

Strategic Flood Risk Assessment

THOMASTOWN LOCAL AREA PLAN 2019

March 2019

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1 Introduction

As part of the Strategic Environmental Assessment for the Thomastown Draft Local Area Plan, in line with *The Planning System and Flood Risk Management – Guidelines for Planning Authorities*¹, (Guidelines) a staged approach has been taken to the appraisal and assessment of flood risk.

Flood Risk is defined as:

“Flood risk is the damage that may be expected to occur at a given location arising from flooding. It is a combination of the likelihood, or probability, of flood occurrence, the degree of flooding and the impacts or damage that the flooding would cause” (OPW, 2014).

One of the key messages of the then Department of Environment, Heritage and Local Government Guidelines “The Planning System and Flood Risk Management, Guidelines for Planning Authorities”, published in 2009, was that “Flood risk management should be integrated into spatial planning at all levels to enhance certainty and clarity in the overall planning process”. The purpose of this Strategic Flood Risk Assessment (SFRA) is to provide sufficient information to allow proper planning decisions to be made on sites at risk of flooding over the lifetime of the next Local Area Plan 2019 – 2025 and also to ensure that Elected Members have the necessary information with regard to flooding, the ‘Sequential Approach’ and the ‘Justification Test’ in coming to decisions on the Draft Plan.

1.1 Disclaimer

It is important to note that compliance with the requirements of *The Planning System and Flood Risk Management - Guidelines for Planning Authorities*, and of the Floods Directive 2007 60/EC is a work in progress and is currently based on emerging and incomplete data as well as estimates of the locations and likelihood of flooding. Much of the assessment has been undertaken based on the finalised Catchment Flood Risk Assessment and Management Plans [CFRAMs]. Although representing the best currently available information, the CFRAM is not intended to provide the level of detail necessary for a detailed flood risk assessment, and should be used with caution when applying the findings to both SFRA and site level appraisals of risk. As a result, this Flood Risk Assessment is based on available information at the time of publication.

Accordingly, all information in relation to flood risk is provided for general policy guidance only. It may be substantially altered in light of future data and analysis. As a result, all landowners and developers are advised that Kilkenny County Council and its agents can accept no responsibility for losses or damages arising due to assessments of the vulnerability to flooding of lands, uses and developments. Owners, users and developers are advised to take all reasonable measures to assess the vulnerability to flooding of lands in which they have an interest prior to making planning or development decisions.

1.2 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:

¹ Department of Environment and OPW, [The Planning System and Flood Risk Management Guidelines for Planning Authorities](#), 2009

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.

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.

1.2.1 Likelihood of Flooding

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

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

Table 1-1 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.

1.2.2 Consequences of Flooding

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

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

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

1.3 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 risk of flooding from fluvial or tidal sources and are defined below in Table 1-2.

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 1-2 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).

1.4 Objectives and Principles of the Planning Guidelines

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

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

- "avoid inappropriate development in areas at risk of flooding;

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

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

The 'Planning System and Flood Risk Management' Guidelines 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.

1.4.1 Structure of a Flood Risk Assessment (FRA)

The Guidelines recommend that a staged approach is adopted when undertaking a Flood Risk Assessment (FRA). The recommended stages are briefly described below:

- **Stage 1 ~ Flood Risk Identification**

To identify whether there may be any flooding or surface water management issues that will require further investigation. This stage mainly comprises a comprehensive desk study of available information to establish whether a flood risk issue exists or whether one may exist in the future.

- **Stage 2 ~ Initial Flood Risk Assessment**

If a flood risk issue is deemed to exist arising from the Stage 1 Flood Risk Identification process, the assessment proceeds to Stage 2 which confirms the sources of flooding, appraises the adequacy of existing information and determines the extent of additional surveys and the degree of modelling that will be required. Stage 2 must be sufficiently detailed to allow the application of the sequential approach within the flood risk zone².

- **Stage 3 ~ Detailed Flood Risk Assessment**

Where Stages 1 and 2 indicate that a proposed area of possible zoning or development may be subject to a significant flood risk, a Stage 3 Detailed Flood Risk Assessment must be undertaken.

² The Sequential approach ensures that development is first and foremost directed towards land that is at low risk of flooding, see Section 3.2 of the Guidelines for further information.

1.4.2 The Sequential Approach and Justification Test

The sequential approach in terms of flood risk management is based on the following principles:

AVOID - SUBSTITUTE - JUSTIFY - MITIGATE – PROCEED.

The primary objective of the sequential approach is that development is primarily directed towards land that is at low risk of flooding (AVOID). The next stage is to ensure that the type of development proposed is not especially vulnerable to the adverse impacts of flooding (SUBSTITUTION).

The Justification Test is designed to rigorously assess the appropriateness, or otherwise, of particular developments that, for various reasons, are being considered in areas of moderate or high flood risk (JUSTIFICATION). The test is comprised of two processes, namely the Plan-Making Justification Test and the Development Management Justification Test. Only the former (Plan-Making Justification Test) is relevant to a Strategic Flood Risk Assessment for a Plan, and this is described as follows.

Justification Test for Development Plans (See p.37 of the Guidelines)

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

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

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

MITIGATION is the process where the flood risk is reduced to acceptable levels by means of land use strategies or by means of detailed proposals for the management of flood risk and surface water, all as addressed in the Flood Risk Assessment. The decision to PROCEED should only be taken after the Justification Test has been passed.

1.5 Scales of Flood Risk Assessment

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

- **Regional Flood Risk Appraisal (RFRA)** – a broad overview of flood risk issues across a region to influence spatial allocations for growth in housing and employment as well as to identify where flood risk management measures may be required at a regional level to support the proposed growth. This should be based on readily derivable information and undertaken to inform the Regional Planning Guidelines.
- **Strategic Flood Risk Assessment (SFRA)** – an assessment of all types of flood risk informing land use planning decisions. This will enable the Planning Authority to allocate appropriate sites for development, whilst identifying opportunities for reducing flood risk. This SFRA will revisit and develop the flood risk identification undertaken in the RFRA, and give consideration to a range of potential sources of flooding. An initial flood risk assessment, based on the identification of Flood Zones, will also be carried out for those areas which will be zoned for development. Where the initial flood risk assessment highlights the potential for a significant level of flood risk, or there is conflict with the proposed vulnerability of development, then a detailed stage 3 FRA will be required to ensure zoning objectives are compatible with flood risk at the site, and more importantly that mitigation measures which reduce flood risk to the site and neighbouring lands can be implemented. The SFRA will highlight where a site specific FRA is required as part of the planning application process.
- **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, the level of detail required for a site specific FRA will be clearly identified. The SSFRA should consider flood mitigation and the management of residual risks, such as culvert blockage or defence overtopping and access and evacuation plans are likely form important element of the assessment. This may be on the basis of readily available information, such as the CFRAM, or may require the development of a hydraulic model to further investigate flood risks.
- This assessment is for a Local Area Plan and therefore is at SFRA scale.

2 Stage 1 Flood Risk Identification

This purpose of this stage of assessment is to identify whether there are any flooding or surface water management issues relating to the plan area that may warrant further investigation. Sources which were consulted are outlined below.

2.1 Definition of the Study Area

Thomastown is one of County Kilkenny's largest district towns, located at the crossing of the R448 (former N9) and the R700 from Kilkenny to New Ross and the R703 from Thomastown to Graiguenamanagh. The town is located approximately 16km south west of Kilkenny City and 32km north east of Waterford City. The Mount Juliet Estate with Hotel and Championship Golf Club lies ca. 6.5km to the east of the town.

2.2 Higher Level Plans

2.2.1 Regional Flood Risk Appraisal

A Regional FRA was carried out and published as Appendix 3 to the Strategic Environmental Assessment of the South East Regional Planning Guidelines, 2010. This document provided guidance on the issues to be addressed in any Strategic Flood Risk Assessment.

Under Section 3.2 River Nore, this RFRA makes reference to Thomastown as follows:

"As with other parts of the south-east region, County Kilkenny was badly hit by flooding in August 2008. Graiguenamanagh and Callan, two of the worst-hit parts of the county, along with Thomastown will benefit from a Flood Risk Management Study which will be undertaken by Kilkenny County Council".

2.2.2 Strategic Flood Risk Appraisal

A Strategic Flood Risk Assessment for County Kilkenny was published in 2014 as part of the County Development Plan 2014-2020. This examined the level of information available on flooding in the county and assessed all settlements affected for the presence of flood risk indicators. This did not cover the Thomastown LAP area in detail as the County Development Plan did not propose any change to the zoning therein.

As part of Amendment 2 to the Thomastown Local Area Plan in 2012, a Flood Risk Assessment was carried out and published as Appendix 1 to the Strategic Environmental Assessment Screening³. The information contained in this was reviewed.

The relevant Objective within the County Development Plan is:

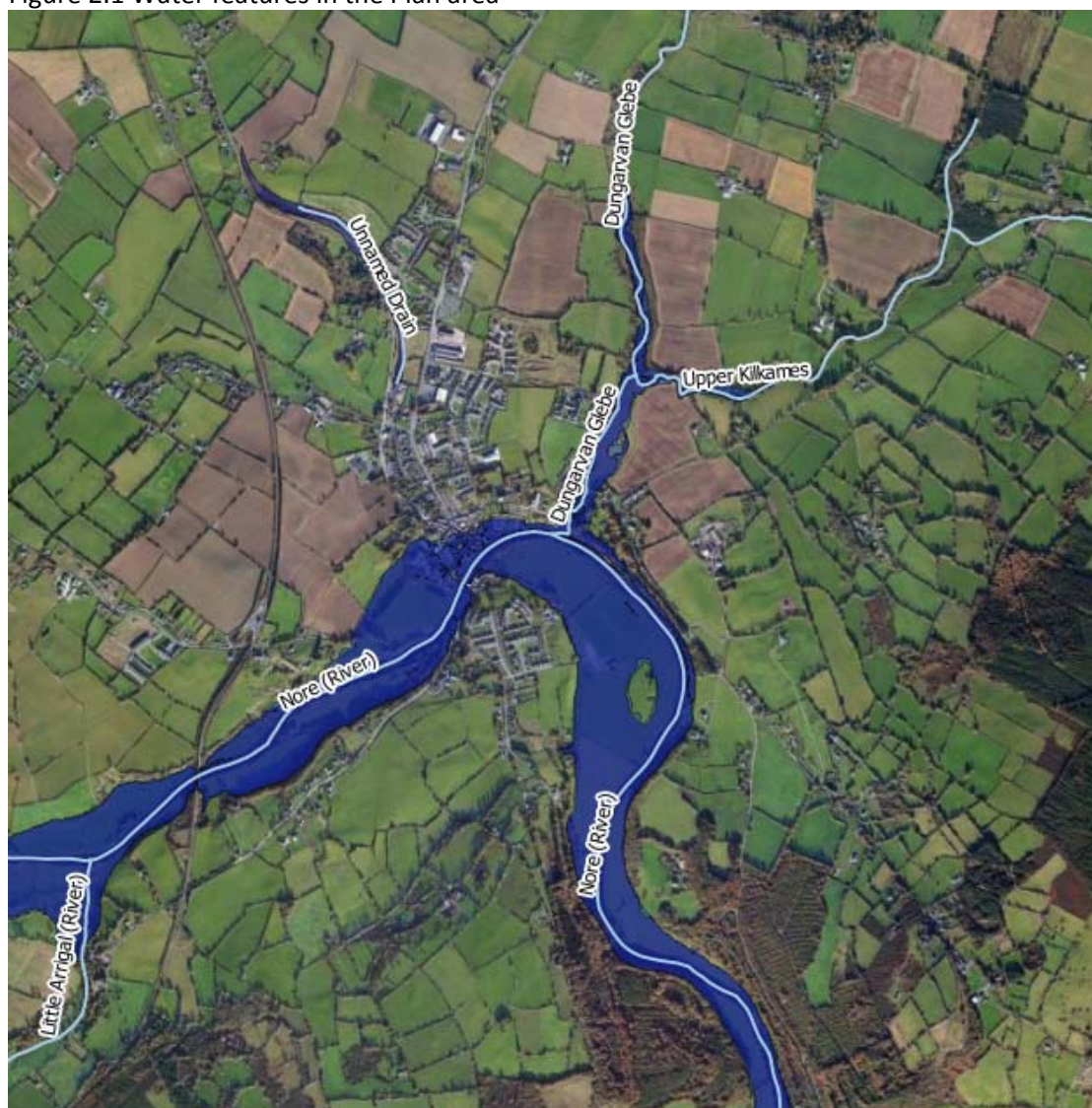
- 9G - To adopt a comprehensive risk-based planning approach to flood management to prevent or minimise future flood risk. In accordance with the Planning System and Flood Risk Management – Guidelines for Planning Authorities, the avoidance of development in areas where flood risk has been identified shall be the primary response.

