STRATEGIC FLOOD RISK ASSESSMENT

FOR

VARIATION NO. 6

TO THE

KILKENNY CITY AND COUNTY DEVELOPMENT PLAN 2021-2027

(AS VARIED)

for: Kilkenny County Council

by: CAAS Ltd.

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Section 1 Introduction and Policy Background

1.1 Introduction

Kilkenny County Council has prepared and made Variation No. 6 to the Kilkenny City and County Development Plan 2021-2027 (as varied) pursuant to Section 13 of the Planning and Development Act 2000 (as amended).

This Strategic Flood Risk Assessment (SFRA) document has been prepared alongside the Framework Plan taking into account *The Planning System and Flood Risk Management - Guidelines for Planning Authorities* (Department of the Environment, Heritage and Local Government and Office of Public Works, 2009) and Department of the Environment, Community and Local Government Circular PL 2/2014.

1.2 The Variation

The purpose of the Variation is to integrate a Framework Plan for Ferrybank-Belview into the Kilkenny City and County Development Plan 2021-2027 (as varied). The Kilkenny City and County Development Plan is a land use plan and overall strategy, policies and objectives for the proper planning and sustainable development of the functional area of Kilkenny County Council over the six-year period 2021-2027.

The Framework Plan will put in place a land use framework that will guide the future sustainable development of the Ferrybank-Belview area. The Framework Plan, in conjunction with the existing City and County Development Plan, will inform and manage the future development of Ferrybank-Belview.

The Variation is accompanied by a number of appendices, including this SFRA Report. All of these documents have informed the crafting of the Plan.

As detailed in the Framework Plan, all of the provisions from the existing Kilkenny City and County Development Plan 2021-2027, as varied, shall be complied with throughout the implementation of the Framework Plan. This includes those provisions relating to flood risk management and drainage.

The SFRA has informed both the land use zoning and the written provisions of the Framework Plan. The detailed Plan preparation process undertaken by the Planning Department combined with specialist input from the SFRA process facilitated zoning that helps to avoid inappropriate development being permitted in areas of high flood risk. In addition, various flood risk management provisions have been integrated into the Framework Plan.

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

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

Certain lands within the Framework Plan area have the potential to be vulnerable to flooding and this vulnerability could be exacerbated by changes in both the occurrence of severe rainfall events and associated flooding. Local conditions such as low-lying lands and slow surface water drainage can increase the risk of flooding.

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

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

1.4 Flood Risk Management Policy

1.4.1 EU Floods Directive

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

- Carry out a preliminary assessment by 2011 in order to identify the river basins and associated coastal areas where potential significant flood risk exists (preliminary mapping was prepared and a list of Areas for Further Assessment finalised in 2012).
- Prepare flood extent maps for the identified areas (finalised in 2016 for inclusion in Flood Risk Management Plans – see below).
- Prepare flood risk management plans focused on prevention, protection and preparedness. These plans are to include measures to reduce the probability of flooding and its potential consequences. These Plans were adopted in 2018.

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

1.4.2 National Flood Policy

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

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

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

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

1.4.3 National CFRAM Programme

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

The CFRAM Programme comprises three phases as follows:

- The Preliminary Flood Risk Assessment[1] (PFRA) mapping exercise, which was completed in 2012;
- The CFRAM Studies and parallel activities, with Flood Risk Management Plans finalised in 2018; and
- Implementation and Review.

The Programme provides for three main consultative stages as follows:

- Consultation for the PFRA mapping that was adopted in 2012;
- Consultation for Flood Extent mapping, that was finalised in 2016 for inclusion in Flood Risk Management Plans; and
- Consultation for Flood Risk Management Plans, that were adopted in 2018.

The OPW is the lead agency for flood risk management in Ireland. The coordination and implementation of Government policy on the management of flood risk in Ireland is part of its responsibility. The European Communities (Assessment and Management of Flood Risks) Regulations 2010 (S.I. No. 122) identifies the Commissioners of Public Works as the 'competent authority' with overall responsibility for implementation of the Floods Directive 2007/60/EC. The OPW is the principal agency involved in the preparation of CFRAM Studies.

1.4.4 Flood Risk Management Guidelines

1.4.4.1 Introduction

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

The core objectives of the Guidelines are to:

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

[1] The PFRAs identified areas at risk of significant flooding and includes maps showing areas deemed to be at risk. The areas deemed to be most significant risk, where the flood risk that is of particular concern nationally, are identified as Areas for Further Assessment (AFAs). Part of the Ferrybank-Belview Framework Plan area is included within the Waterford City AFA. The OPW has undertaken a detailed assessment on the extent and degree of flood risk for various areas, including these AFAs, producing Flood Extent Mapping.

1.4.4.2 Principles of Flood Risk Management

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

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

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

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

1.4.4.3 Stages of SFRA

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

> **Stage 1 Flood risk identification** – to identify whether there may be any flooding or surface water management issues related to either the area of Regional Spatial and Economic Strategies, Development Plans and Local Area Plans or a proposed development site that may warrant further investigation at the appropriate lower-level plan or planning application levels.
>
> **Stage 2 Initial flood risk assessment** – to confirm sources of flooding that may affect a Plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing flood zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment are scoped.
>
> **Stage 3 Detailed flood risk assessment** – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

1.4.4.4 Flood Zones

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

Flood risk = Likelihood of flooding x Consequences of flooding

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

Consequences of flooding depend on the hazards associated with the flooding (e.g. depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of

people, property and the environment potentially affected by a flood (e.g. the age profile of the population, the type of development and the presence and reliability of mitigation measures).

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

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

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);
- **Flood Zone B** – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and
- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all other areas that are not in zones A or B.

A summary of the requirements of the Flood Guidelines for land uses across each of the above flood zones is provided at Appendix I.

1.5 Emerging Information and Disclaimer

It is important to note that compliance with the requirements of the Flood Risk Management Guidelines is currently based on emerging and best available data at the time of preparing the assessment, including Flood Risk Management Plans, which will be updated on a cyclical basis. The SFRA process for the Variation has taken account of submissions made[2] and Material Alterations that that were made during the Variation-preparation process.

Following the making of the Variation, information in relation to flood risk may be altered in light of future data and analysis, by, for example, the OPW, or future flood events. 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 and buildings (including basements) in which they have an interest prior to making planning or development decisions.

Any future SFRAs for the Framework Plan area or for the County will consider other new and emerging data.

[2] As per the Chief Executive's Report on Submissions to Material Alterations to Proposed Variation 6 to the Kilkenny City and County Development Plan 2021, responses to the OPW's submission made during the public display of material alterations are appended to this SFRA Report.

Section 2 Stage 1 SFRA - Flood Risk Identification

2.1 Introduction

Stage 1 SFRA (flood risk identification) has been undertaken in order to identify whether there may be any flooding or surface water management issues within or adjacent to zoned lands and consequently whether Stage 2 SFRA (flood risk assessment) should be proceeded to.

Ferrybank-Belview is located within the Suir River Basin for which the "Flood Risk Management Plan for the Suir River Basin (UOM16)" has been prepared. Stage 1 SFRA is based on existing information on flood risk indicators based on historical evidence and computational models. A selection of key indicators is mapped for Ferrybank-Belview in Appendix II.

2.2 Drainage, Defences and Early Warning Systems

With regard to areas benefitting from drainage and defences (flood relief scheme works), there are various measures that have been implemented in the Ferrybank-Belview area that will contribute towards flood risk management. These include the culverting of streams and rivers in urban areas.

The 2018 Flood Risk Management Plan for the Suir River Basin identifies the following general measures applicable to the catchment under "Measures Applicable for all Areas":

- Prevention: Sustainable Planning and Development Management
- Prevention: Sustainable Urban Drainage Systems
- Prevention: Adaptation Planning
- Prevention: Land Use Management and Natural Flood Risk Management
- Protection: Maintenance of Channels Not Part of a Scheme
- Preparedness: Flood Forecasting and Warning
- Preparedness: Emergency Response Planning
- Preparedness: Promotion of Individual and Community Resilience
- Preparedness: Individual Property Protection
- Preparedness: Flood-Related Data Collection
- Prevention: Voluntary Home Relocation

The FRMP identifies the following existing measures for the Suir River Basin:

- Maintenance of Arterial Drainage Schemes[3]; and
- Maintenance of Drainage Districts[4].

The FRMP identifies the following existing measures for the Waterford City Area for Further Assessment:

- Maintain the existing Waterford Flood Relief Scheme[5].

[3] The OPW has a statutory duty under the Arterial Drainage Act, 1945, and the Amendment of the Act, 1995, to maintain the Arterial Drainage and Flood Relief Schemes constructed by it under those Acts. There are no such schemes identified within the Framework Plan area.

[4] The statutory duty of maintenance for 4,600 km of river channel benefiting from Drainage District Schemes rests with the relevant Local Authorities. There are no such areas identified within the Framework Plan area.

[5] The Waterford City Flood Alleviation Scheme was initiated in 1994 and was constructed from 2008 to 2015. The Scheme comprises of flood defence walls, embankments, flood gates and pumping stations for storm water that would otherwise accumulate behind the defences. It provides protection against a 200-Year flood (0.5% Annual Exceedance Probability) for 615 properties against flooding from Waterford Harbour, the River Suir Estuary and the Johns River. The Benefitting Areas are not located within the Framework Plan area and are to the south of the Suir.

The provision of flood protection measures can significantly reduce flood risk. However, the Ministerial Guidelines require that the presence of flood protection structures should be ignored in determining flood zones. This is because of risks relating to failure and severe flood events that exceed design capacity (the risk of severe events is exacerbated with climate change). Notwithstanding this, new development can proceed in areas that are at elevated levels of flood risk subject to the Justification Test provided for by the Guidelines being passed, which takes into account proposals to manage flood risk, such as the development of defences. Although insurance can be challenging to attain in these instances.

Met Éireann currently issues flood warnings for County Kilkenny. Met Éireann, in collaboration with the OPW, is currently engaged in the establishment of a National Flood Forecasting and Warnings Service to forecast for fluvial and coastal flood events.

Kilkenny County Council have submitted two applications for funding from the OPW under the Minor Works Scheme to address pluvial flooding issues in Drumdowney, where at least one property has previously flooded and others are at risk of flooding or of being cut off by flooding.

