the Riverstown River in the south west of the settlement. The encroachment within the land is not understood to present a significant risk to any vulnerable development. Elsewhere in the settlement there is some issue with pluvial flooding impacting property.
Climate Change	High sensitivity to pluvial flood events. Moderate to low sensitivity to fluvial events.
Conclusion	Risk is generally low, any redevelopment within the IE lands close the river must have an appropriately detailed FRA. Manage flood risk and development in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.

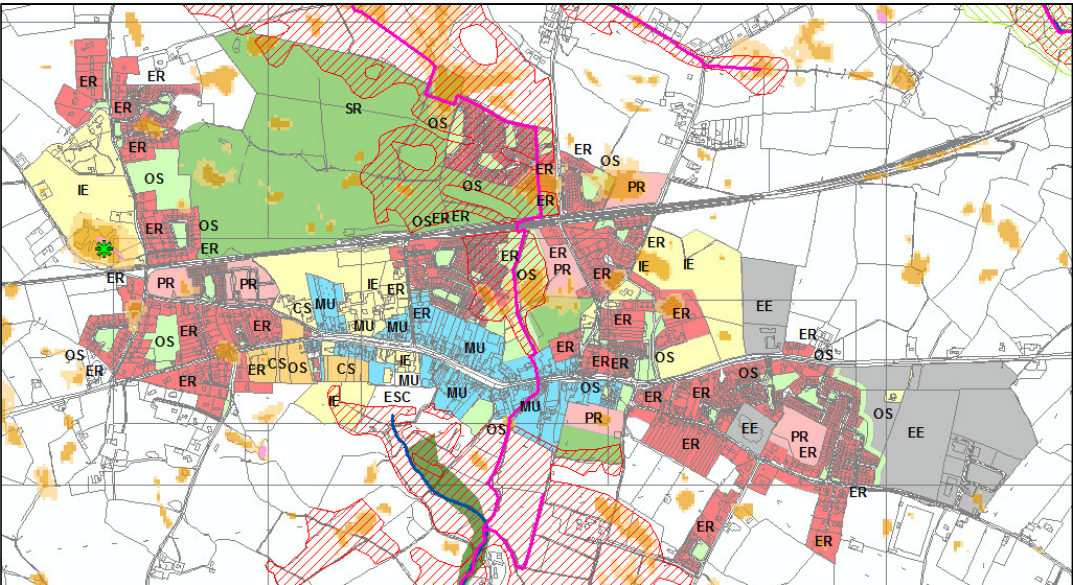
8.13 Kinnegad

Hierarchy/Tier	Self-Sustaining Growth Towns Tier 3
Area for Further Assessment under CFRAM programme?	No
	
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Flood Zone Data	OPW PFRA PLUVIAL & FLUVIAL (taken to represent Flood Zone A/B) BENEFITTING LANDS
Historic Flooding	None recorded
Comment	The principal risk to Kinnegad is from the Kinnegad River, however this is subject to an OPW Arterial Drainage scheme and the channel here is widened and deepened. It is highly likely that the actual flood extents are much less conservative than the Benefitting Lands and to some extent the PFRA extents as well. There is minor overlap with existing developed land only and there is no significant undeveloped lands at potential risk. New Proposed Residential zoning next to the disused quarry lake to the north west of the town is not a significant risk to the site, but an appropriately detailed FRA should be submitted at development management stage to screen risk further. A more detailed assessment of flood risk from the Kinnegad River would potentially be able to reduce the Flood Zone extent and release further land zoned OS for future zoning and development.
Climate Change	Sensitivity to pluvial flood events. Moderate to low sensitivity to fluvial events.
Conclusion	Risk is generally low and is overestimated by Benefitting Lands and PFRA mapping. Manage flood risk and development in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.