³ Kilkenny County Council, [Flood Risk Assessment: Appendix 1 to Strategic Environmental Assessment Screening of Amendment No. 2 to the Thomastown Local Area Plan](#), 2012

2.3 Waterbodies in the Plan area

The plan area contains two main water features: the River Nore flowing west to east, and the Dungarvan Glebe stream in the north east. There is also a small stream or drainage channel which runs from north to south alongside the Kilkenny Road. This stream is culverted below Treacy's Hardware and downstream development.

Figure 2.1 Water features in the Plan area



Map source: Bing maps

2.4 Data Availability and Gap Analysis

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

The Flood Zone maps have been developed using the most appropriate data available to Thomastown at the time of preparing the LAP. The Flood Zone maps have been created specifically to inform the application of the Justification Test and to guide development policy within the town and have been through several iterations of review, and are now

considered to be fit for purpose. However, it should be borne in mind that the input data was developed at a point in time and there may be changes within the catchment that mean a future study, or more localised assessment of risk may result in a change in either flood extent or depth. This means a site specific flood risk assessment may result in locally appropriate information which could show a greater or less level of risk than is included in the Flood Zone maps. This is to be expected and it will require discussion between the developer and the Kilkenny County Council Planning and Engineering teams to ensure the assessment is appropriate and relevant to the site in question.

2.4.1 Data sources

The FRA included an appraisal of available datasets, including coverage and accuracy / level of detail, and a ranking system as to how useful the data will be in undertaking the initial and detailed (if required) stages of the SFRA. The output of this stage of assessment was not a Flood Zone Map, but does provide guidance on the preparation of the Flood Zones through the SFRA.

Data sets reviewed, and their usefulness to the study, are detailed in the following table.

Table 2-1 Review of Data sets

Dataset	Description / coverage	Robustness	Comment on usefulness
South Eastern CFRAM study	Covered the Thomastown LAP area	Flood Zones and flood extents for current and future scenarios provided by OPW. Depth, velocity and risk to life, and defended areas are also available. Modelling is 'best of breed' and outputs will allow informed decisions to be made on zoning objectives. Design water levels will inform decisions relating to raising land and setting finished floor levels.	Very useful – it is considered unlikely that additional assessment will be needed to inform the SFRA as all information needed to carry out the JT for Plan Making will be provided. Site specific FRAs will still be required for planning applications, but information on water levels can form the basis of many decision in relation to finished floor levels. See below for further information.
OPW Preliminary Flood Risk Assessment (PFRA) flood maps – Fluvial	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	Moderate	Not used as all watercourses covered by CFRAM Study model extents
PFRA Maps – Pluvial and groundwater		Low	Used to add to commentary in the risk table and to identify potentially at risk areas of the town, but should not be used to develop screening map or to inform zoning decisions without further analysis.

SFRA for Thomastown Local Area Plan 2019

Dataset	Description / coverage	Robustness	Comment on usefulness
SFRA of Amendment 2 to Thomastown LAP 2012	Based on various indicative data sources	Moderate. Indicates areas of potential risk, but is not based on detailed assessment and followed the precautionary principle.	Reviewed but not used to develop the revised flood maps.
Historical event outlines and point observations and reports	Various, taken from www.floodmaps.ie and from information supplied by Thomastown Area Engineer in relation to the properties which flooded in 2015.	Indicative, as no return period provided	Can be indirectly used to validate flood zones and identify non-fluvial flooding. Used to corroborate flood extents to the west of the Dublin Road.
Arterial Drainage Benefiting land maps	Show land which would (or have) benefited 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, Benefitting lands are mapped along River Nore and to east of the plan area along tributary.	Low	Superseded by the data sources listed above, although may be used to cross check Flood Zones.
Mineral Alluvial Soil Mapping	The soils and subsoils maps were created by the Spatial Analysis Unit, Teagasc. The project was completed in May 2006 and was a collaboration between Teagasc, Geological Survey of Ireland, Forest Service and the EPA. The presence of alluvial soils can indicate areas that have flooded in the past (the source of the alluvium). Alluvial soils are	Low	Can be indirectly used to provide some level of validation of flood zones, but not relied upon for zoning decisions. Used to corroborate the Flood Zones to the west of the Dublin Road, in conjunction with the historical flood records.

Dataset	Description / coverage	Robustness	Comment on usefulness
	mapped along River Nore and along streams running north south into River Nore.		
Ordnance Survey “Lands liable to floods” mapping (6” OS maps)	Maps were based on survey work carried out from 1833-1844 with many updated in the 1930s and 1940s. Area south of the town marked as “Liable to Floods” along River Nore.	Low	Can be indirectly used to provide some level of validation of flood zones, but not relied upon for zoning decisions.
Other maps and studies	There are a number of flood studies for Thomastown, including: - Hyder Consulting (2010) carried out a Flood Relief Report for Callan, Thomastown and Graiguenamanagh. The Thomastown Report included detail on historical flood events and mapped the 100 year flood extent around the River Nore. - Thomastown Individual Property Protection Pilot Study (2016).	Low to Moderate	Reviewed, but superseded by the data above.

2.4.2 OPW Publications

To comply with the Floods’ Directive⁴, the OPW commenced a CFRAM (Catchment Flood Risk Assessment and Management) programme in Ireland in 2011.

The CFRAM Programme comprises three phases:

1. The Preliminary Flood Risk Assessment (PFRA): 2011
2. The CFRAM Studies and parallel activities: 2011-2017
3. Implementation and Review: 2017 onwards

⁴ [Directive 2007/ 60/ EC of the European Parliament and of the Council of 23rd October 2007 on the assessment and management of flood risk: Official Journal L288/ 27-34.](#)

2.4.2.1 Preliminary Flood Risk Assessment

The [Floods' Directive](#) required Member States to undertake a national preliminary flood risk assessment by 2011 to identify areas where significant flood risk exists or might be considered likely to occur. In August 2011, the OPW published the National Preliminary Flood Risk Assessment, Draft for Public Consultation⁵ which comprised a Report and a set of draft, indicative, maps.

This national screening exercise identified where there may be a significant risk associated with flooding, based on available and easily derivable information. The objective of the PFRA was to identify Areas for Further Assessment (AFA's) and this further assessment would take place through Catchment Flood Risk Assessment and Management Studies (CFRAMS).

The OPW published a list of the Areas designated for further assessment in March 2012. Thomastown was designated as an AFA⁶.

Maps of the County were published as part of the Draft PFRA. The OPW have stated that the maps, although draft and indicative, may be of use to the Local Authorities in a number of areas of activity, particularly in the performance of their planning function in relation to the implementation of the [Flooding Guidelines](#).

These maps indicate flood extents – for fluvial flooding they indicate the 100 year event and the extreme event, or 1 in 1000 year event. They also indicate coastal, pluvial and groundwater flood extents. Fluvial flooding is flooding from a river or other watercourse. Pluvial flooding is a result of rainfall-generated overland flows which arise before run-off enters any watercourse or sewer.

2.4.2.2 Catchment Based Management Plans

Phase 2 of the CFRAM programme involved the production of CFRAM studies. The OPW, in co-operation with various Local Authorities, produced Catchment Flood Risk Assessment and Management Studies. These CFRAMS mapped out current and possible future flood risk areas and develop risk assessment plans. They also identified possible structural and non-structural measures to improve the flood risk of the area.

The CFRAM that affects this LAP is the South Eastern CFRAM study. This study commenced in Summer 2011 and was finalised in Summer 2018. The South Eastern district is one of Ireland's largest river basin districts covering about one fifth of the country with an area of nearly 13,000km².

The main aims of the South Eastern CFRAM Study are to:

- assess flood risk, through the identification of flood hazard areas and the associated impacts of flooding;
- identify viable structural and non-structural measures and options for managing the flood risks for localised high-risk areas and within the catchment as a whole;
- prepare a strategic Flood Risk Management Plan (FRMP) and associated Strategic Environmental Assessment (SEA) that sets out the measures and policies that should

⁵ <http://www.cfram.ie/pfra/>

⁶ See <http://www.cfram.ie/wordpress/wp-content/uploads/2011/06/AFA-Designation-Report-120514-Final-2.pdf>

be pursued to achieve the most cost effective and sustainable management of flood risk;

- ensure that full and thorough public and stakeholder consultation and engagement is achieved.

For these risk areas, flood risk and flood hazard maps were developed through detailed hydraulic modelling of the watercourses, with the mapping being published in Summer 2018⁷.

See Figure 2.1 which shows the tiles available for the Thomastown area. The CFRAM mapping is now an important and primary input into flood risk assessment studies.