As identified in Section 5.3 of Appendix I to the Framework Plan:

> **"Drainage/SuDs/Flooding**
> Local surface water management is the responsibility of Kilkenny City and County Council. Any drainage works on site will generally be developer led.
>
> **Residential Sites:** There is a constraint on the combined drainage system in Ferrybank that runs from the Rockshire Road through the general vicinity of residential sites A, B, D, E and F to a pump station on the Abbey Road beside the Clover Road Junction. A separate combined sewer that runs along Abbey Road from Co. Waterford leads to the same pumping station. This frequently backs up, leading to frequent flooding of the area and frequently resulting in road closures and occasionally flooding property. A small, dedicated surface water system in the area has very limited capacity.
>
> There has been recent flooding of the stream that flows westwards along the BUA (Built Up Area) line
> to the northeast of site L. There have been pluvial floods where this stream crosses the Ballyrobin Road (that runs through site L) and further flooding that affected houses in the Mullinabro Woods Housing Estate, immediately north of site O. These areas were badly affected on 23/10/2023. Houses forming ribbon development further north of Mullinabro Woods and on the Cloone Road (outside of the BUA line) all rely on individual septic tanks, many of which frequently flood. Pluvial floods have affected houses to the south of site Q. Runoff arose on from higher ground to the south of these houses.
>
> A full reliance on infiltration could require significant areas for percolation to cope with the emerging
> increased rainfall intensity, which could impact on densities on these plots. The scope for positive drainage systems that avoid existing drainage systems should be explored to provide resilience for more extreme rainfall events.
>
> **Employment Sites:**
> A. Attenuation facilities installed through private development works – IDA Business Park west of E-B and Smartply, north of E-O.
> B. Flooding history where two properties at Ballyvalla (Eircode X91 W8X4 and X91 C6Y6) were flooded. The latter occurred most recently on 23/10/23, when the residents had to be rescued and evacuated by the Fire Service. The Local Primary Road LP3412 flooded frequently to the west of these properties. The bridge on the LP3412 between the two properties was replaced in early 2024 with a larger flow capacity, which may alleviate the risk. Local residents held the view that works on Plot E-I and E-J contributed to the flood events.
> C. The bridge on the Local Secondary Road LS7476 was repaired in early 2024 and appears to have ample capacity.

D. The N29 positive drainage system can become overwhelmed at its junction with the LS7582 leading to Smartply. Spilled fertiliser from Port operations and mud from illegal truck parking along the N29 verges exacerbate the issue.
E. Eircode X91 W2VO in Gorteens flooded extensively on 23/10/23 from water emerging from plot E-L. Works were carried in 2024 on in that land (open drain behind roadside boundary ditch) and at the flooded property (kerbing and ramps to divert water along the road and to existing drainage system) to reduce the flood risk.
F. Run off from lands to the north of Plot E-J flowed through railway bridge on LP3415, entering Eircode X91 HX09 in Drumdowney Lower, destroying boundary walls and flooding several properties. Works to reshape the LP3415 to convey water further along the LP3415 and avoid the affected properties was completed in 2024.
G. These reclaimed lands are prone to flooding. The landowner believes this was a result of the development of the Port, but 25" maps indicate "liable to floods"."

2.3 Other Flood Studies

Other Flood Studies considered in the preparation of this assessment include:

- Previous SFRAs in County Kilkenny;
- Flood Risk Management Plan for the Suir River Basin, 2018; and
- Regional Flood Risk Assessment for the Southern Regional Spatial and Economic Strategy, 2020.

2.4 Flood Risk Indicators

Indicators of flood risk that are based on historical flooding events are identified and described on Table 2. Indicators of flood risk that are based on computational models – predictive flood risk indicators – are identified and described on Table 3. A selection of the historical and predictive flood risk indicators that were considered by the SFRA are mapped at settlement level for Ferrybank-Belview in Appendix II.

Historical indicators taken into account in the identification of flood zones include flood events, such as during Storm Babet (October 2023).

Table 2 Historical Flood Risk Indicators

Information Source	Description	Strategic Limitations
Recorded Flood Events from the OPW	A flood event is the occurrence of recorded flooding at a given location on a given date. The flood event is derived from different types of information (reports, photographs etc.).	This dataset only provides a spot location
Recurring Flood Events	A flood event that has occurred more than once at a certain area is named a recurring flood event.	This dataset only provides a spot location
OPW Flood Extent	A flood extent is an inundated area as recorded at a certain moment in time. This layer of information includes floods recorded in 1999/2000 and 1954.	Coverage limited
Alluvium Soils	Mineral alluvial soil mapping is indicative of recurrent or significant fluvial flooding at some point in the past and was generated by Teagasc with co-operation of the Forest Service, EPA and GSI. This project was completed May 2006.	Drainage may have changed significantly since these soils were deposited.

Table 3 Predictive Flood Risk Indicators

Information Source	Description	Strategic Limitations
CFRAM Study, Flood Extent Mapping, 2016	Following the undertaking of the PFRA, the OPW, through its engineering consultants and working with local authorities and other stakeholders, conducted extensive engineering assessments to better understand and detail the actual risk from flooding for areas that were at highest levels of risk. This was the subject of public consultation. The outcome of that work includes Predicted Flood Extent maps that were finalised in 2016. For fluvial flood levels, calibration and verification of the models make use of the best available data including hydrometric records, photographs, videos, press articles and anecdotal information.	Spatial spread is limited, including to the areas that are considered to be at most risk of flooding.
National Indicative Fluvial Mapping (NIFM) 2021	The PFRA indicative flood maps have now been superseded by the recently published NIFM. The OPW NIFM project has produced second generation indicative fluvial flood spatial data that are of a higher quality and accuracy to those produced for the first cycle PFRA. This project has covered 27,000 km of river reaches, separated into 37 drainage areas, consisting of 509 sub-catchments. Data has been produced for catchments greater than 5km^2 in areas for which flood maps were not produced under the National CFRAM Programme and should be read in this context.	Does not cover smaller sized catchments less than 5km^2.
National Coastal Flood Hazard Mapping 2021	The OPW's National Coastal Flood Hazard Mapping, completed in 2021, provides updated national scale coastal flood extent and depth maps. Maps were produced for the 50% (equivalent to a one in two-year event), 20%, 10%, 5%, 2%, 1%, 0.5% and 0.1% (equivalent to a one in 1000-year event) Annual Exceedance Probabilities for the present-day scenario and for future climate change scenarios, which represent increases in sea level.	Although widely accepted methods have been used to prepare the maps, there is a range of inherent uncertainties within the process of preparing the flood extent and depth maps. These include: • Uncertainties in the estimated extreme water levels: This can arise due to uncertainties in topographic and other survey data, meteorological data, assumptions and / or approximations in the hydraulic / hydrodynamic models in representing physical reality, assumptions in the hydraulic / hydrodynamic modelling, datum conversions, etc. • Uncertainties in the flood extents and depths: This can arise due to uncertainties in the estimated extreme water levels, topographic and other survey data, assumptions and / or approximations in the way that flooding spreads over a floodplain, etc. Due to the various sources of potential inaccuracies in the flood extent and depth maps, a quantitative assessment of their accuracy has not been carried out. A qualitative assessment of the maps was carried out as part of the quality control process. The flood extent and depth maps are therefore suitable for the assessment of flood risk at a strategic scale only, and should not be used to assess the flood hazard and risk associated with individual properties or point locations, or to replace a detailed flood risk assessment. The potential for inaccuracy should be recognised if these flood maps are to be used for any purpose.
GSI's Synthetic Aperture Radar Seasonal Flood Mapping, 2015-2021	This mapping outlines the peak observed surface and groundwater flood extents over each winter season from 2015 to 2021.	Not all turloughs are included in the predictive map as some sites could not be successfully monitored with SAR and/or modelled.

Information Source	Description	Strategic Limitations
PFRA Mapping, OPW, 2012	Along water bodies where no other modelled data is available, this mapping was considered by the SFRA alongside other indicators of flood risk. The PFRA was completed as part of the first cycle of implementation of the Floods Directive in 2011. The PFRA covered a range of sources of flood risk.	Significant limitations. With respect to fluvial data, the maps have various limitations and potential sources of local error, notably: • Local errors in the DTM: For example, where bank-side vegetation was not filtered out of the DTM, the flood levels are likely to be over estimated • Local channel works: The method assumes a certain channel capacity, so the flood levels are likely to be over-estimated where works have been carried out to enhance channel capacity (e.g., where arterial drainage schemes have been completed) • Flood defences: The method does not take account of flood defences • Channel structures: The method does not take account of structures in or over the channel, and so where such structures exist and constrict flow capacity, the flood levels may be under-estimated Further, Some buildings and other infrastructure may be shown as being within the flooded area, but may in reality be above the flood level.

2.5 Conclusion

The information detailed above indicates elevated levels of flood risk in various locations across the town; therefore, a Stage 2 SFRA was proceeded to.

Section 3 Stage 2 SFRA - Flood Risk Assessment

3.1 Introduction

Stage 2 SFRA (flood risk assessment) has been undertaken in order to:

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

3.2 Findings and Adequacy of Existing Information and Delineation of Flood Zones

Desk and in-field studies were undertaken taking into account the following factors:

- Predictive indicators, including those detailed at Table 3 of this report;
- Historical indicators of flood risk;
- Documented Council knowledge of lands;
- The potential source and direction of flood paths from rivers and streams;
- Vegetation indicative of flood risk; and
- The locations of topographic/built features that coincide with the flood indicator related boundaries/topographical survey.

Within the annual exceedance probabilities specified by the Flood Guidelines for Flood Zones A and B, there are elevated levels of flood risk at certain areas in Ferrybank-Belview, as shown in Appendix II. Appendix IV provides overlay mapping of the adopted Framework Plan's land use zoning and: the Flood Zones; and Future Climate Scenario Risk Areas (see Section 3.4).

3.3 Flood Risk Zone Mapping

Flood Risk Zone maps have been produced taking into account the findings of the Stage 1 and Stage 2 SFRA desk and in field studies as identified above[6].

The Flood Risk Zone map for Ferrybank-Belview is provided in Appendix II and identifies Flood Zone A (darker blue) and Flood Zone B[7] (lighter blue). All other areas fall within Flood Zone C. As per the Guidelines, the flood zones are as follow:

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);
- **Flood Zone B** – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and
- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all other areas that are not in zones A or B.

Appendix IV provides overlay mapping of the adopted Framework Plan's land use zoning and: the Flood Zones; and Future Climate Scenario Risk Areas (see Section 3.4).

[6] Including taking into account predictive and historical indicators of flood risk, documented Council knowledge of lands, Council Engineer review and input into indicators and flood zones (local knowledge), the potential source and direction of flood paths from rivers and streams, vegetation indicative of flood risk and the locations of topographic/built features that coincide with the flood indicator related boundaries/topographical survey.

[7] As identified by the Guidelines, in rivers with a well-defined floodplain or where the coastal plain is well defined at its rear, the limits of Zones A and B will virtually coincide. Zone B will only be significantly different in spatial extent from Zone A where there is extensive land with a gentle gradient away from the river or the sea.

3.4 Sensitivity to Climate Change

'The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009' recommends that a precautionary approach to climate change is adopted due to the level of uncertainty involved in the potential effects. In this regard, the Guidelines recommend:

- Recognising that significant changes in the flood extent may result from an increase in rainfall or tide events and accordingly adopting a cautious approach to zoning land in these potential transitional areas;
- Ensuring that the levels of structures designed to protect against flooding such as flood defences[8], land raising or raised floor levels are sufficient to cope with the effects of climate change over the lifetime of the development they are designed to protect (normally 85-100 years); and
- Ensuring that structures to protect against flooding and the development protected are capable of adaptation to the effects of climate change when there is more certainty about the effects and still time for such adaptation to be effective.