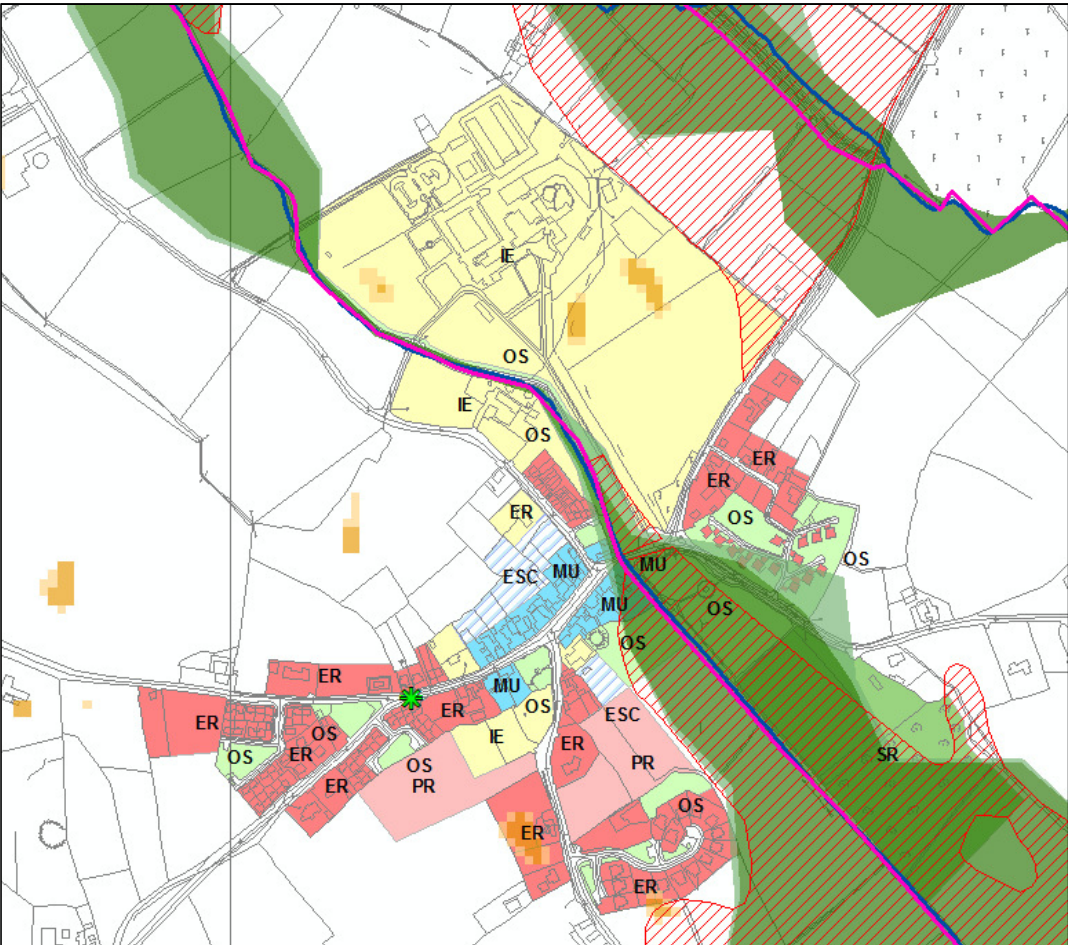
8.14 Milltownpass

Hierarchy/Tier	Rural (Served) Tier 6
Area for Further Assessment under CFRAM programme?	No
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Flood Zone Data	OPW PFRA PLUVIAL & FLUVIAL BENEFITTING LANDS (taken to represent Flood Zone A/B)
Historic Flooding	None recorded
Comment	Risk in Milltownpass was reviewed by the OPW under the CFRAM but it was found that the channel capacity is in the order of the 1% AEP event. Site visit from JBA also confirmed that flood risk from the Benefitting Lands and the PFRA is overestimated and the School is not at high risk, other areas of existing residential development is also at lower risk than suggested by the mapping. Undeveloped land includes Sports & Recreational (SR) and Proposed Residential. SR is appropriate within Flood Zone A/B, the PR lands have a small overlap with benefiting lands but a site specific flood risk assessment confirms that land levels are high at this location and channel capacity is also significant.
Climate Change	Moderate to low sensitivity to fluvial events.
Conclusion	Risk is generally low and is overestimated by Benefitting Lands and PFRA mapping. The PR lands must be subject to a detailed FRA at development. Manage flood risk and development in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.