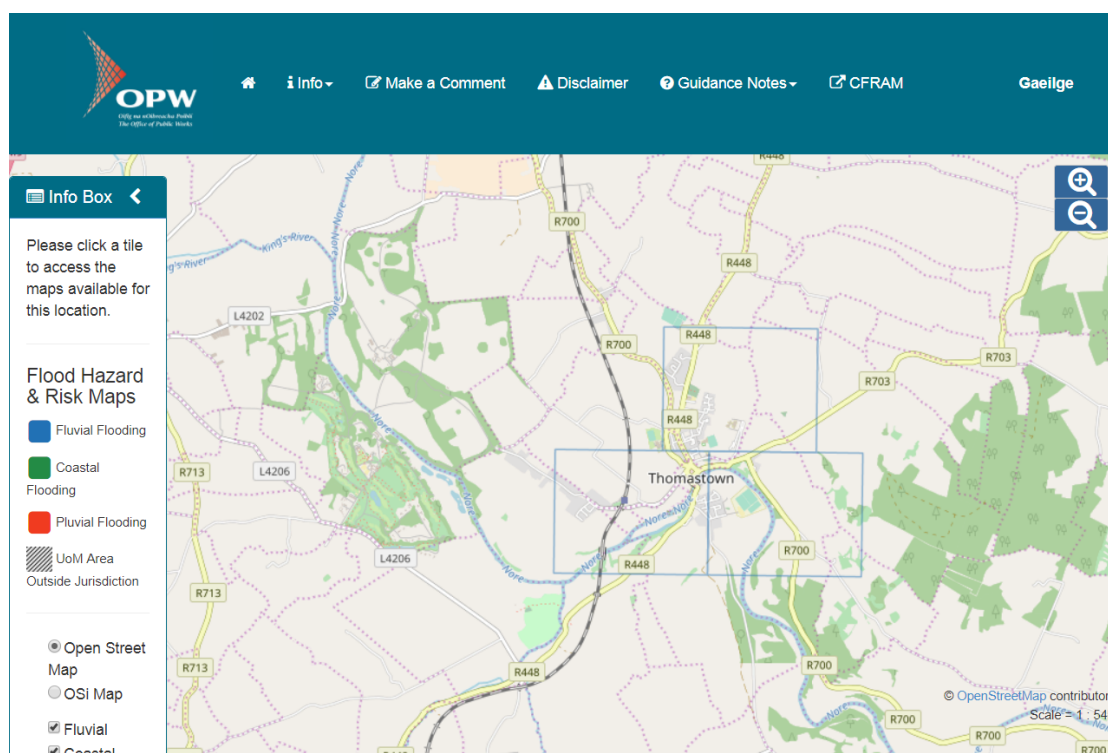


Figure 2.2: Available tiles for CFRAM flood maps from OPW

The CFRAM flood maps on floodinfo.ie provide information on predicted flood levels and depths for the current 10%, 1% and 0.1% AEP flood extents, and the extents of flooding in the medium-range future and high-end future climate change scenarios. The information has been used to undertake this SFRA, and is also available to inform site specific flood risk assessments through the development management stages of planning.

2.4.2.3 Flood Risk Management Plans

Following on from the CFRAM mapping, Flood Risk Management Plans (FRMPs) were also finalised and published in Summer 2018. The FRMP for the Unit of Management 15: Nore covers the plan area. FRMPs include measures in relation to flood prevention, protection and preparedness. Emergency response to flooding, recovery from flooding and incorporating lessons learned will be important elements of the FRMPs. Issues such as climate change, land use practices and future development are also addressed in the FRMPs.

⁷ <http://www.floodinfo.ie/map/floodmaps/>

In the case of Thomastown, the proposed measure detailed in the FRMP⁸ consists of building hard defences, at risk properties would be protected by embankments and walls, sheet piled where necessary and set back where possible from the river channel. These hard defences would protect properties from the 1% AEP fluvial event and with an estimated average height of 1.9m and a total length of 2.7km. However, it is important to note that the programme for the scheme is yet to be finalised

2.4.3 Summary of flood sources

Having regard to all of the information sources as outlined above, the following potential sources of flooding have been identified within the plan area.

2.4.3.1 Fluvial flooding

Flooding of watercourses is associated with the exceedance of channel capacity during higher flows. The process of flooding on watercourses depends on a number of characteristics associated with the catchment including; geographical location and variation in rainfall, steepness of the channel and surrounding floodplain and infiltration and rate of runoff associated with urban and rural catchments. The River Nore and the Dungarvan Glebe Stream are the primary sources of flood risk in Thomastown. The River Nore has caused significant flooding in Thomastown on a number of previous occasions, with the most recent floods occurring in March 2018, December 2015 and November 2009. On these occasions, much of the town centre was flooded, including The Quay, Marshes Street, Market Street and Low Street. The River Nore is relatively slow to rise and fall and typically flooding in Thomastown can last up to 24 hours.

2.4.4 Pluvial Flooding

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

Although having potentially severe consequences, pluvial flooding can generally be managed through site design, layout and drainage. However, SFRA's require a strategic assessment of the likelihood of surface water flooding, which includes consideration of the following:

Are there zoned lands which may need to accommodate and retain surface water flow routes?

Are there zoned lands which might discharge upstream of an area vulnerable to surface water flooding?

A preliminary screening of surface water risk has been carried out for this SFRA, drawing on the OPW's PFRA mapping. There is a limited risk shown on the PFRA mapping, and the couple of highlighted risk areas fall within the Cloghabrody Heights and Maudlin Court developments, and the land zoned for new residential development to the east. For development within or near these areas, particular attention to surface water risk is

⁸[http://s3-eu-west-](http://s3-eu-west-1.amazonaws.com/docs.floodinfo.opw/floodinfo_docs/Final_FRMPs_For_Publication/FRMP_Final2018_RiverBasin_15.pdf)

[1.amazonaws.com/docs.floodinfo.opw/floodinfo_docs/Final_FRMPs_For_Publication/FRMP_Final2018_RiverBasin_15.pdf](http://s3-eu-west-1.amazonaws.com/docs.floodinfo.opw/floodinfo_docs/Final_FRMPs_For_Publication/FRMP_Final2018_RiverBasin_15.pdf)

required. Drainage Impact Assessments are required for all development proposals, regardless of the Flood Zone the site is located within.

2.4.5 Flooding from Drainage Systems

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

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

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

2.4.6 Ground water flooding

A preliminary hydrogeological assessment in the area adjoining the River Nore in Thomastown has indicated that there may also be issues of groundwater flooding. This does not impact on the development of Flood Zone Maps, or the application of the Justification Test. However, it does mean that certain construction techniques may not be appropriate in some locations. It also means that where, in other situations, a flood wall or embankment would provide protection from overland flooding, where groundwater is a problem underground flow routes would also need to be considered.

2.4.7 Climate Change

Climate change should be considered when assessing flood risk and in particular residual flood risk. Areas of residual risk are highly sensitive to climate change impacts as an increase in flood levels will increase the likelihood of defence failure.

The 'Planning System and Flood Risk Management' Guidelines recommends that a precautionary approach to climate change is adopted due to the level of uncertainty involved in the potential effects. Specific advice on the expected impacts of climate change and the allowances to be provided for future flood risk management in Ireland is given in the OPW draft guidance⁹. 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

⁹ OPW Assessment of Potential Future Scenarios, Flood Risk Management Draft Guidance, 2009

allowances for climate change are given in Table 2.2. These climate change allowances are particularly important at the development management stage of planning, and will ensure that proposed development is designed and constructed to take into account current Government advice. Guidance on when the MRFS or HEFS should be used is provided in Section 4.8. Further work on the impacts of climate change on flood levels has been undertaken as part of the CFRAM for both the River Nore and the Dungarvan Glebe Stream. The CFRAM study includes both current and potential future water levels across the river system, and these levels can be used to inform design criteria for developments within the CFRAM study area.

It is acknowledged that climate change research is advancing rapidly, and the allowances provided in the OPW guidance may be an underestimate of future impacts. At this, the plan making stage, a detailed knowledge of the impact of climate change on flood levels is not required to inform the strategic allocation of land.

Table 2-2: 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		

3 Stage 2 Initial Flood Risk Assessment

The purpose of this stage is to ensure that all relevant flood risk issues are assessed in relation to the decisions to be made and potential conflicts between flood risk and development are addressed to the appropriate level of detail.

An iterative process of flood risk assessment has been undertaken. This has involved the refinement of the zoning objectives map, which was reviewed and amended according to the Flood Zones and the vulnerability of the uses proposed under each zone.

3.1.1 Flood zone mapping

Using a combination of the CFRAM mapping, and the other flood risk indicators as described earlier, the flood zones have been developed, and are shown in Figure 3-. Given the primacy of CFRAM mapping, this is used where available. The CFRAM mapping delineates both Zone A and B., and the land outside this area forming Flood Zone C. The flood zone for the stream which flows parallel to the Kilkenny Road, to the west of the Berkley Lawn housing estate, is based on a combination of alluvial soils mapping, historical event information and local knowledge of the site.

3.1.2 Application of the Sequential Approach

Having identified the area of flood risk within the plan area the next step is to apply the sequential approach to land use planning. The areas of flood risk were overlaid on the current zoning for the area. This was taken from Amendment 1, Core Strategy (2012). This identified 17 locations where flood risk and future development may cause a conflict, see Figure 3-.

Under the current LAP 2009 as amended a total of eight zones governed land use in Thomastown; Agriculture, Open Space/biodiversity, Community/Education, Industry, Mixed Use, New Residential, Existing Residential and Phase 2.

The uses permitted within each of these zones were examined in detail to ascertain in what circumstances the (plan level) Justification Test would be required. Two of the eight zones (Agriculture and Open Space/Biodiversity) do not pose a conflict between flood risk and development, as detailed below:

Agriculture

For the most part, the uses permissible under the Agriculture zoning of the LAP fall into either the 'Less Vulnerable development' category or the 'Water Compatible development' categories of vulnerability. Houses, guesthouses and nursing homes, which are 'Highly vulnerable developments' are open for consideration within the Agriculture zoning, however, a proviso will be included that they will not be permitted within the flood zones. The Draft Plan also proposes to include a proviso that less vulnerable uses will not be permitted within the Agriculture zoning in Flood Zone A. Extensions to existing uses or structures will be permitted. Therefore Justification Tests at this plan-making stage are not required for Agriculture zoning.

Open Space / Biodiversity

In the main, the uses permissible under the Open Space zoning fall into either the 'Less Vulnerable development' category or the 'Water Compatible development' categories of

vulnerability. The Draft Plan also includes a proviso that less vulnerable uses will not be permitted within Flood Zone A. Extensions to existing uses or structures will be permitted. Therefore Justification Tests at this plan-making stage are not required for Open Space zoning.

3.1.3 Site specific Flood review

A total of 17 areas of potential conflict have been identified in the current zoning map (2009 LAP as amended in 2012) and have been subject to site specific flood risk review under this FRA. These have been assessed individually, considering the zoning proposed under the Draft LAP for each site. (Figure 2.3 shows the Flood Zones overlain on the proposed Draft zoning map.) For each of these areas, flood risk and development options have been appraised. Where required, the Justification test has been applied. If the Justification Test has been passed, details of the required considerations for site specific objectives, and development management site specific FRA have been provided. Following the sequential approach, where the Justification Test cannot be passed, the land has been rezoned to a less vulnerable use.

The same approach has been applied to the Draft LAP, and the zonings proposed within it to ensure there is no conflict between proposed zonings and flooding.

The summary of this review is detailed over the following pages.