The CFRAM Programme include maps for two potential future scenarios taking account of different degrees of climate impact, the Mid-Range Future Scenario (more likely to occur over the coming decades) and the High-Range Future Scenario (less likely to occur over the coming decades). Furthermore, the National Coastal Flood Hazard Mapping 2021 provides updated national scale coastal flood extent and depth maps for the present-day scenario and for various future scenario maps, representing projected future scenarios for the end of century (c. 2100). Appendix IV provides overlay mapping of the adopted Framework Plan's land use zoning and: the Flood Zones; and Future Climate Scenario Risk Areas (see Section 3.4).

A selection of Future Scenario Mapping is provided under Appendix II of this SFRA report. In compliance with the Guidelines, the Flood Zones identified by the SFRA are defined on the basis of current flood risk.

The Guidelines state that:

> "A precautionary approach should be applied, where necessary, to reflect uncertainties in flooding datasets and risk assessment techniques and the ability to predict the future climate and performance of existing flood defences. Development should be designed with careful consideration to possible future changes in flood risk, including the effects of climate change and / or coastal erosion so that future occupants are not subject to unacceptable risks."

The Framework Plan informed by the SFRA ensures a precautionary approach to flood risk management and greenfield lands at risk of flooding is generally zoned only for open space or water compatible development purposes. The Council will require all developments within areas identified to be at flood risk to comply with the requirements of *The Planning System and Flood Risk Assessment Guidelines* (2009). Proposals for development where there is an identified or potential flood risk will be required to carry out a site-specific Flood Risk Assessment in accordance with these Guidelines and the standards of the Development Plan and Framework Plan.

Relevant Development Management Standards from the Framework Plan include:

> **INF-DM3** Applications for minor developments such as small-scale infill, small extensions to houses or the rebuilding of houses, and most changes of use of existing uses to existing buildings (residential, commercial or industrial) within flood risk areas will be supported, provided they do not:
>
> - obstruct important flow paths.
> - introduce a significant number of people into flood risk areas.
> - entail the storage of hazardous substances.
> - increase the risk of flooding elsewhere or

[8] Defended areas are highly sensitive to climate change as the likelihood of defence failure and resulting flooding increases.

- have adverse impacts or impede access to a water- course, floodplain or flood protection and management facilities.

INF-DM4 Flood risk assessments shall apply the precautionary approach and shall consider climate change impacts and adaptation measures, including details of structural and non-structural flood risk management measures. The SFRA datasets and the most up to date CFRAM Programme climate scenario mapping, together with the allowances to be provided for future flood risk management provided in the OPW's (2019) Flood Risk Management Climate Change Sectoral Adaptation Plan and the guidance on potential future scenarios contained therein, should be consulted by prospective applicants for developments in this regard.

3.5 Sustainable Drainage Systems and Surface Water Guidance and Strategy

As provided for by measures integrated into both the existing, already in force, Kilkenny City and County Development Plan and the Framework Plan (including the measures reproduced at Section 4 of this report), new developments will be required to incorporate the requirement for Sustainable Urban Drainage Systems (SuDS) where appropriate. In combination, these provisions contribute towards a sustainable drainage strategy for the Framework Plan area.

It is likely that some or all of the following SuDS techniques will be applicable to opportunity sites within Ferrybank-Belview, including to manage surface water run-off:

- Rainwater harvesting
- Green roofs
- Infiltration systems
- Proprietary treatment systems
- Filter strips
- Filter drains
- Swales
- Bioretention systems
- Trees
- Pervious pavements
- Attenuation storage tanks
- Detention basins
- Ponds and wetlands

Each land use zoning objective, including those for opportunity sites, allows for a range of possible uses and the Framework Plan, and associated City and County Development Plan, allow for a range of scales, heights, densities configurations/layouts and designs. The application of different SuDS techniques will be dependent on a combination of the site's characteristics and the development (when known) being considered.

Because of the infinite range of land use types and associated developments and designs that could occur on sites within the Framework Plan area under this type of Plan[9], the guidance from this SFRA is to consider the full range of SUDs available, taking into account the recommendations and information provided above and below. On key development/opportunity sites, in particular, integrated and area-based provision of SuDS and green infrastructure may be appropriate in order to avoid reliance on individual site by site solutions.

Some sites, such as those for which guidance is provided for below, will pose particular challenges for SuDS. The best practice manuals cited at the end of this sub-section should be considered in determining solutions at these and other development sites.

At sites with high groundwater levels:

[9] Refer to Framework Plan Section "5.7 Land Use Zones".

- Infiltration techniques may be particularly challenging and shallow infiltration basins or permeable pavements, may be most appropriate.
- Storage and conveyance systems need to be kept above maximum groundwater levels and membranes of appropriate robustness should be used to line any tanks
- Locating storage tanks or lined sub-base systems below the maximum likely groundwater level can cause result in flotation and structural risks

At sites that are steeply sloping:

- Effective utilisation of SuDS storage capacity should be considered, which can benefit from aligning with contours of roads and other structures, where these sites are terraced. Terraced car-parking areas can allow for storage of water through pervious pavements. Basins on terraces can provide open space. The runoff catchment on these sites can also be divided into smaller sub catchments.
- Velocities in swales and basins due to the steep slope can be managed by using check dams in swales or in storage layers, such as below permeable pavements.
- The possibility of infiltrating water resurfacing downslope or to increase pressure on downslope structures, such as walls, causing them to fail should be considered.

At sites that are very flat:

- On very flat sites, it is often not possible to construct piped drainage systems with sufficient falls to achieve minimum self-cleansing velocities. The solution can involve the use of shallow SuDS components such as swales, pervious pavements or high-capacity linear drainage channels, often dividing the site into small sub-catchments and providing local combined storage and conveyance components.
- A slight fall on any subgrade exposed to water is preferred in order to avoid ponding of water and reduction in strength in the soil due to waterlogging. If this is not possible then reduction in strength should be taken into account in the structural design of tanks or pervious pavements.
- Pumping should be a last resort and only allowable in situations where guaranteed maintenance of the pumps can be ensured.

At sites that include areas of floodplain:

- Notwithstanding that all storage volume should normally be provided within the development footprint, outside of the floodplain, SuDs on floodplains can be effective in managing routine rainfall/treatment for frequent events.
- SuDs should be selected and designed taking account of the likely high groundwater table and vulnerability to erosion during periods of high flows/water levels and SuDS should not reduce floodplain storage or conveyance.
- Conveyance routes should limit grading and the creation of surface features that could either reduce floodplain capacity or be washed out in a flood.
- Surface discharge from SuDS should be dispersed with point discharges minimised or eliminated.
- All SuDS within or crossing a floodplain should take full consideration of the likely influence of river water levels on the design performance. Combined probability assessments may be required.
- Siltation and subsequent clearance after a flood event has subsided should also be taken into account in the design.

SuDS are effective technologies, which aim to reduce flood risk, improve water quality and enhance biodiversity and amenity.

The systems should aim to mimic the natural drainage of the application site to minimise the effect of a development on flooding and pollution of existing waterways. SuDS include devices such as swales, permeable pavements, filter drains, storage ponds, constructed wetlands, soakways and green roofs. The integration of nature-based solutions, such as amenity areas, ecological corridors and attenuation ponds, into public and private development initiatives, is applicable within the provisions of the

Framework Plan and should be encouraged. Applications for development should take into account, as appropriate, the Department of Housing, Local Government and Heritage's (2022) "Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas - Water Sensitive Urban Design - Best Practice Interim Guidance Document".

In some exceptional cases, and at the discretion of the relevant Council, where it is demonstrated that SuDS devices are not feasible, approval may be given to install underground attenuation tanks or enlarged pipes in conjunction with other devices to achieve the required water quality. Such alternative measures will only be considered as a last resort. Proposals for surface water attenuation systems should include maintenance proposals and procedures.

Urban developments, both within developments and within the public realm, should seek to minimise and limit the extent of hard surfacing and paving and require the use of sustainable drainage techniques for new development or for extensions to existing developments, in order to reduce the potential impact of existing and predicted flood risk. Development proposals should be accompanied by a comprehensive SuDS assessment that addresses run-off rate, run-off quality and its impact on the existing habitat and water quality.

For larger sites (i.e. multiple dwellings or commercial units) master planning should ensure that existing flow routes are maintained, through the use of green infrastructure. In addition, where multiple individual proposals are being made SUDS should be integrated where appropriate and relevant.

All proposed development, should consider the impact of surface water flood risks on drainage design e.g. in the form of a section within the flood risk assessment (for sites in Flood Zone A or B) or part of a surface water management plan.

Pluvial flood risk is likely to be present in local areas, however; it is not taken into account in the delineation of flood zones. Furthermore, PFRA indicative pluvial maps (2012) are not considered to be reliable for the purposes of zoning or decision-making. Particular attention should be given to development in low-lying areas which may act as natural ponds for collection of run-off. The drainage design should ensure no increase in flood risk to the site, or the downstream catchment. Where possible, and particularly in areas of new development, floor levels should be at an appropriate height 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.

Further to the above, proposals for development should consider the Construction Industry Research and Information Association (CIRIA) SuDS Manual 2015 and any future update of this guidance and Greater Dublin Strategic Drainage Study documents in designing SUDS solutions, including the New Development Policy, the Final Strategy Report, the Code of Practice and "Irish SuDS: guidance on applying the GDSDS surface water drainage criteria".

Section 4 Flood and Drainage Provisions

4.1 Introduction

In order to comply with *The Planning System and Flood Risk Management - Guidelines for Planning Authorities* (Department of the Environment, Heritage and Local Government and Office of Public Works, 2009) and Department of the Environment, Community and Local Government Circular (*PL 2/2014*) and in order to contribute towards flood risk management within the Framework Plan area, the measures below have been integrated into the Framework Plan and the existing, already in force, Kilkenny City and County Development Plan.

4.2 Land Use Zoning

That Flood Zones identified by the SFRA were used in line with the requirements provided for by the Flood Guidelines for land uses in Flood Zones A and B when preparing the Framework Plan. Appendix IV provides overlay mapping of the adopted Framework Plan's land use zoning and: the Flood Zones; and Future Climate Scenario Risk Areas (see Section 3.4).

4.3 Integration of flood risk management provisions into the Kilkenny City and County Development Plan

Provisions relating to flood risk management have already been integrated into the Kilkenny City and County Development Plan. These are detailed on Table 4.