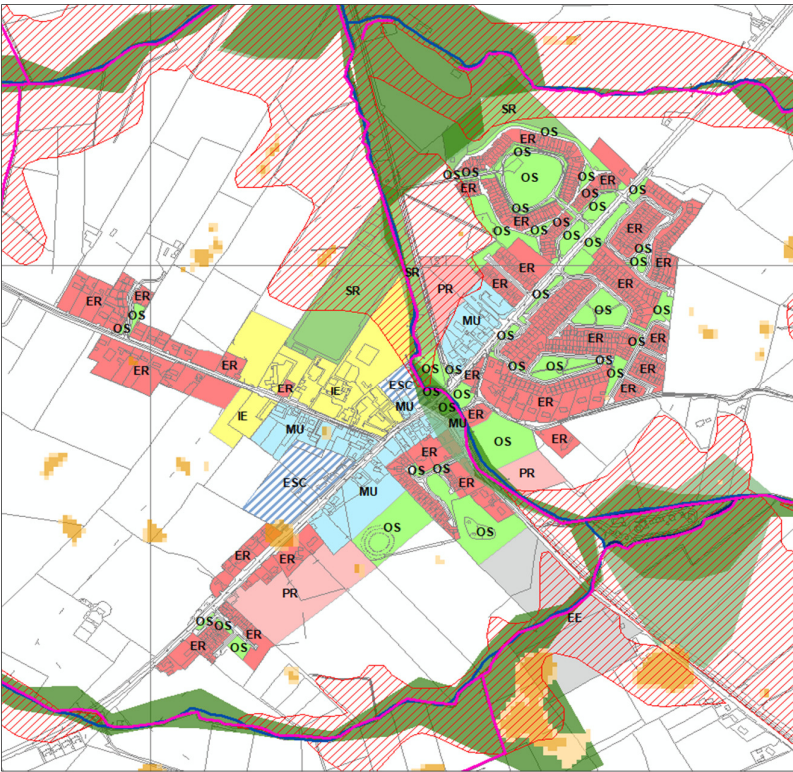
8.15 Moate

Hierarchy/Tier	Self-Sustaining Growth Towns Tier 3
Area for Further Assessment under CFRAM programme?	No
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Flood Zone Data	BENEFITTING LANDS (taken to represent Flood Zone A/B)
Historic Flooding	Turlough (western edge of settlement) floods after heavy rain every year. The flood is of long duration.
Comment	<p>The principal risk within Moate is from an OPW Arterial Drainage channel that flows in a southerly direction through the town. It is culverted beneath an existing housing estate in the north of the settlement, the risk from the Benefitting Lands mapping here is not correct and should be Zone C. The watercourse emerges in the OS land to the north of the railway line before extending through OS land south of the line. PR land here has been located in Flood Zone C and once more it is expected that the actual extent of Flood Zone A would be less than represented by the Benefitting Lands mapping. Most of the pluvial risk is contained within the Benefitting Lands areas and is indicative of low lying areas within the settlement, despite the presence of Benefitting Lands mapping the risk to existing and proposed development is low.</p> <p>Undeveloped IE lands located on the southern extent of the settlement are subject to significant Benefitting Lands flood extent. The lands are separated from the nearest drainage channel by circa 200m and there is a fall of around 2m in vertical height. It is highly unlikely that the lands are at high risk of flooding and prior to any development the extent of flooding should be confirmed by an appropriately detailed site specific FRA and should follow the approach set out in the Development Management and Flood Risk section of this SFRA.</p>
Climate Change	Limited analysis to confirm fluvial sensitivity, but likely to be moderate. Pluvial would be high, particularly adjacent to the Turlough.
Conclusion	Risk is generally low and is overestimated by Benefitting Lands mapping. Manage flood risk and development in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.