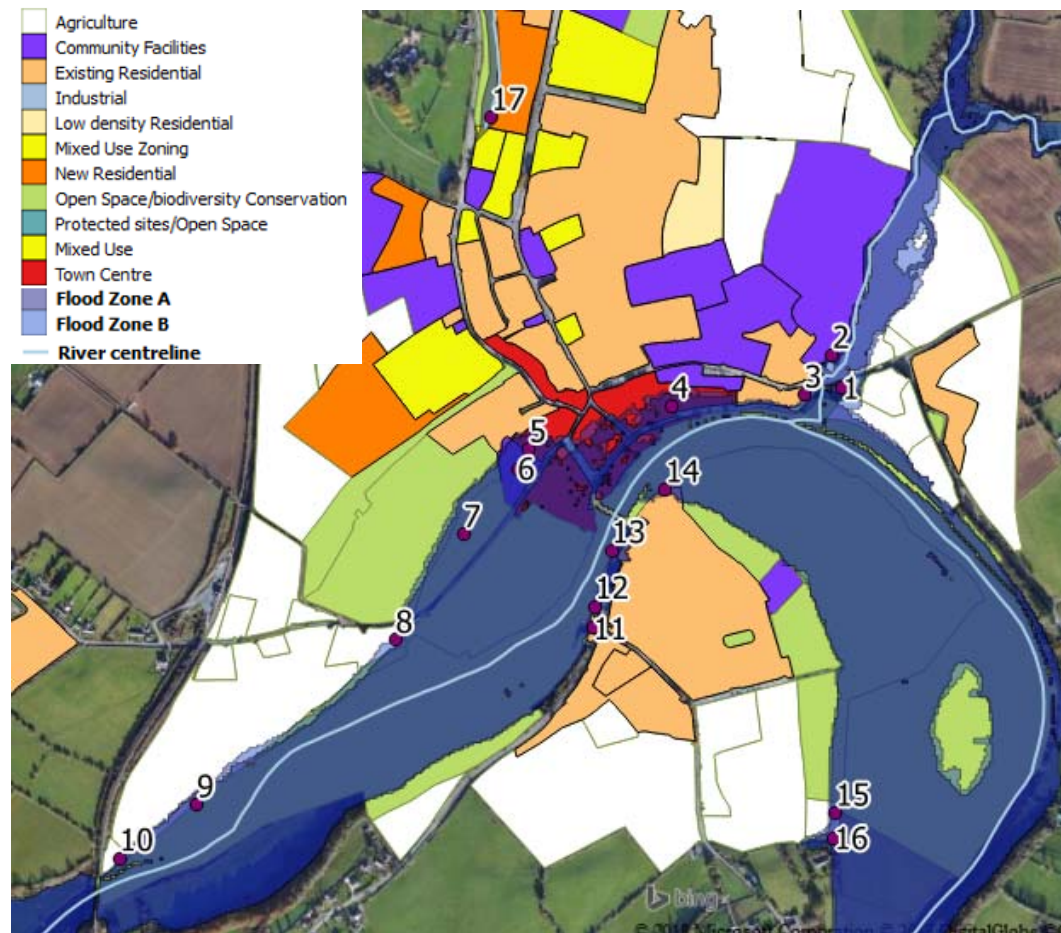
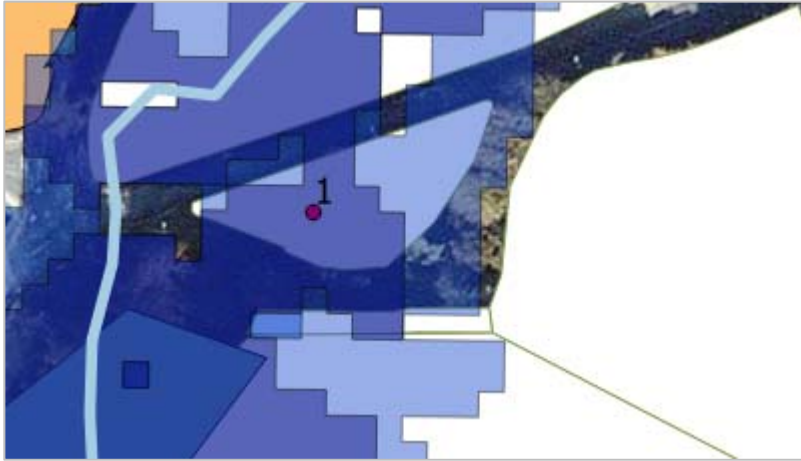


Figure 3-3: Flood Zone Map with Draft LAP Zonings and areas of conflict highlighted

SFRA for Thomastown Local Area Plan 2019

It should be noted that all the images below relate to the zoning contained in the Draft LAP, not the 2009 LAP as amended.

Site 1: Dangan	
	
Site Description	<p>This land parcel is adjacent to both the River Nore and its tributary.</p> <p>This site was zoned for Residential in the 2009 LAP as amended.</p>
Benefitting from Defences (flood relief scheme works)	<p>The land parcel does not benefit from defences.</p>
Sensitivity to Climate Change	<p>Relatively low. There is some increase in the extent of the 1% AEP flood, but it is still within the extent of the current 0.1% AEP flood. There is a minimal increase in the extent of the 0.1% AEP flood between current and MRFS.</p>
Residual Risk	<p>No specific residual risk issues likely. There is a culvert which passes below the R703 road to Kiljames, but this is upstream of the site so unlikely to increase flood risk in the event of blockage.</p>
Historical Flooding	<p>It is not known if this area has flooded in the past.</p>
<p>Commentary on Flood Risk:</p> <p>Approximately half of the land parcel is within Flood Zone A, with the remainder being in Flood Zone B. Depths in the 1% AEP event are generally less than 0.25m, and in the 0.1% AEP event are up to 1m.</p> <p>Water levels are controlled by levels on the Nore, which prevents discharge when river levels are high.</p>	
<p>Justification Test:</p> <p>The Justification Test was applied, but could not be passed. Therefore, the site is being rezoned to Agriculture</p>	
<p>Development Options:</p> <p>The 'Agriculture' zoning is appropriate to the level of flood risk. Although some highly and less vulnerable development is permitted within this zoning, the sequential approach will see any such development located within Flood Zone C. For all other development, the general guidelines on undertaking an FRA should be applied.</p>	

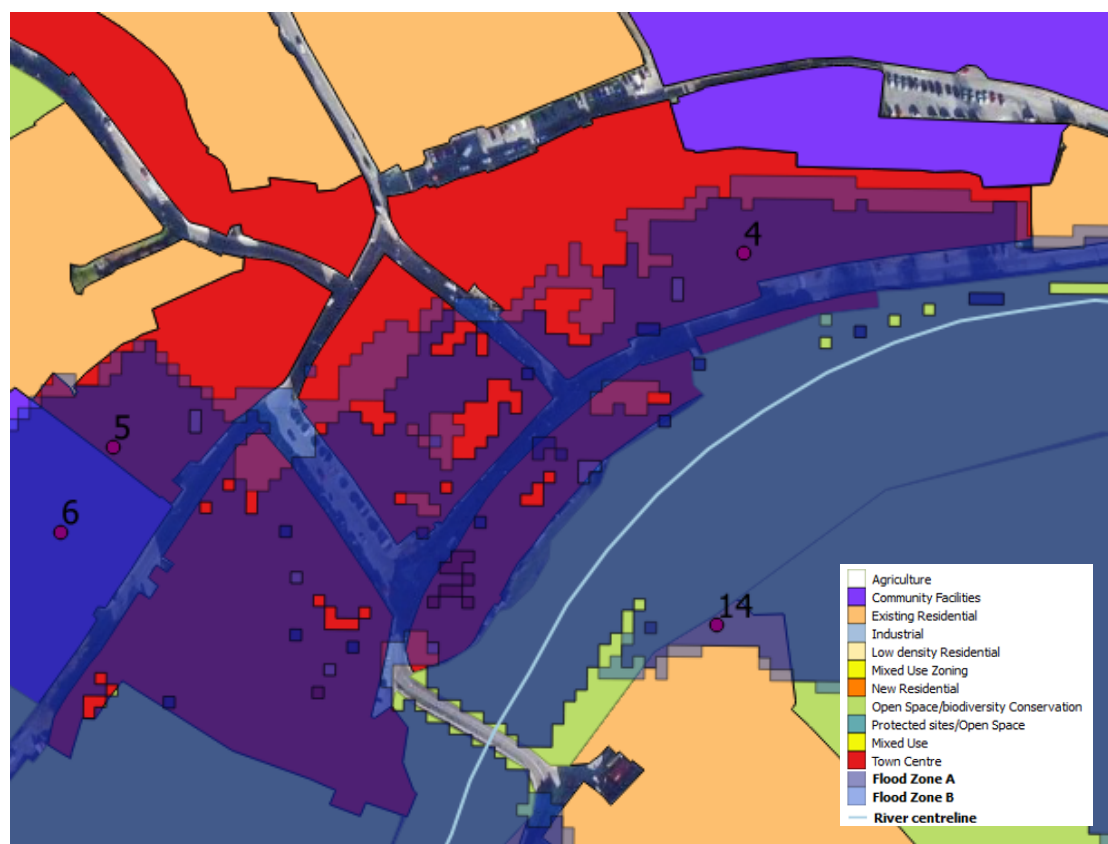
Site 2: Community Facilities	
Site Description	This area is zoned for community facilities. It lies on the banks of a tributary of the River Nore. The land parcel is currently a mix of agricultural land and residential development. An access road runs along the eastern boundary of the area, a short distance from the top of the bank of the stream. This area currently appears to be a mix of grass and scrub forming the margins of the stream, with some encroachment onto the access road.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences
Sensitivity to Climate Change	Relatively low. There is some increase in the extent of the 1% AEP flood, but it is still within the extent of the current 0.1% AEP flood. There is a minimal increase in the extent of the 0.1% AEP flood between current and MRFS.
Residual Risk	There is a culvert which passes below the R703 road to Kiljames. The size of this culvert is unknown, but is likely to be prone to blockage. However, as the stream is influenced by levels in the Nore, blockage is unlikely to significantly increase risks. However, it should be assessed at site specific FRA.
Historical Flooding	It is not known if this area has flooded in the past.
<p>Commentary on Flood Risk:</p> <p>The majority of the land parcel is within Flood Zone C. The margin of the parcel is within Flood Zone B, with minor encroachment of Flood Zone A along the stream bank. The CFRAM mapping predicts water depths of up to 1m in the 0.1% AEP flood at the junction of Nore View Terrace and Chapel Lane. This will impact on access during the more extreme floods. At the lower end of the stream, water levels are controlled by levels on the Nore, which prevents discharge when river levels are high.</p>	
<p>Justification Test:</p> <p>Not required as the majority of the site is within Flood Zone C.</p>	
<p>Development Options:</p> <p>As the majority of the site is within Flood Zone C, it is appropriate for all forms of development. Community facilities could include a variety of land uses, ranging from highly vulnerable to water compatible.</p>	

It is appropriate to retain the 'community facilities' zoning for the parcel. At development management stage, the sequential approach should be applied within the site, to ensure that water compatible uses are retained within the area shown as Flood Zone B.

If development density and usage are planned to increase within the land parcel, it is recommended that consideration to access and egress during an extreme flood is included in the flood risk assessment.