Table 4 Kilkenny City and County Development Plan Provisions relating to Flood Risk Management

Kilkenny City and County Development Plan Provision
10.2.6 Flooding It is Council policy 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. The Council will ensure that new developments do not reduce the effectiveness or integrity of any existing or new flood defence infrastructure, and will facilitate the provision of new, or the reinforcement of existing, flood defences and protection measures where necessary. 10.2.6.2 Development Management Requirements • Where flood risk may be an issue for any proposed development, a detailed flood risk assessment should be carried out appropriate to the scale and nature of the development and the risks arising. In particular, any area within or adjoining flood zone A or B, or flood risk area, shall be the subject of a site-specific Flood Risk Assessment appropriate to the type and scale of the development being proposed. This shall be undertaken in accordance with the Planning System and Flood Risk Management – Guidelines and the Strategic Flood Risk Assessment accompanying this Plan. • If a Site Specific FRA demonstrates an unmanageable level of flood risk and/or impacts to 3rd party lands, development cannot proceed. • Proposals for mitigation and management of flood risk will only be considered where avoidance is not possible and where development can be clearly justified with the Guidelines' Justification Test. 10.2.7 Surface Water Drainage The Planning Authority shall have regard to any catchment-based surface water management plan in accordance with the Flood Risk Guidelines 2009, to facilitate the management of nature-based surface water management in a holistic manner. In all instances where development is proposed, non – nature based solutions to surface water management will only be considered where nature-based solutions cannot be incorporated or will not provide an adequate solution to the surface water management. 10.2.8 Development Management Requirements The Planning Authority will have regard to the Inland Fisheries Ireland guidance on 'Planning for Watercourses in the Urban Environment' in assessing applications. • Development must, so far as is reasonably practicable, incorporate the maximum provision to reduce the rate and quantity of runoff e.g.: - o Hard surface areas (car parks, etc.), should be constructed in permeable or semipermeable materials,

Kilkenny City and County Development Plan Provision
o On site storm water ponds to store and/or attenuate additional runoff from the development should be provided, o Soak-aways or french drains should be provided to increase infiltration and minimise additional runoff. o The Planning Authority will normally require that all new developments, include rainwater harvesting and/or grey water recycling in their design. except where not practical or feasible • Individual developments shall be obliged, in all cases where surface water drainage measures are required, to provide a surface water drainage system separated from the foul drainage system. • In the case of one-off rural dwellings or extensions, except in circumstances where an existing surface water drainage system is available to the proposed site for development and which, in the opinion of the planning authority has adequate capacity to accommodate the identified surface water loading, surface water shall be disposed of, in its entirety within the curtilage of the development site by way of suitably sized soak holes. • In the case of driveways, drainage measures shall be provided to a detail acceptable to the planning authority so as to avoid run-off from the site to the adjoining public road. • For all other green-field developments in general the limitation of surface water run-off to pre-development levels will be required. Where a developer can clearly demonstrate that capacity exists to accommodate run-off levels in excess of green-field levels then the planning authority shall consider such proposals on a case by case basis. • In the case of brown-field development, while existing surface water drainage measures will be taken into account, some attenuation measures for surface water may be required at the discretion of the planning authority in the interests of balanced and sustainable development. • In line with the above Kilkenny County Council will consider all drainage proposals consistent with SuDS (Sustainable Drainage Systems). • For developments adjacent to watercourses of a significant conveyance capacity any structures (including hard landscaping) must be set back a minimum of 5-10m from the edge of the watercourse to allow access for channel clearing/maintenance. Any required setback may be increased to provide for habitat protection. Development consisting of construction of embankments, wide bridge piers, or similar structures will not normally be permitted in or across flood plains or river channels. • The culverting of water courses is discouraged. Where culverting is unavoidable, the use of ecologically friendly box culverts is required. A development proposal requiring culverting should document open watercourse habitat lost and provide compensatory habitat. • Adequate allowance be made for climate change in designing surface water proposals a multiplication factor of 1.2 shall be applied to all river return periods up to 100 years except in circumstances where the OPW have provided advice specifying the particular multiplication factor for return periods up to 100 years. In the case of rainfall a multiplication factor of 1.1 shall be applied to rainfall intensities to make allowance for climate change requirements. • In the design of surface water systems, regard shall be had to the Greater Dublin Regional Code of Practice for Drainage Works and associated GDSDS technical documents. • For larger scale developments a report will be required specifying the SUDS measures considered in principle. If natural measures are not included, the reasons why not should be outlined.

4.4 Integration of flood risk management provisions into the Variation

Further to the land use zoning approach contained in the Variation's Framework Plan (see Section 4.2 above) and the measures contained in the existing County Development Plans (see Section 4.3 above), a number of other measures relating to flood risk and drainage have been integrated into the Framework Plan as detailed on Table 5.

Table 5 Variation's Framework Plan Provisions relating to Flood Risk Management

Variation's Framework Plan Provision
DSUD8 Apply nature-based solutions with natural landscape, rain gardens, swales and biodiversity enhancement, as part of an overall water management strategy. Relevant policy and guidance documents with regards to nature-based solutions to be applied in both new and existing developments. • Implementation of Urban Nature-based Solutions- Guidance Document for Planners, Developers and Developer Agents. (LAWPRP, KCC and Uisce Eireann) • Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas. Water Sensitive Urban Design. Best Practise Interim Guidance Document. (DHLGH) • Rainwater Management Plans- Guidance for Local Authorities. (DHLGH) Section 5.7 Land Use Zones - Overriding Flood Risk-related Limitation on the above Land Use Zones There are a number of instances where Flood Risk Zones A and B overlap with a variety of the above land-use zoning objectives, including Open Space and Water Compatible Development. Uses under all zoning objectives shall be limited to water compatible uses in Flood Zone A, and less vulnerable or water compatible uses in Flood Zone B. Detailed, site specific Flood Risk Assessment will be required in these areas. This limitation shall take primacy over any other provision relating to these land use zoning objectives. Uses on lands associated with Mid-Range and High-End NIFM/NCFHM future climate scenario risk areas, outside of Flood

Variation's Framework Plan Provision
Zones A or B, shall be limited to less vulnerable and water compatible development. This limitation shall take primacy over any other related land use zoning provision. Detailed, site-specific Flood Risk Assessment will be required in these areas. INF1 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 and associated Circular PL2/2014 follow the sequential approach to flood risk management when assessing the location for new development based on avoidance, reduction and mitigation of flood risk. INF2 Maintain the natural wetland characteristics of wet grassland and reed swamps which are currently free from development and act as natural stormwater retention areas. INF-DM1 Where flood risk may be an issue for any proposed development, including pluvial flood risk, a flood risk assessment shall be carried out that is appropriate to the scale and nature of the development and the risks arising. This shall be undertaken in accordance with the Flood Risk Assessment Guidelines, including the sequential approach. Proposals for mitigation and management of flood risk will only be considered where avoidance is not possible and where development can be clearly justified with the Guidelines' Justification Test. INF-DM2 Applications for development in flood vulnerable zones, and accompanying flood risk assessments, shall provide details of appropriate structural and non-structural risk management measures as relevant and appropriate, including, but not limited to specifications of the following (for more details please refer to Section 4 of the accompanying SFRA): • Floor Levels • Internal Layout • Flood-Resistant Construction • Flood-Resilient Construction • Emergency Response Planning • Access and Egress During Flood Events INF-DM3 Applications for minor developments such as small-scale infill, small extensions to houses or the rebuilding of houses, and most changes of use of existing uses to existing buildings (residential, commercial or industrial) within flood risk areas will be supported, provided they do not: • obstruct important flow paths. • introduce a significant number of people into flood risk areas. • entail the storage of hazardous substances. • increase the risk of flooding elsewhere or • have adverse impacts or impede access to a water- course, floodplain or flood protection and management facilities. INF-DM4 Flood risk assessments shall apply the precautionary approach and shall consider climate change impacts and adaptation measures, including details of structural and non-structural flood risk management measures. The SFRA datasets and the most up to date CFRAM Programme climate scenario mapping, together with the allowances to be provided for future flood risk management provided in the OPW's (2019) Flood Risk Management Climate Change Sectoral Adaptation Plan and the guidance on potential future scenarios contained therein, should be consulted by prospective applicants for developments in this regard INF-DM5 Minimise flood risk arising from surface water flooding by promoting the use of natural flood risk management measures including sustainable drainage systems, minimising extent of hard surface/paving, and smart solutions such as innovative green infrastructure. (Refer also to Section 3.5 of the accompanying SFRA "Sustainable Drainage Systems and Surface Water Guidance and Strategy")

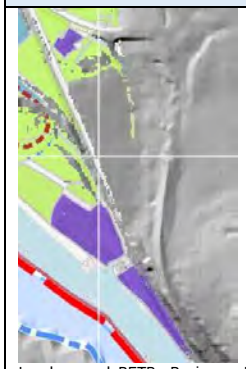
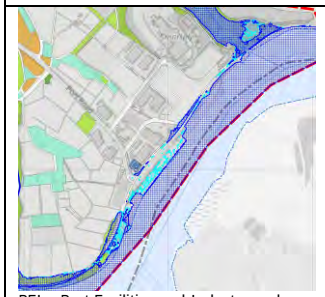
4.5 Justification Tests

In order to meet the objectives of proper planning and sustainable development various uses are provided for in Flood Zones A and B. The limitations outlined under the "Overriding Flood Risk-related Limitation on the above Land Use Zones" from Section 5.7 of the Framework Plan's applies to all lands zoned in Flood Zone A and B.

Table 6 provides the findings of the Justification Test undertaken for certain lands, as required by the Flood Guidelines, informed by Kilkenny County Council.

Open Space and Water Compatible Development in Flood Zones A/B are considered appropriate under the Guidelines and are not subject to the Justification Test.

Table 6 Justification Test

Site	Flood Zone	Justification Test (Fails, if one of the following fails; all must be passed for the test to be passed)			
		Is the settlement targeted for growth under the NPF, RSES, existing CDP and/or CDP?	**Is the zoning of the lands required to achieve the proper planning and sustainable development of the settlement and in particular has the required sub-criteria been satisfied[10] ?**	**Has flood risk assessment to an appropriate level of detail been carried out as part of the SEA as part of the 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 impact elsewhere?**	**Overall Result and Decision by Planning Authority**
 Lands zoned BETPs Business, Enterprise and Technology Parks	A and B	Yes	No	A Stage 1 and 2 Flood Risk Assessment has been undertaken as part of the Variation preparation process. This level of assessment is considered appropriate and has informed the zoning proposals and policies and objectives contained in the Framework Plan. Section 4 of the SFRA outlines the measures integrated into Framework Plan (and existing City and County Development Plan) to adequately manage flood risks. A precautionary approach has been applied to the zoning of lands with undeveloped lands that is liable to flood generally zoned for Open Space or Water Compatible Development related uses. Future development will: be subject to site-specific flood risk assessments; and comply with the flood risk management provisions of the Framework Plan and existing City and County Development Plan (see Section 4 above), including structural and non-structural risk management measures. This is in order to ensure that flood hazard and risk to the area and to other adjoining locations will not be increased or, if practicable, will be reduced. Overlaps between Land Use Zoning and Flood Zones have been mapped to clearly indicate lands constrained by flood risk. Development is subject to the policies, objectives and requirements of the Framework Plan and existing City and County Development Plan that relate to flood risk and climate change.	Fail, however these lands are associated with existing development / infrastructure and the "Overriding Flood Risk-related Limitation on the above Land Use Zones" from Section 5.7 of the Framework Plan would significantly limit future development. The land use zoning objective reflects the existing use of the site and therefore the zoning is retained.
 Existing Residential	A and B	Yes	No	A Stage 1 and 2 Flood Risk Assessment has been undertaken as part of the Variation preparation process. This level of assessment is considered appropriate and has informed the zoning proposals and policies and objectives contained in the Framework Plan. Section 4 of the SFRA outlines the measures integrated into Framework Plan (and existing City and County Development Plan) to adequately manage flood risks. A precautionary approach has been applied to the zoning of lands with undeveloped lands that is liable to flood generally zoned for Open Space or Water Compatible Development related uses. Future development will: be subject to site-specific flood risk assessments; and comply with the flood risk management provisions of the Framework Plan and existing City and County Development Plan (see Section 4 above), including structural and non-structural risk management measures. This is in order to ensure that flood hazard and risk to the area and to other adjoining locations will not be increased or, if practicable, will be reduced. Overlaps between Land Use Zoning and Flood Zones have been mapped to clearly indicate lands constrained by flood risk. Development is subject to the policies, objectives and requirements of the Framework Plan and existing City and County Development Plan that relate to flood risk and climate change.	Fail, however these lands are associated with existing development / infrastructure and the "Overriding Flood Risk-related Limitation on the above Land Use Zones" from Section 5.7 of the Framework Plan would significantly limit future development. The land use zoning objective reflects the existing use of the site and therefore the zoning is retained.
 PFI – Port Facilities and Industry and Public Utility	A and B	Yes	No	A Stage 1 and 2 Flood Risk Assessment has been undertaken as part of the plan preparation process. This level of assessment is considered appropriate and has informed the zoning proposals and policies and objectives contained in the Plan. Section 4 of the SFRA outlines the measures integrated into Plan to adequately manage flood risks. A precautionary approach has been applied to the zoning of lands with undeveloped lands that is liable to flood generally zoned for Open Space or Water Compatible Development related uses. Future development will: be subject to site-specific flood risk assessments; and comply with the flood risk management provisions of the Plan (see Section 4 above), including structural and non-structural risk management measures. This is in order to ensure that flood hazard and risk to the area and to other adjoining locations will not be increased or, if practicable, will be reduced. Overlaps between Land Use Zoning and Flood Zones have been mapped to clearly indicate lands constrained by flood risk. Development is subject to the policies, objectives and requirements of the Plan that relate to flood risk and climate change.	Fail, however these lands are associated with existing development / infrastructure and the "Overriding Flood Risk-related Limitation on the above Land Use Zones" from Section 5.7 of the Framework Plan would significantly limit future development. The land use zoning objective reflects the existing use of the site and therefore the zoning is retained.