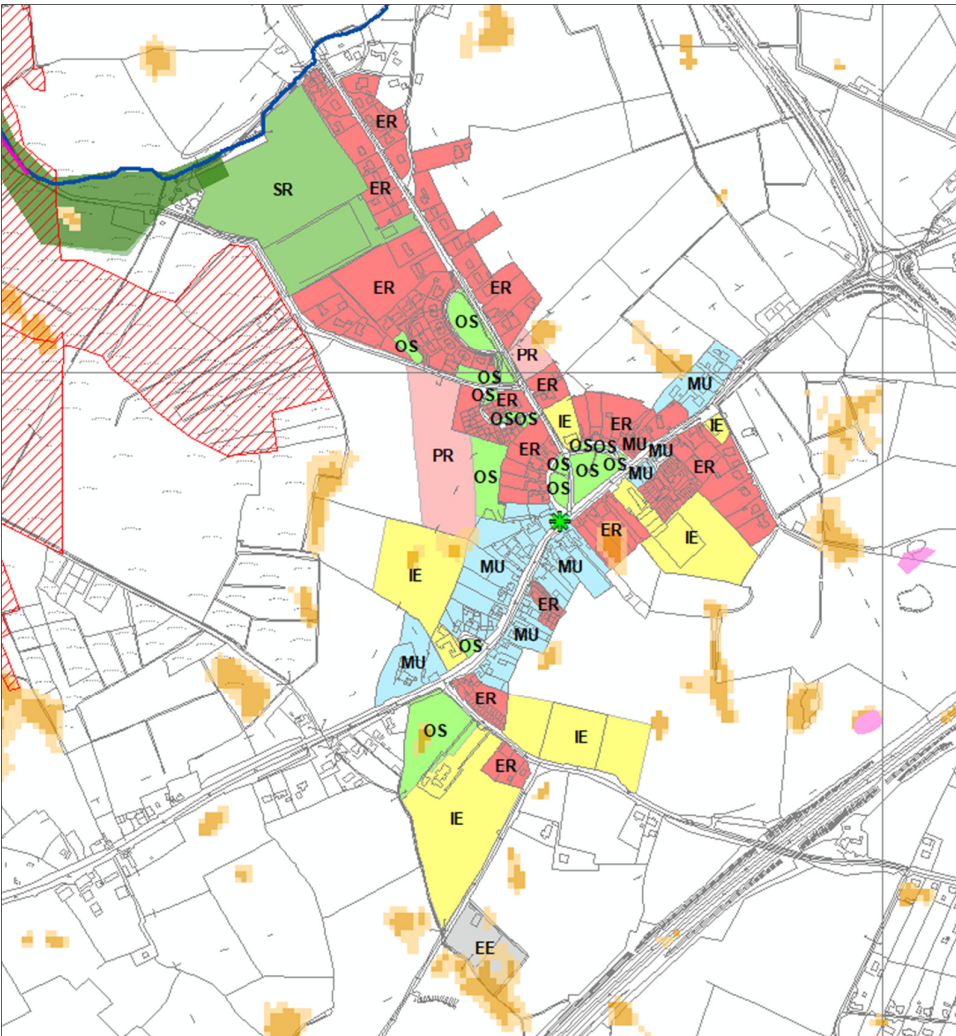
8.16 Multyfarnham

Hierarchy/Tier	Rural (Served) Tier 6
Area for Further Assessment under CFRAM programme?	No
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Flood Zone Data	OPW PFRA Pluvial & Fluvial (taken to represent Flood Zone A/B) BENEFITTING LANDS
Historic Flooding	Low lying area floods after very heavy rain. The road is liable to flood.
Comment	Benefitting Lands and PFRA outlines are similar. The River Gaine passes through the village centre, flood risk is typically avoided by use of OS zoning. Some Existing Residential (ER) in Zone B (PFRA), however the presence of the Arterial Drainage scheme in place on the River Gaine means that the flood extents are most likely to be overestimated.
Climate Change	High fluvial sensitivity. Pluvial flooding is limited in the settlement.
Conclusion	Risk is generally low and is overestimated by Benefitting Lands mapping. All undeveloped zoned lands are within Flood Zone C. Manage flood risk and development in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.

8.17 Rochfortbridge

Hierarchy/Tier	Self-Sustaining Towns Tier 4
Area for Further Assessment under CFRAM programme?	No
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Flood Zone Data	OPW PFRA Pluvial & Fluvial (taken to represent Flood Zone A/B) BENEFITTING LANDS
Historic Flooding	None found
Comment	The Arterial Drainage channel flows through centre of the town. Extensive Benefitting Lands flood extents are overestimated, and this was confirmed by a site visit. PFRA extents are more representative of risk and should be used as an indicative estimate of Flood Zones. Flood risk predominantly impacts water compatible use except in the centre where there appears to be some risk to existing development ESC, MU & ER. The EE zoning to the south of the settlement has a significant overlap with the PFRA mapping (Flood Zone A & B). At Development Management stage a Stage 3 Detailed Flood Risk Assessment will be required to define the extent of Flood Zone A/B and ensure that open space/water compatible land use is maintained within the areas of the site at risk and that the development can appropriately manage the impacts of flooding both on and off site. Residual risk of culvert blockage will also need to be investigated.
Climate Change	High fluvial sensitivity. Pluvial flooding is limited in the settlement.
Conclusion	Risk is generally low, but any redevelopment within the ESC, MU & ER adjacent to the watercourse must have an appropriately detailed FRA. EE lands to the south overlap Flood Zone A/B and Stage 3 FRA is required at Development Management stage, Flood Zone A/B should be defined and kept as open space/water compatible use. IE lands also have a border with the watercourse and should apply a riparian border and be subject to an appropriately detailed FRA. Manage flood risk and development in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.

8.18 Tyrrellspass

Hierarchy/Tier	Towns & Villages Tier 5
Area for Further Assessment under CFRAM programme?	No
	
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Flood Zone Data	OPW PFRA Pluvial & Fluvial (taken to represent Flood Zone A/B) BENEFITTING LANDS (also taken to represent Flood Zone A/B)
Historic Flooding	Low lying land floods after heavy rain every year (pluvial). A property in the village is affected.
Comment	There is limited fluvial flood risk to the northern fringe of the village, this is only predicted to impact Sports and Recreation (SR) zoning, but the risk may extend upstream to impact existing residential land. There is some predicted but isolated areas of pluvial flooding and the historic flood event confirms that one property in the village is impacted by this.
Climate Change	Moderate fluvial sensitivity. Pluvial flooding is limited in the settlement, but given the existing risk it is assumed it would be highly sensitive to further increases in rainfall.
Conclusion	Risk is generally low. Manage flood risk and development in line with approved WMCDP Policy and the guidance provided within the SFRA section on Development Management & Flood Risk.



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