Site 3: Site at corner of Chapel Lane and R700	
Site Description	<p>The site falls relatively steeply from north to south. At the front (along Low Street) the site is low lying and adjacent to the River Nore. At the eastern end (where No. 3 is shown above) there is a terrace of 3 residential dwellings. To the south-western corner of the land parcel there is another dwelling. None of these properties have a threshold above road level.</p> <p>The site is zoned for 'Existing Residential' development.</p>
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences
Sensitivity to Climate Change	Low. There is little increase in extent when the current and MRFS flood outlines are compared and a moderate increase in flood depths.
Residual Risk	No particular residual risk considerations
Historical Flooding	When the River Nore is in flood it overtops onto Low Street. It is not known if the residential properties have flooded previously.
<p>Commentary on Flood Risk:</p> <p>The lower margins of the land parcel are within Flood Zone A and B, whilst the majority of the site is within Flood Zone C. In the CFRAM, depths of flooding are shown to be shallow, with up to 0.25m predicted in the 0.1% AEP flood.</p>	
<p>Justification Test:</p> <p>Not required as the majority of the site is within Flood Zone C.</p>	
<p>Development Options:</p> <p>Retaining the zoning for 'existing residential' is an appropriate classification and reflects the current land use. Further residential development within Flood Zone C would not require the Justification Test. However, should opportunities to reduce the vulnerability of the existing, low lying properties arise (such as conversion to an alternative use) these should be sought. Intensification of development along the southern boundary of the site should not be permitted.</p>	

Land parcel 4: Mixed use in Town Centre



Site Description	The land parcel was zoned for 'Mixed Use' development in the 2009 LAP as amended. It forms the core of the town. It is currently extensively developed, and uses include the Quay carpark and a mix of residential, commercial and retail uses, generally within the traditional form of terraced premises.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences.
Sensitivity to Climate Change	Moderate. There is little increase in extent when the current and MRFS flood outlines are compared, but depths of flooding are likely to increase significantly.
Residual Risk	No particular residual risk considerations
Historical Flooding	This area of Thomastown has a significant flood history and a high number of properties flooded in 2015.
<p>Commentary on Flood Risk:</p> <p>The southern portion of the land parcel is within Flood Zones A and B. The northern part, facing Chapel Lane, is within Flood Zone C. The CFRAM predicts flood depths in the 1% AEP event of up to 0.5m, with depths in the 0.1% event becoming more significant, at over 1m in parts.</p>	
<p>Development Options:</p> <p>To continue the current mix of less and highly vulnerable development within this land parcel, a Justification Test is required. To reflect the importance of the area as the core of the settlement, the zoning has been changed from Mixed Use to Town Centre.</p>	
<p>Justification Test:</p>	

The urban settlement is targeted for growth	Thomastown is identified as a District Town in the County Core Strategy, and as such is targeted for growth.
The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement	The zoning of this parcel as Town Centre will promote redevelopment of the core. Its continued development is essential to achieving compact and sustainable urban growth.
Is essential to facilitate regeneration and / or expansion of the centre of the urban settlement.	The zoning of this parcel as Town Centre will encourage the regeneration and/or expansion of the centre.
Comprises significant previously developed and/ or under utilised lands	This land is under-utilised at present, but would have formed part of the town core historically.
Is within or adjoining the core of an established or designated urban settlement	This area is in the core of Thomastown, as highlighted through the new 'Town Centre' zoning.
Will be essential in achieving compact and sustainable urban growth	This land will be essential in achieving compact growth.
There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.	There are no suitable alternative lands in areas at lower risk of flooding within or adjoining the core.
<p>Flood Risk Assessment</p> <p>Given the level of development in this land parcel, future development is likely to be limited to residential or commercial infill, changes of use and renovations. It is recommended that development is allocated sequentially through the land parcel, with highly vulnerable development to the north (within Flood Zone C) and at first floor levels. There should be no overall increase in the quantum of risk, including no increase in density of use or vulnerability of individual uses.</p> <p>Site specific flood risk assessments will be required for all future development in Flood Zone A and B, in line with the general FRA guidance.</p> <p>It is also recommended that, as a minimum, an initial review of flood risks (including historical flooding) is undertaken for properties in Flood Zone C as the CFRAM, although the most detailed mapping available, may not be suitable for definition of risks as an individual site scale. In many of these cases, Section 5.28 of the Planning Guidelines would apply, and the emphasis is on reducing flood risk to the proposed development and neighbouring sites. In this location it is not feasible to require elevated finished floor levels for individual units. The site specific FRA will need to review flood risks, including potential flow paths, depths and velocities of flooding, lead time for advanced warning and duration of inundation. The FRA should consider methods of minimising flood risks through the sequential approach (water compatible or less vulnerable development at ground floor, and highly vulnerable raised to first floor levels), the use of property level protection and flood resilience measures (particularly in the case of new builds or extensive renovation) and emergency planning (for access and egress).</p> <p>Should extensive redevelopment be planned (for example of entire development blocks) a detailed FRA would be required to assess risks, and more importantly investigate flood mitigation options and their impact on surrounding development. It is likely that any significant development in this regard would be found to be premature until a flood relief scheme for Thomastown is in place, or alternatively, is incorporated into the redevelopment plans.</p>	

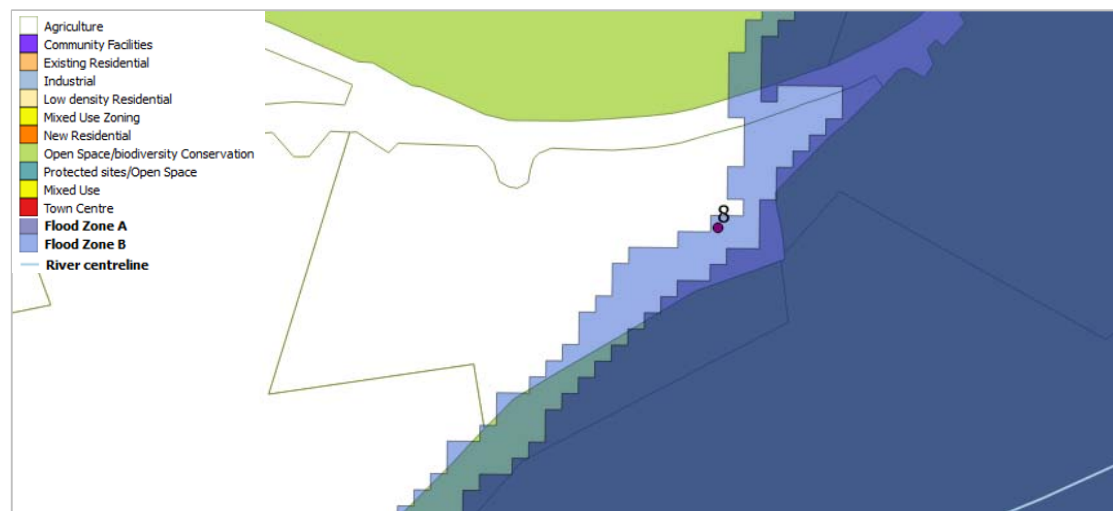
Land parcel 5: Station Road Residential	
Site Description	The land parcel is zoned for 'Existing Residential' uses in the 2009 LAP. There are a couple of residential units in the upper (main) part of the site. The southern part of the site (where number 5 is indicated above) runs between the former Super Valu and the community hall. At its frontage on Station Road there is a pair of semi-detached residential units which are level with the adjacent footpath. The land to the rear of the property appears to be derelict brownfield.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences
Sensitivity to Climate Change	Moderate. There is little increase in extent when the current and MRFS flood outlines are compared, but depths of flooding are likely to increase significantly.
Residual Risk	No particular residual risk considerations
Historical Flooding	The properties flooded in 2015.
<p>Commentary on Flood Risk:</p> <p>The majority of the site is within Flood Zone C and is appropriate for residential uses. Flood Zone A covers the road fronting property and brownfield land to the rear. Depths of flooding across this part of the site could be up to 1.5m in the 1% AEP event, and parts flooding to over 2m in the 0.1% AEP event.</p>	
<p>Development Options:</p> <p>The site has been rezoned as 'Town Centre' and amalgamated into Area 4, above. As such, the same Justification Test and development considerations apply.</p>	

Land parcel 6: Station Road Community Facilities	
Site Description	The land parcel is currently zoned for 'Community Facilities'. It comprises the library, a club house for Thomastown paddlers, the community hall, a playground and tennis courts.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences
Sensitivity to Climate Change	Moderate. There is little increase in extent when the current and MRFS flood outlines are compared, but depths of flooding are likely to increase significantly.
Residual Risk	No particular residual risk considerations
Historical Flooding	The site flooded in 2015, with inundation to the library, concert hall and Paddlers club house.
<p>Commentary on Flood Risk: Nearly the whole of the site is shown to be within Flood Zone A. Depths of flooding across the site could be up to 2m in the 1% AEP event, and over 2m in the 0.1% AEP event. Greatest depths are across the playground and the tennis courts to the rear of the buildings.</p>	
<p>Development Options: The current land uses are generally appropriate to the level of flood risk in this location (i.e. water compatible uses), and are suited to the community facilities designation. Despite this, the Justification Test will still need to be applied as uses include less vulnerable developments and there is a high level of flood risk.</p>	
Justification Test:	
The urban settlement is targeted for growth	Thomastown is identified as a District Town in the County Core Strategy, and as such is targeted for growth.
The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement	The zoning of this parcel as Community Facilities will allow an appropriate mix of community and social uses to develop here.
Is essential to facilitate regeneration and / or expansion of the centre of the urban settlement.	The zoning of this parcel as Community Facilities is essential to allow for the

	regeneration and/or expansion of the centre, by providing the necessary social infrastructure.
Comprises significant previously developed and/or underutilised lands	This land is developed as a community complex with a variety of uses.
Is within or adjoining the core of an established or designated urban settlement	This area adjoins the core of Thomastown.
Will be essential in achieving compact and sustainable urban growth	This land will be essential in achieving compact and sustainable growth.
There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.	There are no suitable alternative lands in areas at lower risk of flooding within or adjoining the core.
<p>Flood Risk Assessment</p> <p>Should future development, or redevelopment, within this land parcel be planned, it should be limited to water compatible uses at ground level, or less vulnerable uses with an appropriate assessment of flood risks as part of the site specific FRA. There should be no increase in the vulnerability of the development. Opportunities for reducing flood risk, through increasing floor levels, should be explored. In Flood Zone A the need for compensatory storage should be investigated. As the land parcel is on the margins of the floodplain it is likely that limited filling within this parcel will not impact on flood risk elsewhere, but this will still need to be demonstrated through hydraulic modelling.</p>	

Land parcel 7: Station Road	
Site Description	This land was zoned for Phase 2 Residential in the 2009 LAP as amended. Phase 2 was intended to act as a strategic reserve. The site is currently undeveloped and lies on the right bank of the River Nore.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences
Sensitivity to Climate Change	Moderate. The site is wholly within Flood Zone A so there is no increase in extent when the current and MRFS flood outlines are compared, but depths of flooding are likely to increase significantly.
Residual Risk	No particular residual risk considerations
Historical Flooding	As active floodplain, parts of the site flooded in 2015, although the extents of flooding are not known.
<p>Commentary on Flood Risk: The whole site is within Flood Zone A, with depths of flooding in the 1% AEP event modelled as in excess of 2m.</p>	
<p>Justification Test: The Justification Test was applied, but could not be passed. Therefore, the site is being rezoned to Open Space / Biodiversity</p>	
<p>Development Options: The 'Agriculture' zoning is appropriate to the level of flood risk. Although some less vulnerable development is permitted within this zoning, the sequential approach will see any such development located within Flood Zone C. For all other development, the general guidelines on undertaking an FRA should be applied.</p>	

Land parcel 8: Residential south of Station Road



Site Description	This land was zoned for Residential in the 2009 LAP as amended. The site is currently developed and includes a single residential property.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences
Sensitivity to Climate Change	Moderate. There is some increase in extent when the current and MRFS flood outlines are compared, and depths of flooding are likely to increase significantly.
Residual Risk	No particular residual risk considerations
Historical Flooding	It is not known if the site has flooded historically,