[10] (i) Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement; (ii) Comprises significant previously developed and/or under-utilised lands; (iii) Is within or adjoining the core of an established or designated urban settlement; (iv) Will be essential in achieving compact and sustainable urban growth; and (v) There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.

Section 5 Conclusion

Kilkenny County Council has prepared a Framework Plan for Ferrybank-Belview under the Planning and Development Act 2000 (as amended). The Framework Plan sets out an overall strategy for the proper planning and sustainable development of the Framework Plan area.

As detailed in the Framework Plan, all of the provisions from the existing Kilkenny City and County Development Plan 2021-2027, as varied, shall be complied with throughout the implementation of the Framework Plan. This includes those provisions relating to flood risk management and drainage.

The SFRA has informed both the land use zoning and the written provisions of the Framework Plan. The detailed Plan preparation process undertaken by the Planning Department combined with specialist input from the SFRA process facilitated zoning that helps to avoid inappropriate development being permitted in areas of high flood risk. In addition, various flood risk management provisions have been integrated into the Framework Plan.

Appendix I: Summary of the requirements of the Flood Guidelines for land uses in Flood Zones

Requirements relating to land uses in Flood Zones as set out in the Department of Environment, Heritage and Local Government (DEHLG) and Office of Public Works (OPW) 2009 Flood Guidelines (including at Chapter 3 Principles and Key Mechanisms and Chapter 5 Flooding and Development Management) and Departmental Circular PL2/2014 should be adhered to.

- The Sequential Approach, including the Justification test -

The key principles of the Guidelines' risk-based sequential approach (see Figure 1) are:

- Avoid development in areas at risk of flooding. If this is not possible, consider substituting a land use that is less vulnerable to flooding. Only when both avoidance and substitution cannot take place should consideration be given to mitigation and management of risks.

- Inappropriate types of development that would create unacceptable risks from flooding should not be planned for or permitted.

- Exceptions to the restriction of development due to potential flood risks are provided for through the use of a Justification Test, where the planning need and the sustainable management of flood risk to an acceptable level must be demonstrated.

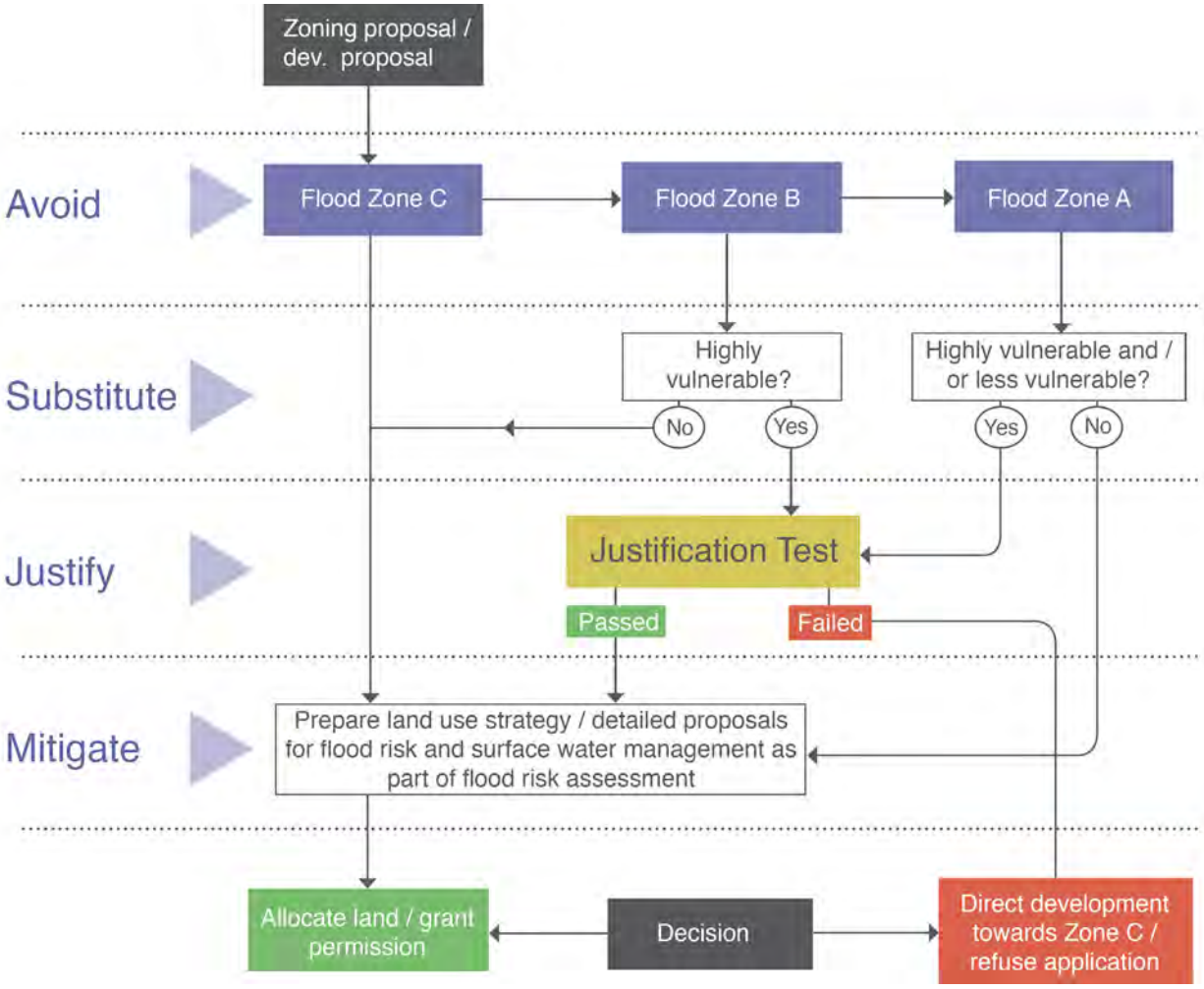


Figure 1 Sequential Approach Process[11]

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

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

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

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

[11] Flood Zone C covers all areas outside of Zones A and B

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

Table 7 overleaf classifies the vulnerability of different types of development while Table 8 identifies the appropriateness of development belonging to each vulnerability class within each of the flood zones as well as identifying what instances in which the Justification Test should be undertaken. Inappropriate development that does not meet the criteria of the Justification Test should not be considered at the plan-making stage or approved within the development management process.

Table 7 Classification of vulnerability of different types of development

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

*Uses not listed here should be considered on their own merits

Table 8 Vulnerability Classes and Flood Zones

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

The **Justification Test** which is referred to as part of the Sequential Approach is an assessment of whether a development proposal within an area at risk of flooding meets specific criteria for proper planning and sustainable development and demonstrates that it will not be subject to unacceptable risk nor increase flood risk elsewhere. The Justification Test should be applied only where development is within flood risk areas that would be defined as inappropriate under the screening test of the sequential risk based approach outlined above. This Justification Test is shown below.

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

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

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

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

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

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

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

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

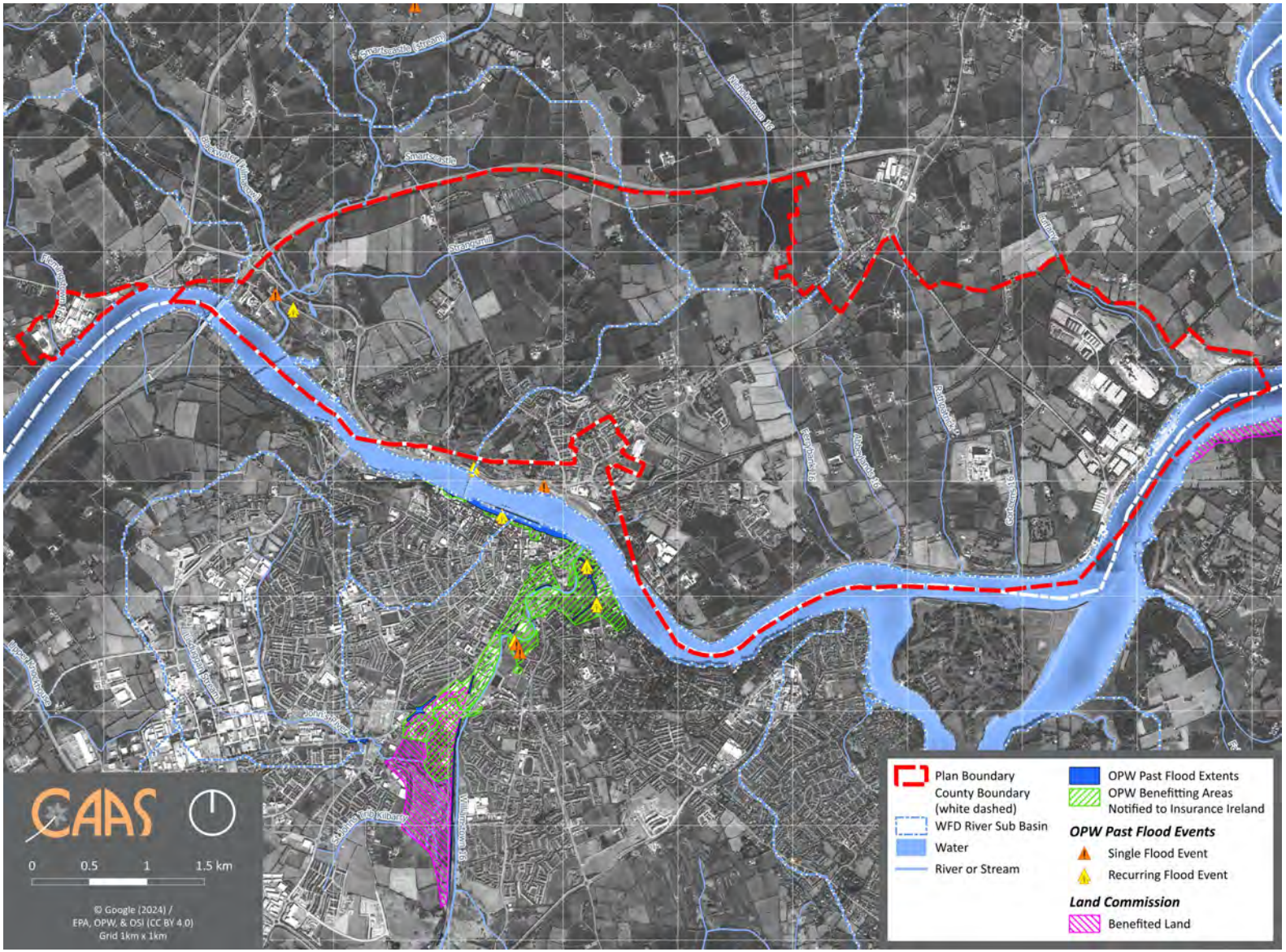
3 A flood risk assessment to an appropriate level of detail has been carried out as part of the Strategic Environmental Assessment as part of the development plan preparation process, which demonstrates that flood risk to the development can be adequately managed and the use or development of the lands will not cause unacceptable adverse impacts elsewhere.

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

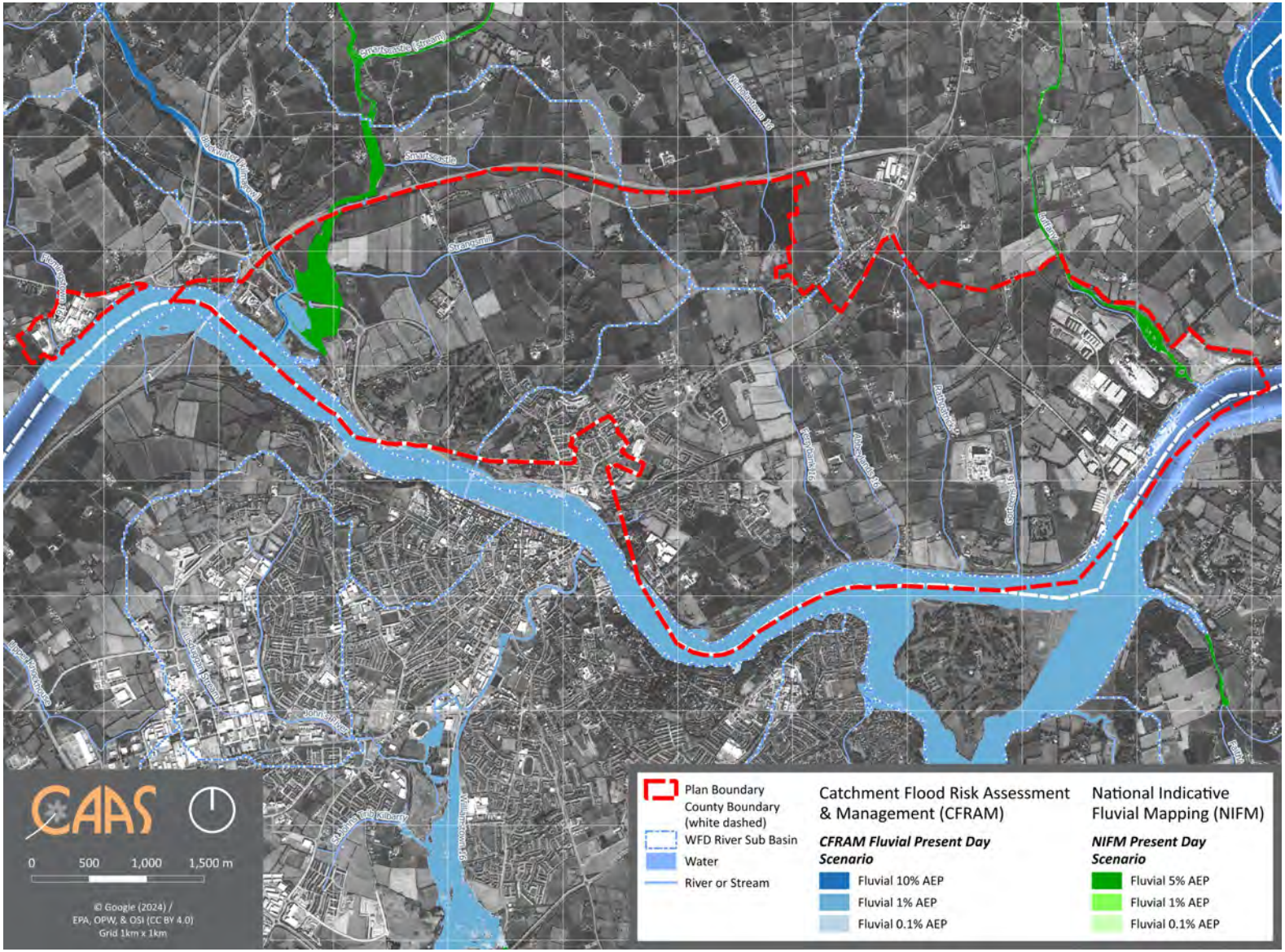
Figure 2 Justification Test [12]

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

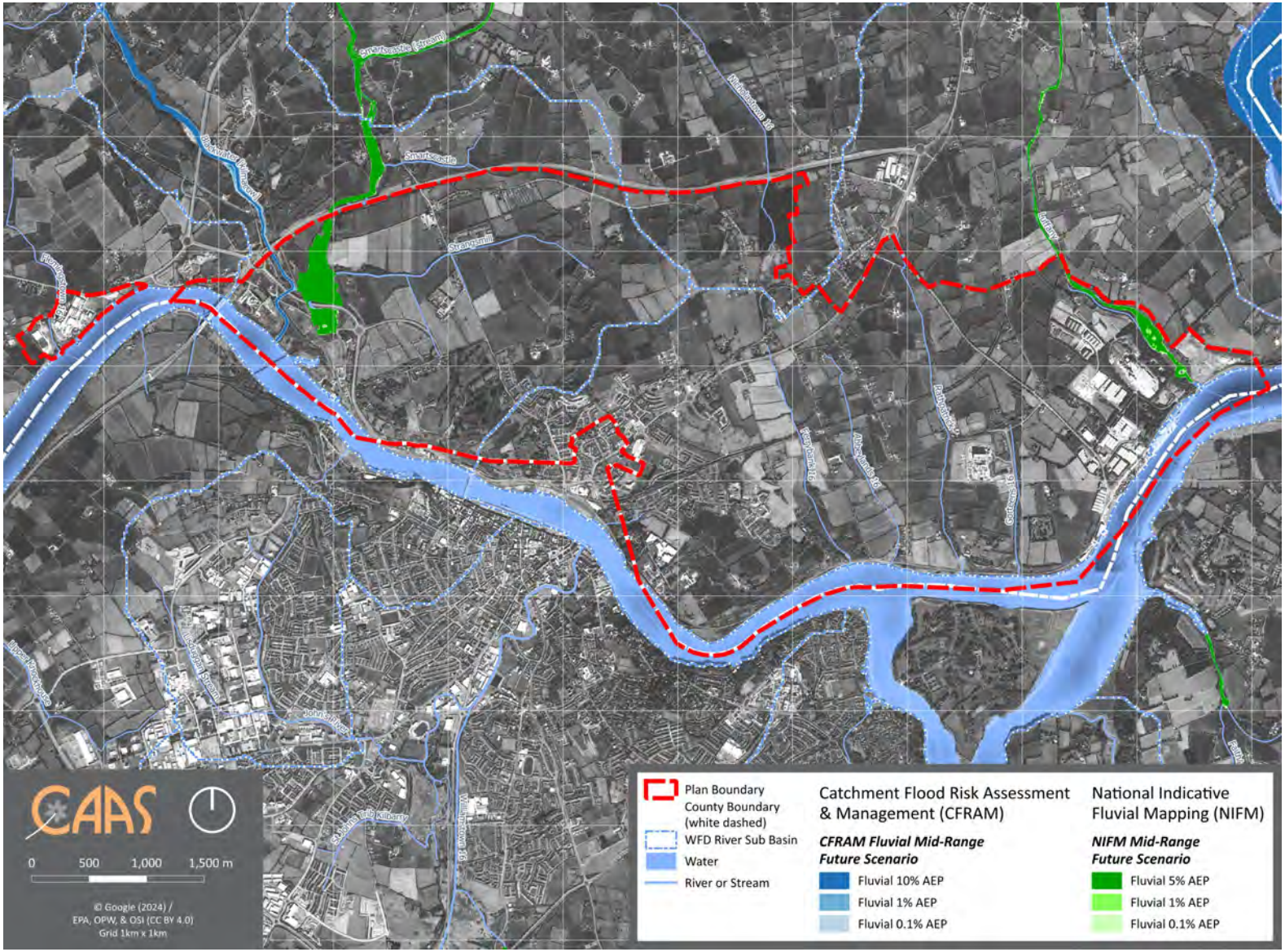
Appendix II: Flood Risk Indicator and Zone Mapping