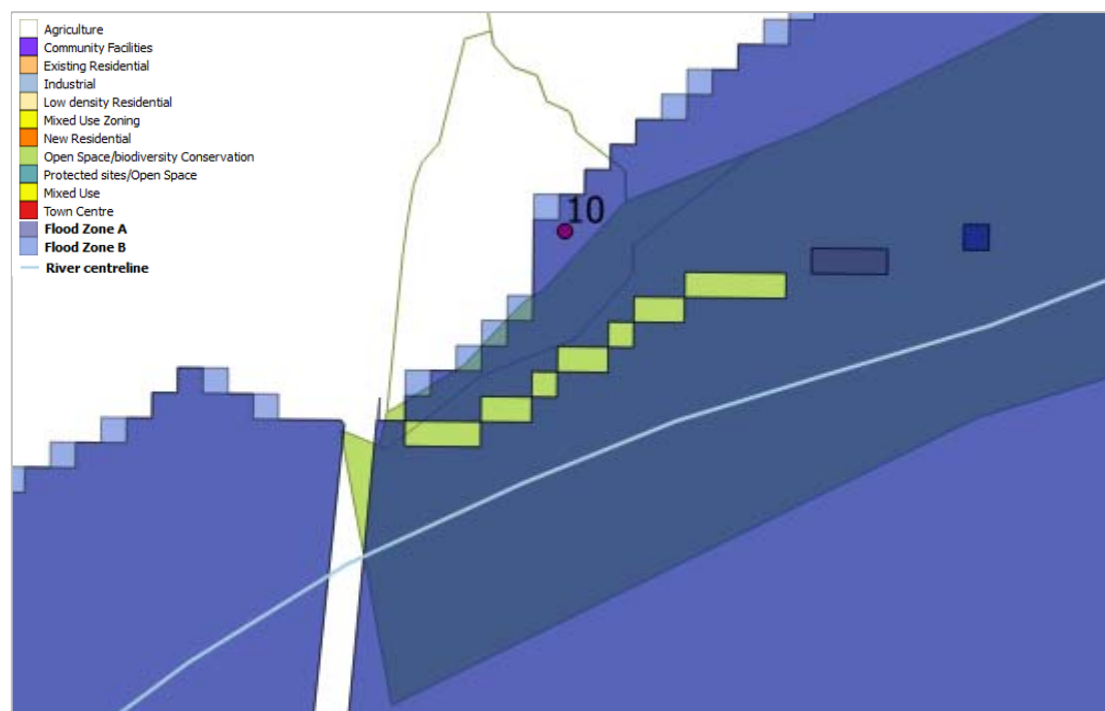
Commentary on Flood Risk:
 The site is partially within Flood Zone B, with the modelled outline encroaching slightly on the footprint of the existing dwelling. Much of the curtilage of the property is within Flood Zone C. There is also a minor encroachment of Flood Zone A, but largely limited to the boundary of the site. Depths of flooding are modelled to reach up to 1m during the 0.1% AEP event.

Justification Test:
 As the majority of the site is within Flood Zone C, the Justification Test does not need to be applied.

Development Options:
 Although the existing residential development is highly vulnerable, there is a significant proportion of the site which is within Flood Zone C. Application of the sequential approach will see any additional development located within Flood Zone C.
 However, within the Draft LAP, the site has been rezoned to 'Agriculture', which is also appropriate to the level of flood risk. Although some less vulnerable development is permitted within this zoning, the sequential approach will see any such development located within Flood Zone C. For all development, the general guidelines on undertaking an FRA should be applied.

Land parcel 9: Phase 2 south of Station Road	
Site Description	<p>This land was zoned for Phase 2 Residential in the 2009 LAP as amended. Phase 2 was intended to act as a strategic reserve.</p> <p>The site is on the right bank of the River Nore.</p>
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences
Sensitivity to Climate Change	Moderate. There is little increase in extent when the current and MRFS flood outlines are compared, but depths of flooding are likely to increase significantly.
Residual Risk	No particular residual risk considerations
Historical Flooding	As active floodplain, parts of the site flooded in 2015, although the extents of flooding are not known.
<p>Commentary on Flood Risk:</p> <p>The margin of the site is within Flood Zone A, with a small additional encroachment into Flood Zone B. Depths of flooding in the 1% AEP event are modelled at over 2m, but rapidly slope up to less than 0.25m.</p>	
<p>Justification Test:</p> <p>As the majority of the site is within Flood Zone C, the Justification Test does not need to be applied.</p>	
<p>Development Options:</p> <p>Although the residential zoning is highly vulnerable, there is a significant proportion of the site which is within Flood Zone C. Application of the sequential approach will see any additional development located within Flood Zone C.</p> <p>However, within the Draft LAP, the site has been rezoned to 'Agriculture', which is also appropriate to the level of flood risk. Although some less vulnerable development is permitted within this zoning, the sequential approach will see any such development located within Flood Zone C. For all development, the general guidelines on undertaking an FRA should be applied.</p>	

Land parcel **10: Residential south of Station road, between railway line and River Nore**



Site Description	This land was zoned for Existing Residential in the 2009 LAP as amended. There is an existing residential dwelling on the site. The site is on the right bank of the River Nore.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences
Sensitivity to Climate Change	Moderate. There is little increase in extent when the current and MRFS flood outlines are compared, but depths of flooding are likely to increase significantly.
Residual Risk	No particular residual risk considerations
Historical Flooding	As active floodplain, parts of the site are likely to have flooded in 2015, although the extents of flooding are not known.

Commentary on Flood Risk:
 The margin of the site is within Flood Zone A, with a small additional encroachment into Flood Zone B. Depths of flooding in the 1% AEP event are modelled at up to 2m, but rapidly slope up to less than 0.25m. The footprint of the existing dwelling is shown to be in Flood Zone C.

Justification Test:
 As the majority of the site is within Flood Zone C, the Justification Test does not need to be applied.

Development Options:
 Although the residential zoning is highly vulnerable, there is a significant proportion of the site which is within Flood Zone C. Application of the sequential approach will see any new development located within Flood Zone C.
 However, within the Draft LAP, the site has been rezoned to 'Agriculture', which is also appropriate to the level of flood risk. Although some less vulnerable development is permitted within this zoning, the sequential approach will see any such development located within Flood Zone C. For all development, the general guidelines on undertaking an FRA should be applied.

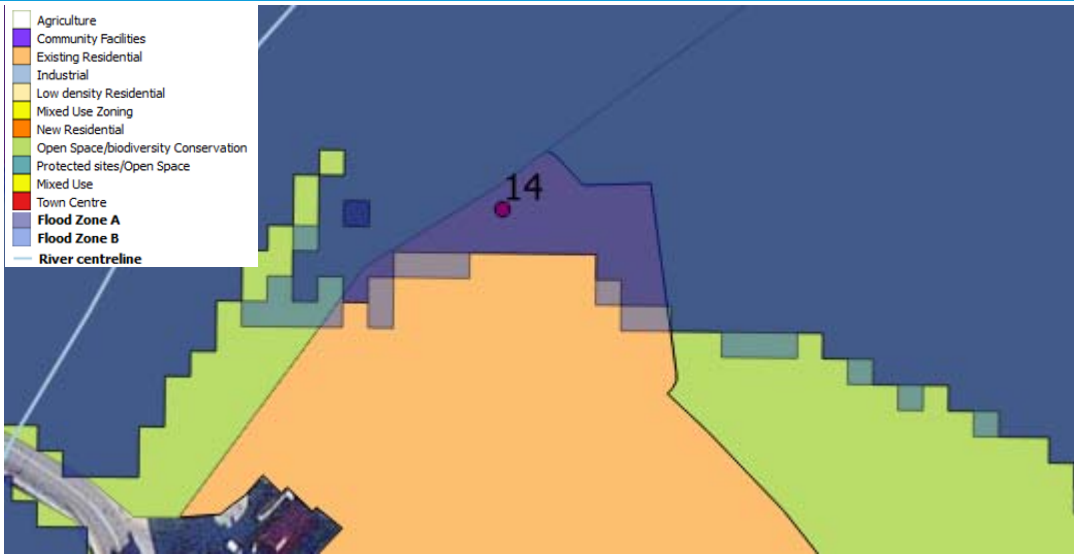
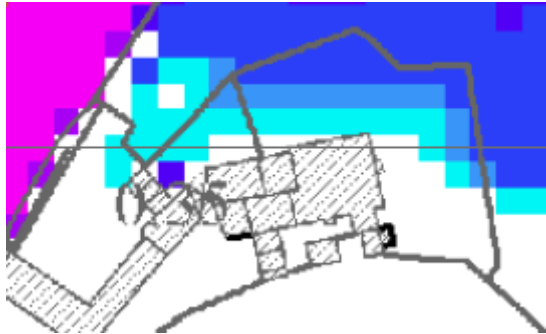
Land parcel 11: Mill Street	
Site Description	The land parcel is zoned 'Existing Residential', and consists of a small number of buildings which appear to be a combination of residential dwellings and small businesses. The parcel fronts directly onto the River Nore.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences
Sensitivity to Climate Change	High. Given the size of the land parcel, the extent of flooding increases significantly when the MRFS is considered.
Residual Risk	No particular residual risk considerations
Historical Flooding	The buildings did not flood in 2015.
<p>Commentary on Flood Risk:</p> <p>Despite its proximity to the river, the land parcel is largely within Flood Zone C, and is therefore appropriate to highly vulnerable uses. There is some encroachment of Flood Zone C across part of the parcel. However it is not clear if this is a true representation of risks or an artefact of the modelling and mapping process from the CFRAM. Depths in this area are modelling to be less than 0.25m in the 0.1% AEP event.</p>	
<p>Development Options:</p> <p>Retaining the current 'Existing Residential' zoning is appropriate to the current land use, and is acceptable given the modelled level of flood risk. No Justification Test is required. Any future development within this land parcel should be accompanied by a FRA, which will provide details of existing ground and threshold levels and a site specific assessment of flood risks. This will guide decisions in relation to change of use or total redevelopment of the site. In the case of the latter, an increase in finished floor levels of a new build will allow the development to be raised against climate change levels.</p>	

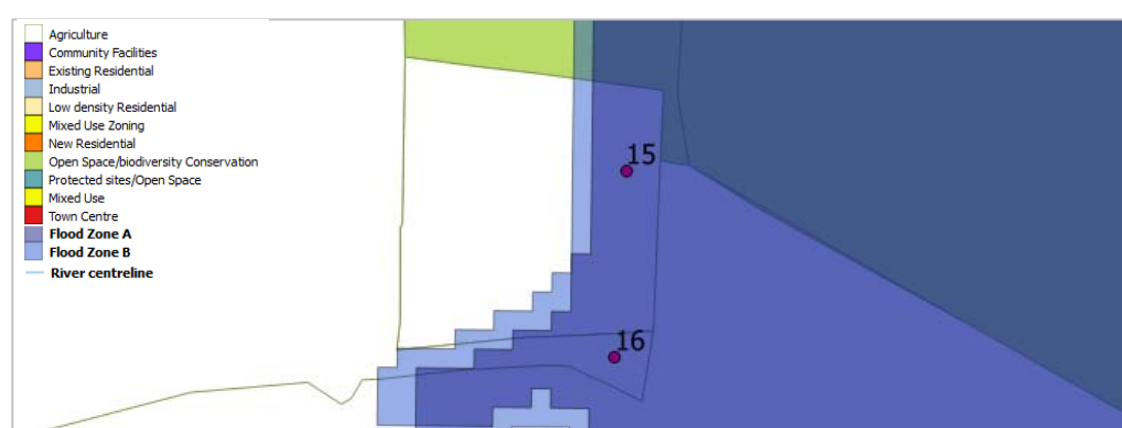
Land parcel		12: Mill Street Community Facilities
Site Description	The land parcel is zoned 'Community Facilities in the 2009 LAP as amended, and consists of the former mill building, which contains a mix of uses. The parcel fronts directly onto the River Nore.	
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences.	
Sensitivity to Climate Change	High. Given the size of the land parcel, the extent of flooding increases significantly when the MRFS is considered.	
Residual Risk	No particular residual risk considerations	
Historical Flooding	The buildings did not flood in 2015.	
<p>Commentary on Flood Risk: The land parcel is largely within Flood Zone A. Flood depths in this area are modelled to be in excess of 2m in both the 1% and 0.1% AEP flood events.</p>		
<p>Development Options: It is proposed to change the zoning to Existing Residential to better reflect the current land use. The vulnerability of development permitted within this zoning is unchanged, and requires application of the Justification Test.</p>		
Justification Test		
The urban settlement is targeted for growth	Thomastown is identified as a District Town in the County Core Strategy, and as such is targeted for growth.	
The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement	The zoning of this parcel as Existing Residential will promote redevelopment of the core. Its continued development is essential to achieving compact and sustainable urban growth.	
Is essential to facilitate regeneration and / or expansion of the centre of the urban settlement.	The zoning of this parcel as Existing Residential will encourage the regeneration and/or expansion of the centre.	
Comprises significant previously developed and/ or under utilised lands	For the most part, this land is developed, and would have been a significant part of the town core historically.	