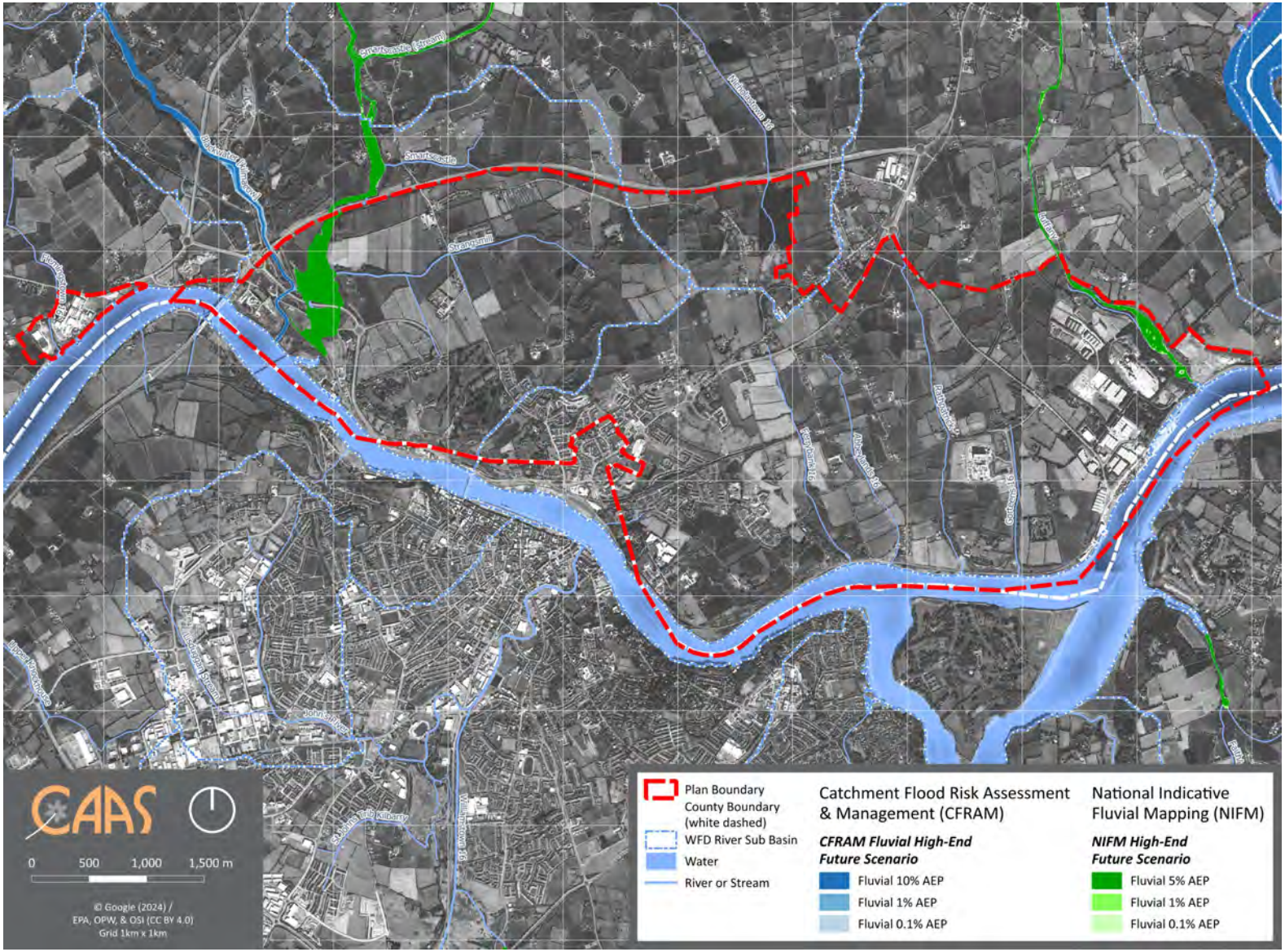
Historical Indicators



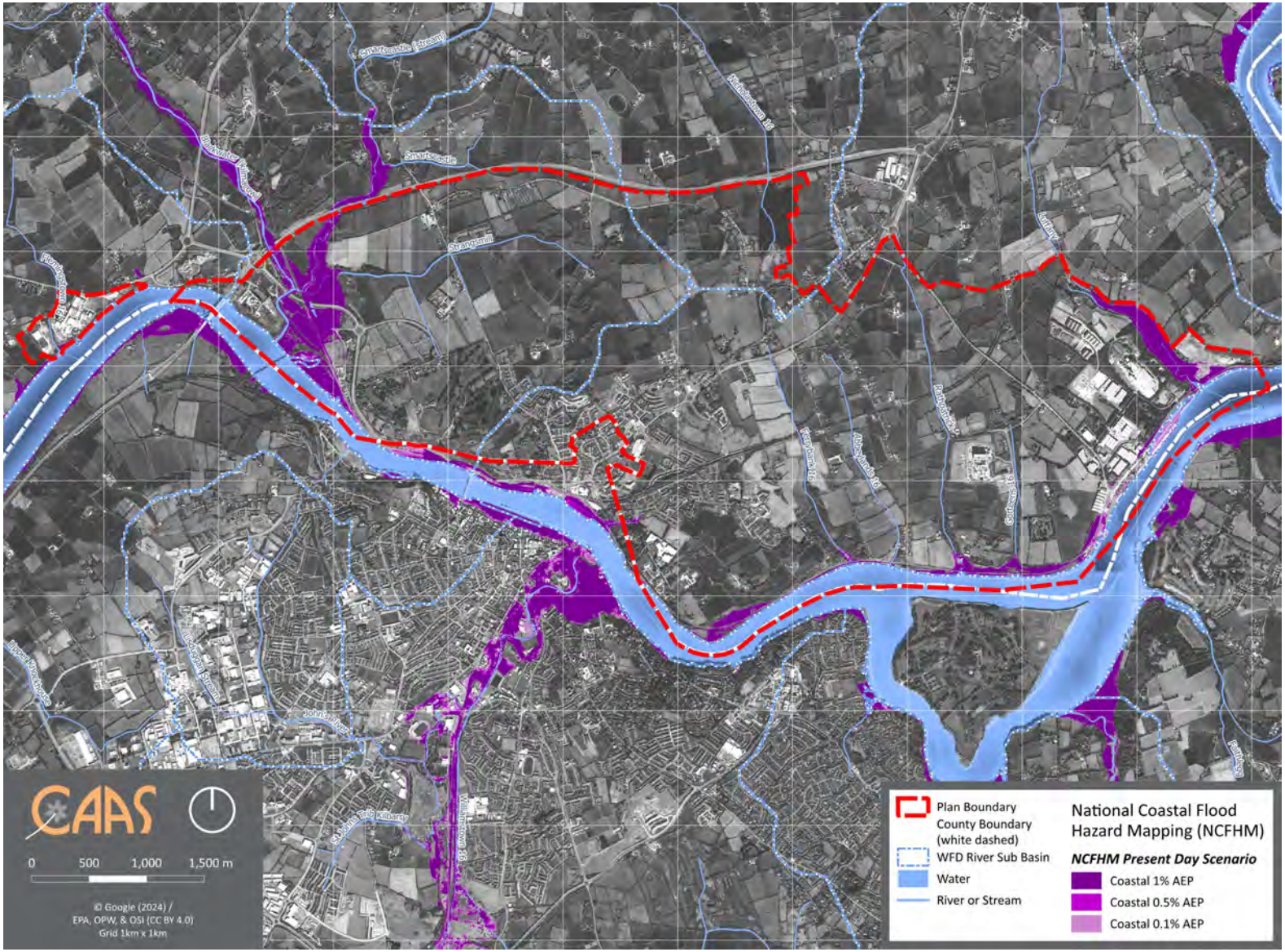
CFRAM and NIFM Fluvial Present Day Scenario Mapping



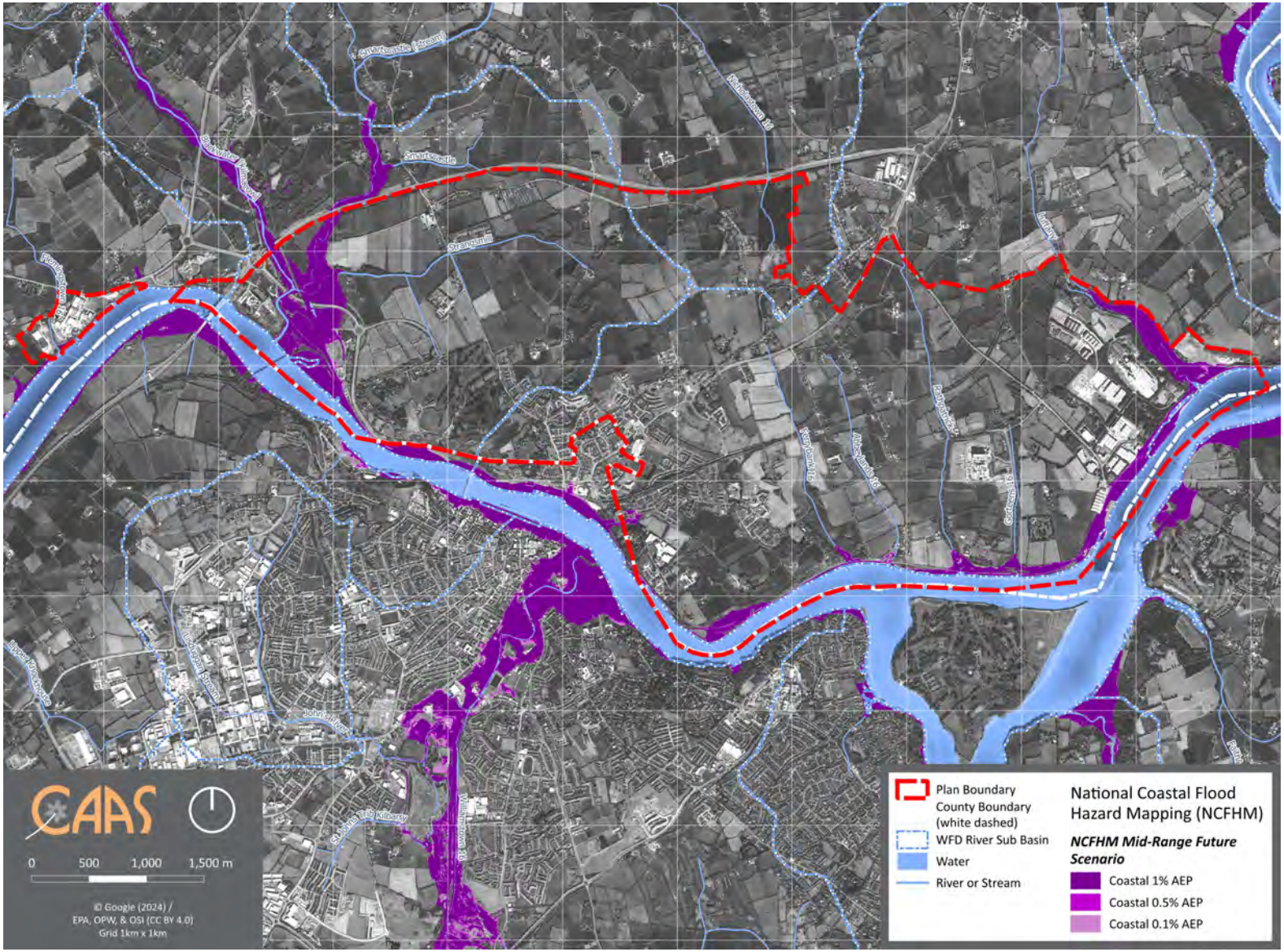
CFRAM and NIFM Fluvial Mid-Range Climate Change Scenario Mapping