<p>Is within or adjoining the core of an established or designated urban settlement</p>	<p>This area adjoins the core of Thomastown.</p>
<p>Will be essential in achieving compact and sustainable urban growth</p>	<p>This land will be essential in achieving compact and sustainable growth.</p>
<p>There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.</p>	<p>There are no suitable alternative lands in areas at lower risk of flooding within or adjoining the core.</p>
<p>Flood Risk Assessment</p> <p>There should be no overall increase in the quantum of risk, including no increase in density of use or vulnerability of individual uses with the site. This will be included as a site specific objective for Mill Street.</p> <p>Should redevelopment of sites take place they will fall under Section 5.28 of the Planning Guidelines, and the Justification Test will not apply. Such redevelopment should be accompanied by an appropriately detailed FRA, which can draw upon information contained in the CFRAM. Where possible flood resilient features should be incorporated into the development. Retro-fitting property level protection should also be considered, although in an existing, old building this is not always possible.</p>	

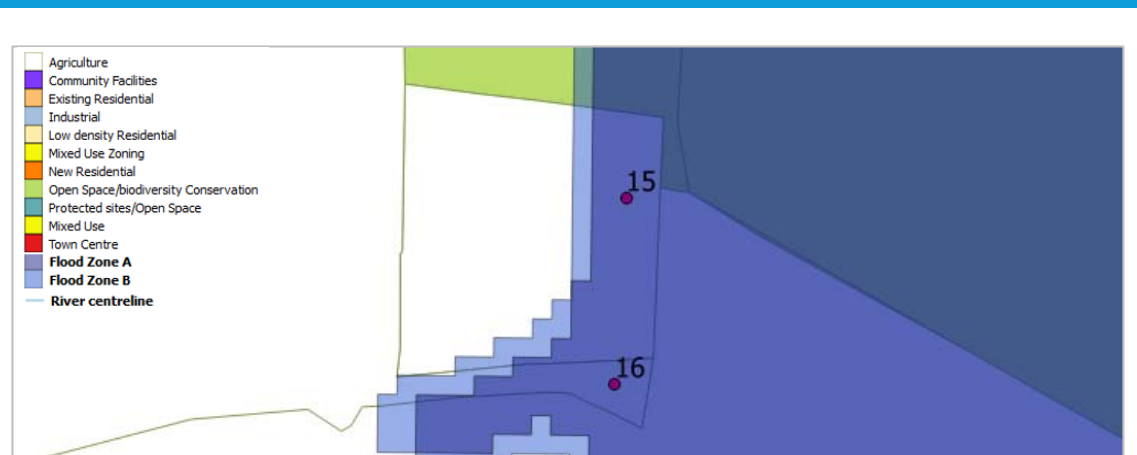
Land parcel 13: Mill Street Residential	
Site Description	The land parcel is zoned 'Existing Residential' in the 2009 LAP as amended, and consists of a row of terraced housing, and a public house. The parcel fronts directly onto the River Nore.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences.
Sensitivity to Climate Change	Moderate to high. The site is fully within Flood Zone A, so the extent of flooding across the site will not increase in the future, but depths of will increase significantly; by way of an example, there is almost 900mm of an increase between the current 1% and 0.1% AEP events, so a similar increase is possible in the future 1% AEP event.
Residual Risk	No particular residual risk considerations
Historical Flooding	The buildings did not flood in 2015.
<p>Commentary on Flood Risk:</p> <p>The land parcel is entirely within Flood Zone A, with the flood extent modelled to continue for some distance across the R448 road. Flood depths across the parcel vary, but range from in excess of 2m at the waters edge to under 0.5m at the road frontage in the 1% AEP event. It should be noted that this parcel is also shown to be at risk in the 10% AEP flood event, indicating more frequent flooding is likely, and depth in this event could still reach up to 1.5m.</p>	
<p>Development Options:</p> <p>The vulnerability of development permitted within this zoning is high, and requires application of the Justification Test.</p>	
<p>Justification Test</p>	
The urban settlement is targeted for growth	Thomastown is identified as a District Town in the County Core Strategy, and as such is targeted for growth.
The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement	The zoning of this parcel as Existing Residential will promote redevelopment of the core. Its continued development is essential to achieving compact and sustainable urban growth.

<p>Is essential to facilitate regeneration and / or expansion of the centre of the urban settlement.</p>	<p>The zoning of this parcel as Existing Residential will encourage the regeneration and/or expansion of the centre.</p>
<p>Comprises significant previously developed and/ or under utilised lands</p>	<p>For the most part, this land is developed, and would have been a significant part of the town core historically.</p>
<p>Is within or adjoining the core of an established or designated urban settlement</p>	<p>This area adjoins the core of Thomastown.</p>
<p>Will be essential in achieving compact and sustainable urban growth</p>	<p>This land will be essential in achieving compact and sustainable growth.</p>
<p>There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.</p>	<p>There are no suitable alternative lands in areas at lower risk of flooding within or adjoining the core.</p>
<p>Flood Risk Assessment</p> <p>There should be no overall increase in the quantum of risk, including no increase in density of use or vulnerability of individual uses with the site. This will be included as a site specific objective for Mill Street.</p> <p>Should redevelopment of sites take place they will fall under Section 5.28 of the Planning Guidelines, and the Justification Test will not apply. Such redevelopment should be accompanied by an appropriately detailed FRA, which can draw upon information contained in the CFRAM. Where possible flood resilient features should be incorporated into the development. Retro-fitting property level protection should also be considered, although in an existing, old building this is not always possible.</p>	

Land parcel 14: Grennan House	
	
Site Description	The land parcel is zoned 'Existing Residential' in the 2009 LAP as amended, and consists of an extensive residential development and interspersed community facilities and small businesses.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences.
Sensitivity to Climate Change	Moderate. Flood extents and depths will increase by a moderate amount under the MRFS.
Residual Risk	No particular residual risk considerations
Historical Flooding	The buildings did not flood in 2015.
<p>Commentary on Flood Risk:</p> <p>The majority of this land parcel is in Flood Zone C and is appropriate for highly vulnerable uses. There is some encroachment of Flood Zone A, and a small area of Flood Zone B to the north of the land parcel. Depths of flooding in this location are modelled to be up to 1m along the river bank in the 1% AEP event. In the CFRAM map outputs, the flood extents appear only to cover the gardens of the property in this location, and not to encroach on the buildings (see below).</p>	
<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Legend</p> <p>1% Fluvial AEP Flood Depth</p> <ul style="list-style-type: none"> 0 - 0.25m 0.25 - 0.5m 0.5 - 1m 1.0 - 1.5m 1.5 - 2m >2m </div> </div> <p>Extract from 1% AEP SE CFRAM flood depth map</p>	
<p>Development Options:</p> <p>A Justification Test is not required for this land parcel and retention of the 'Existing Residential' zoning is appropriate. However, in the area to the north, and bordering the River Nore, a site specific FRA should be prepared for any future development. The FRA should focus on avoiding development in Flood Zone A or B and ensuring an appropriate FFL is set, which takes into account the impact of climate change and a suitable freeboard.</p>	

Land parcel 15: Grennan - Residential	
	
Site Description	This land was zoned for Existing Residential in the 2009 LAP as amended. The site is on the outer edge of the floodplain of the River Nore. There is one existing residential dwelling on the site.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences
Sensitivity to Climate Change	Moderate. There is little increase in extent when the current and MRFS flood outlines are compared, but depths of flooding are likely to increase significantly.
Residual Risk	No particular residual risk considerations
Historical Flooding	It is not known if the site flooded in 2015.
<p>Commentary on Flood Risk:</p> <p>The majority of this land parcel is in Flood Zone C and is appropriate for highly vulnerable uses. There is some encroachment of Flood Zone A, and a small fringing area of Flood Zone B. Depths of flooding in this location are modelled to be up to 1m in the 1% AEP event. In the CFRAM map outputs, the flood extents appear only to cover the garden of the property in this location, and does not impact on the building.</p>	
<p>Justification Test:</p> <p>As the majority of the site is within Flood Zone C, the Justification Test does not need to be applied.</p>	
<p>Development Options:</p> <p>Although the residential zoning is highly vulnerable, there is a significant proportion of the site which is within Flood Zone C. Application of the sequential approach will see any new development located within Flood Zone C.</p> <p>However, within the Draft LAP, the site has been rezoned to 'Agriculture', which is also appropriate to the level of flood risk. Although some less vulnerable development is permitted within this zoning, the sequential approach will see any such development located within Flood Zone C. For all development, the general guidelines on undertaking an FRA should be applied.</p>	

Land parcel 16: Grennan – Phase 2



Site Description	This land was zoned for Phase 2 Residential in the 2009 LAP as amended. The site is on the outer edge of the floodplain of the River Nore.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences
Sensitivity to Climate Change	Moderate. There is little increase in extent when the current and MRFS flood outlines are compared, but depths of flooding are likely to increase significantly.
Residual Risk	No particular residual risk considerations
Historical Flooding	It is not known if the site flooded in 2015.

Commentary on Flood Risk:
 The site is largely within Flood Zone A, with the remainder falling within Flood Zone B. Depths of flooding in this location are modelled to be up to 2m in the 1% AEP event.

Justification Test:
 The Justification Test was applied but could not be passed. Therefore, the site is being rezoned to Agriculture.

Development Options:
 The 'Agriculture' zoning is appropriate to the level of flood risk. Although some less vulnerable development is permitted within this zoning, the sequential approach will see any such development located within Flood Zone C. For all other development, the general guidelines on undertaking an FRA should be applied.

Land parcel 17: Cloghabrody	
Site Description	This land was zoned for Residential in the 2009 LAP as amended. There is an extant planning permission for residential development on site.
Benefitting from Defences (flood relief scheme works)	The land parcel does not benefit from defences
Sensitivity to Climate Change	Unknown, but likely to be low.
Residual Risk	The risk of blockage of the culvert at the downstream end of the site should be investigated as it may cause a backup of water onto the site.
Historical Flooding	The land has flooded in the past, notably in March 2018.
<p>Commentary on Flood Risk:</p> <p>Flood risk to the site is contained to a relatively narrow band at either side of the stream, as indicated by the alluvial soils mapping and historical flooding. Flooding is likely to be exacerbated by culvert blockage causing a backing up of water on the left and right banks. As a result, residual risk analysis may find that the flood extents are greater than shown in the Flood Zone.</p> <p>A site specific flood risk assessment was recently submitted in support of planning application 17/739.</p>	
<p>Justification Test:</p> <p>As the majority of the site is within Flood Zone C, the Justification Test does not need to be applied.</p>	
<p>Development Options:</p> <p>In the Draft LAP, this site is being zoned for a combination of New Residential, and Open Space along the stream. The Residential land zoning is appropriate to the site.</p> <p>Any new planning application on site should include a site specific FRA. Specific considerations will need to include mitigation measures to ensure an appropriate freeboard above projected flood levels, and consideration of climate change impacts. Residual risk analysis must also be undertaken in relation to culvert blockage.</p> <p>As the site does not benefit from CFRAM flood extents, the FRA should be based on best available information, which may be possible through site visit, topographic survey and a number of hydraulic calculations. However, it may require the construction of a short length of hydraulic model to confirm the extents and depths of flooding, and in particular to investigate the impact of culvert blockage on flood risk.</p>	

4 Guide to Site Specific Flood Risk Assessment

4.1 *Development Management and Flood Risk*

In order to guide both applicants and planning officials 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 and development vulnerability). For each scenario, a number of considerations relating to the suitability of the development are summarised below.

It should be noted that this section of the SFRA begins from the point that all land zoned for development has passed the Justification Test for Development Plans, and therefore Part 1 of the Justification Test for Development Management. It builds upon the site specific FRA detailed in Section **Error! Reference source not found.** of this SFRA.

In order to determine the appropriate design standards for a development it will be necessary to undertake a site-specific flood risk assessment as part of the development management process. 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 information 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.

4.2 *Requirements for a Flood Risk Assessment*

An appropriately detailed flood risk assessment will be required in support of any planning application. The level of detail will vary depending on the risks identified and the proposed land use. As a minimum, all proposed development, including that in Flood Zone C, must consider the impact of surface water flood risks on drainage design. In addition, flood risk from sources other than fluvial should be reviewed.

For sites within Flood Zone A or B, a site specific "Stage 2 - Initial FRA" will be required, and may need to be developed into a "Stage 3 - Detailed FRA". The extents of Flood Zone A and B are delineated through this SFRA. However, future studies may refine the extents (either to reduce or enlarge them) so a comprehensive review of available data should be undertaken once 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 FFL. Further information on the required content of the FRA is provided in the Planning System and Flood Risk Management.

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.

4.3 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% AEP (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. Evacuation routes in the event of inundation of surrounding land should also be detailed.

The impacts of climate change should be considered for all proposed developments. This is particularly important for development near areas at risk of tidal flooding. A development which is currently in Flood Zone C may be shown to be at risk under future scenarios. Details of the approach to incorporating climate change impacts into the assessment and design are provided in Section 4.8.

4.4 Drainage impact assessment

All proposed development, including that in Flood Zone C, must consider the impact of surface water flood risks on drainage design. In this regard, all the other development scenarios must pass through this stage before completing the planning and development process, and should be accompanied by an appropriately detailed flood risk assessment, or drainage impact assessment. Particular attention should be given to development in low-lying areas which may act as natural ponds for collection of runoff.

The drainage design should ensure no increase in flood risk to the site, or the downstream catchment. Considerable detail on the process and design of SUDS is provided in the Great Dublin Strategic Drainage Study, and more details and guidance are available on the 'Irish SuDS: Guidance and Tools' website¹⁰.

Master planning should ensure that existing flow routes are maintained through the use of green infrastructure. 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. A more rigorous design approach will be required in locations indicated to be at, or near, known surface water flooding locations.

4.5 Applications for Minor Developments in Areas at Risk of Flooding

Section 5.28 of the Planning Guidelines on Flood Risk Management highlights 'minor development', which by its nature is exempt from the application of the Justification Test. However, an assessment of the risks of flooding should accompany such applications to demonstrate that they would 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 Section 4 - Designing for Residual Flood Risk of the Technical Appendices to the DoECLG Flooding Guidelines). Emergency access must be considered as in many cases flood resilience will not be easily achieved in the existing built environment.

4.6 Applications for Development in Areas at Risk of Flooding

4.6.1 Highly vulnerable development in Flood Zone A or B

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

4.6.1.1 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.

4.6.1.2 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.*"

Within this SFRA, small scale infill housing, extensions or changes of use have been considered and, subject to site specific flood risk assessment, can generally be considered appropriate provided they constitute a continuation of the existing level of development.

In cases where development has been justified, the outline requirements for a flood risk assessment and flood management measures have been detailed in this SFRA in both the following sections and the site specific assessments in Section **Error! Reference source not found.**, which also details where such development has been justified. Of prime importance are the requirement to manage risk to the development site and not to increase flood risk elsewhere. This should give due consideration to safe evacuation routes and access for emergency services during a flood event.

4.6.2 Less vulnerable development in Flood Zone A or B

Less vulnerable development includes retail, leisure and warehousing and buildings used for agriculture and forestry. This category includes less vulnerable development in all forms.

The design and assessment of less vulnerable development should begin with 1% AEP fluvial event as standard, with climate change and a suitable freeboard included in the setting of finished floor levels.

4.7 Key points for FRAs for all types of development

- Finished floor levels for new development to be set above the 1% AEP fluvial level, with an allowance for climate change and 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
- Within currently developed areas, such as the urban cores, compensatory storage for all land raising with Flood Zone A is to be provided within the flood cell and on a level for level basis up to the 1% level. The impact of loss of storage should also be investigated for the 1 in 1000 year event, and further compensatory storage provided if the development is shown to have a significant impact on flood risk elsewhere.
- For less vulnerable development, it may be that a lower finished floor level (as low as 1 in 100 year flood level) could be constructed to if 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. It should be noted that the developer should consider the ability to gain property and contents insurance for the development.

4.8 Incorporating Climate Change into Development Design

As detailed throughout this SFRA, consideration and incorporation of the potential impacts of climate change into development layout and design is essential. The following summary provides an indication of allowances that should be considered when assessing the impacts of climate change. It should be noted that this information is intended as a guide only and there may be instances where it is appropriate for a greater or lesser allowance to be provided, particularly as climate change projections are further refined. The guidance does not necessarily relate directly to the vulnerability of the development used within the Planning Guidelines, but should be assessed on a case by case basis. For the River Nore and the Dungarvan Glebe Stream, climate change extents are provided in the CFRAM study.

For most development, including residential, nursing homes, shops and offices, the medium-range future scenario (20% increase in flows) is an appropriate consideration.

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% increase. However, the reasoning and impacts of such an approach should be provided in the site specific FRA.

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

4.9 Flood Mitigation Measures at Site Design

For any development proposal in an area at moderate or high risk of flooding that is considered acceptable in principle, it must be demonstrated that appropriate mitigation measures can be put in place and that residual risks can be managed to acceptable levels.

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

Various mitigation measures are outlined below and further detail on flood resilience and flood resistance are included in the Technical Appendices of the Planning Guidelines, The Planning System and Flood Risk Management¹¹.

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

4.9.1 Site Layout and Design

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

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

4.9.2 Ground levels, floor levels and building use

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

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

In some sites it is possible that ground levels can be re-landscaped to provide a sufficiently large development footprint. However, it is likely that in other potential development locations there is insufficient land available to fully compensate for the loss of floodplain. In such cases it will be necessary to reconsider the layout or reduce the scale of development,

¹¹ The Planning System and Flood Risk Management Guidelines for Planning Authorities, Technical Appendices, November 2009

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.

4.9.3 Raised Defences

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

4.10 '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). This function is provided by the Open Space zoning with the Draft LAP.

5 Recommendations

5.1 Incorporation into LAP

This SFRA has fully informed the zoning of the LAP.

A policy is proposed for inclusion in Chapter 10: Infrastructure & Environment of the LAP to ensure that where flood risk may be an issue, development proposals shall be the subject of a site-specific Flood Risk Assessment, appropriate to the type and scale of the development being proposed and shall be carried out in line with the Guidelines. This will include for areas of pluvial flooding.

The CDP 2014-2020, contains text and policies on flooding in Section 9.2.9 (Objective 9G).

In addition to assessing flood risk, this LAP will be proactive in addressing flooding. It will seek to protect all stream and river corridors from development, with opportunities for storm water attenuation ponds in the proposed areas of open space, so as to ensure the water quality of rivers and streams is maintained. It will also protect sites of wet grassland and reed swamps which act as natural stormwater retention areas.

SUDS can be thought of as a move away from the conventional practice of piping all surface water directly to the nearest watercourse or river. Using SUDS techniques, water is either infiltrated or conveyed more slowly to watercourses via ponds, filter drains or other installations. This mimics natural catchment behaviour more closely where rainfall either infiltrates through the soil or runs off slowly over the ground surface to the nearest ditch or watercourse. SUDS also attempt to mimic the natural situation whereby pollutants are filtered through soils or broken down by bacteria.

5.2 Monitoring and Review

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

There are a number of key outputs from possible future studies and datasets, which should be incorporated into any update of the SFRA as availability allows. Not all future sources of information should trigger an immediate full update of the SFRA; however, new information should be collected and kept alongside the SFRA until it is updated. It is recommended that the OPW be consulted and that their progress in implementation of the requirements of the EU Flood Directive is reviewed prior to the preparation of the next County Development Plan and the next Thomastown LAP.

Trigger	Source	Possible Timescale
Catchment Flood Risk Assessment and Management (CFRAM) Flood Hazard Mapping (round 2)	OPW under the Floods Directive	2025
South Eastern River Basin Flood Risk Assessment and Management (EFRAM) Plan	OPW	2025 and 6 yearly

SFRA for Thomastown Local Area Plan 2019

		reviews
Flood maps of other sources, such as drainage networks	Various	Unknown
Significant flood events	Various	Unknown
Changes to Planning and / or Flood Management Policy	DoEHLG / OPW	Unknown
Construction / completion of flood relief schemes	OPW / KCC	Unknown

This FRA is based on currently available data and in accordance with its status as a “living document” it will be subject to modification by these emerging datasets of maps and plans as they become available. In the interim any development proposal in the areas identified in this FRA shall be subject to detailed flood risk assessment.

Strategic Flood Risk Assessment Map 1: Areas of Flood Risk in Thomastown with 2019 zoning

Legend

- Plan Boundary
- Flood Zone A
- Flood Zone B
- ★ Areas of conflict between zoning and flood risk
- Agriculture
- Community Facilities
- Existing Residential
- Industrial
- Low density Residential
- Mixed Use
- New Residential
- Open Space/biodiversity Conservation
- Town Centre

Date: April 2019
Scale: 1: 10,000 @ A3
Based on Ordnance Survey
Ireland Map, Licence No.
Kilkenny/CCMA/08/12