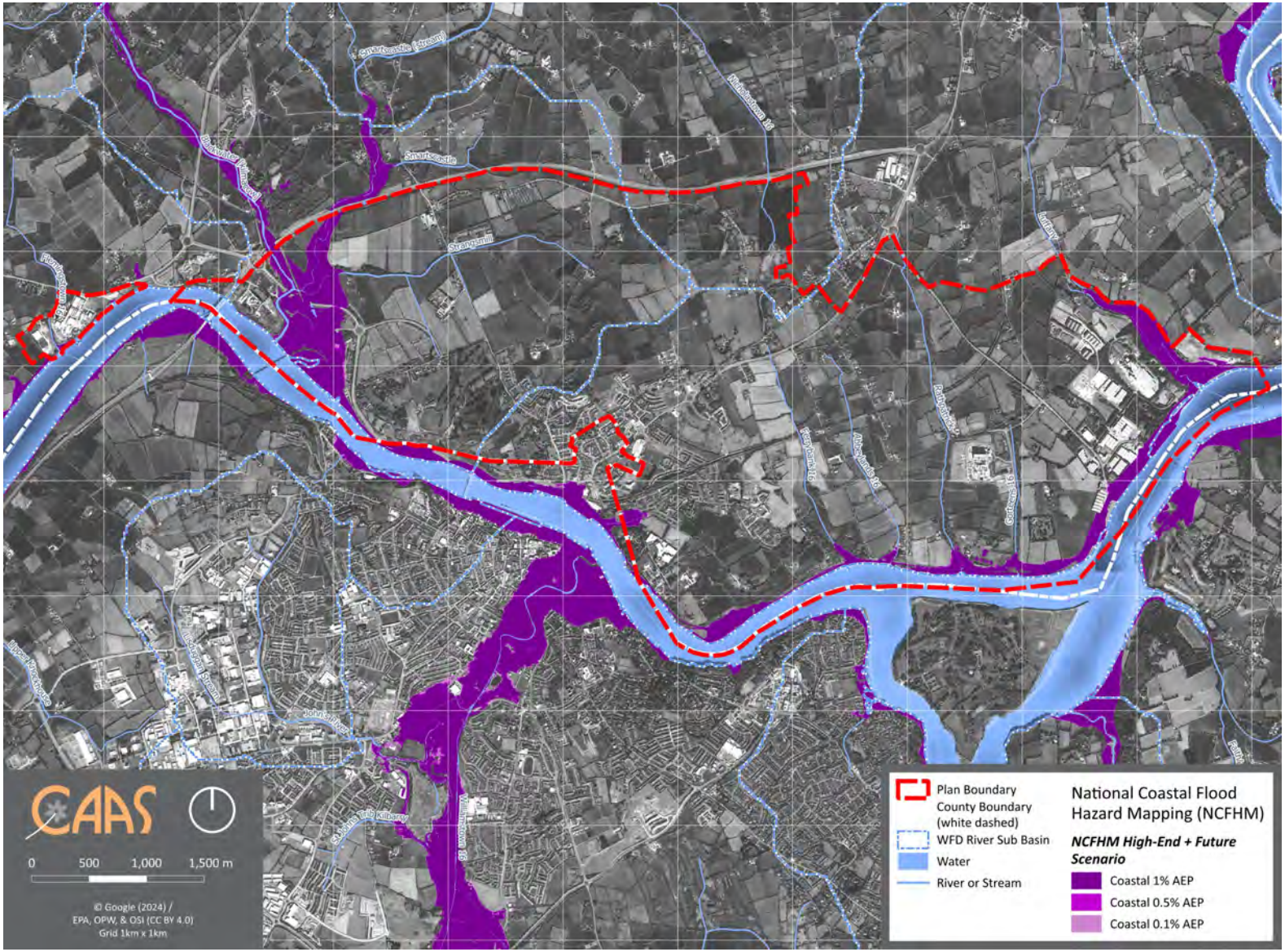
CFRAM and NIFM Fluvial High-End Climate Change Scenario Mapping



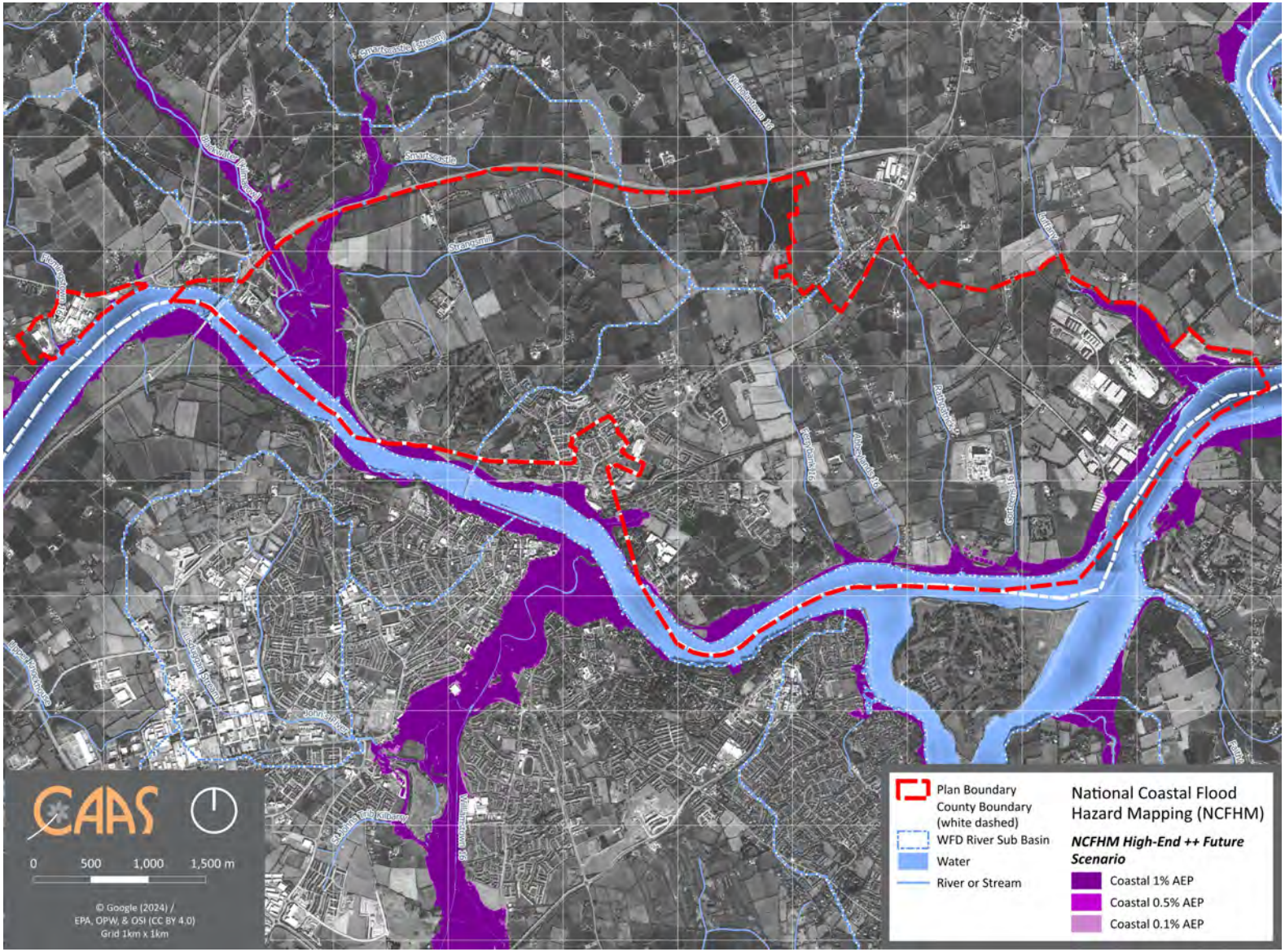
NCFHM (Coastal) Present Day Climate Change Scenario Mapping



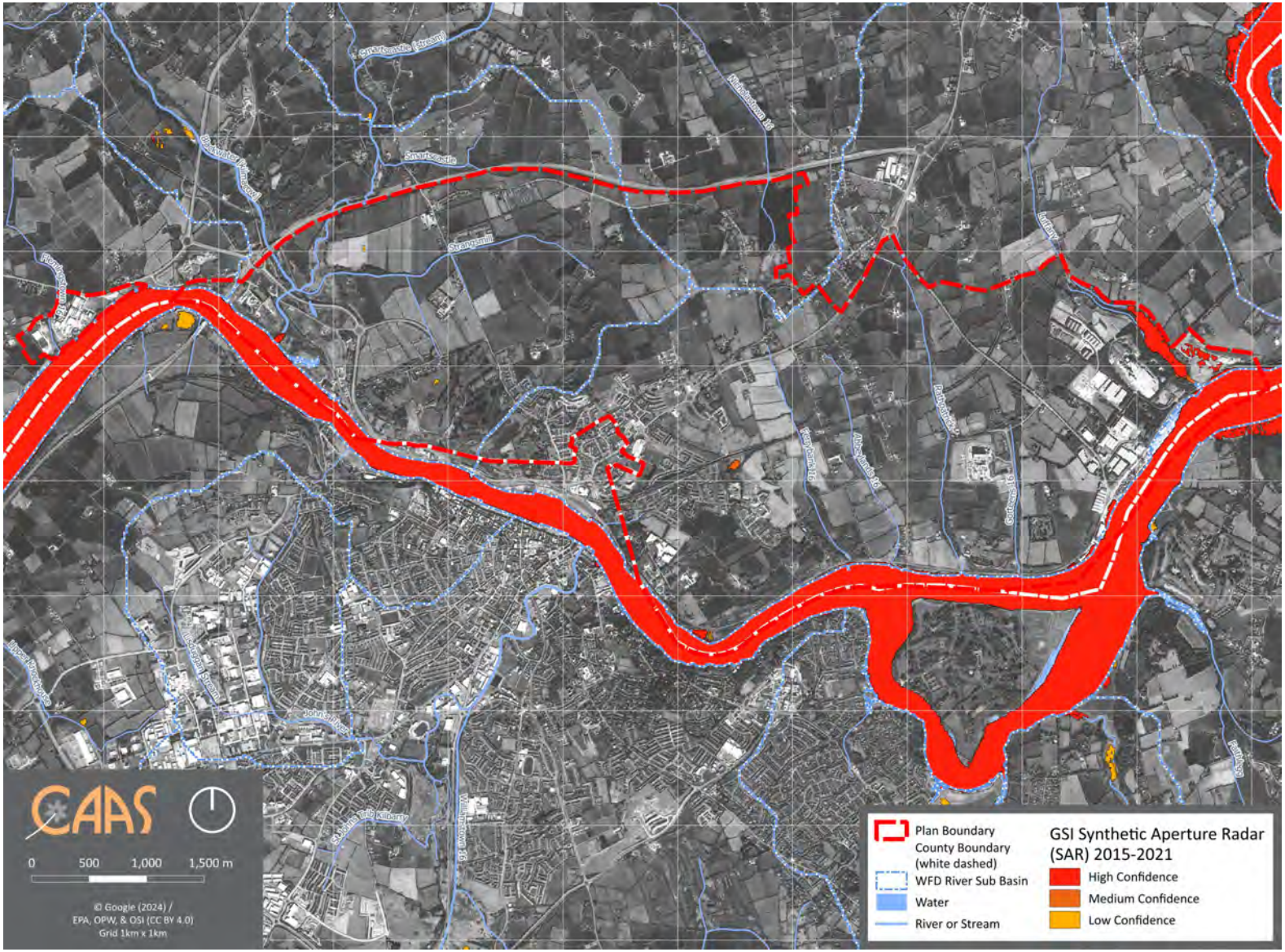
NCFHM (Coastal) Present Day Climate Change Scenario Mapping



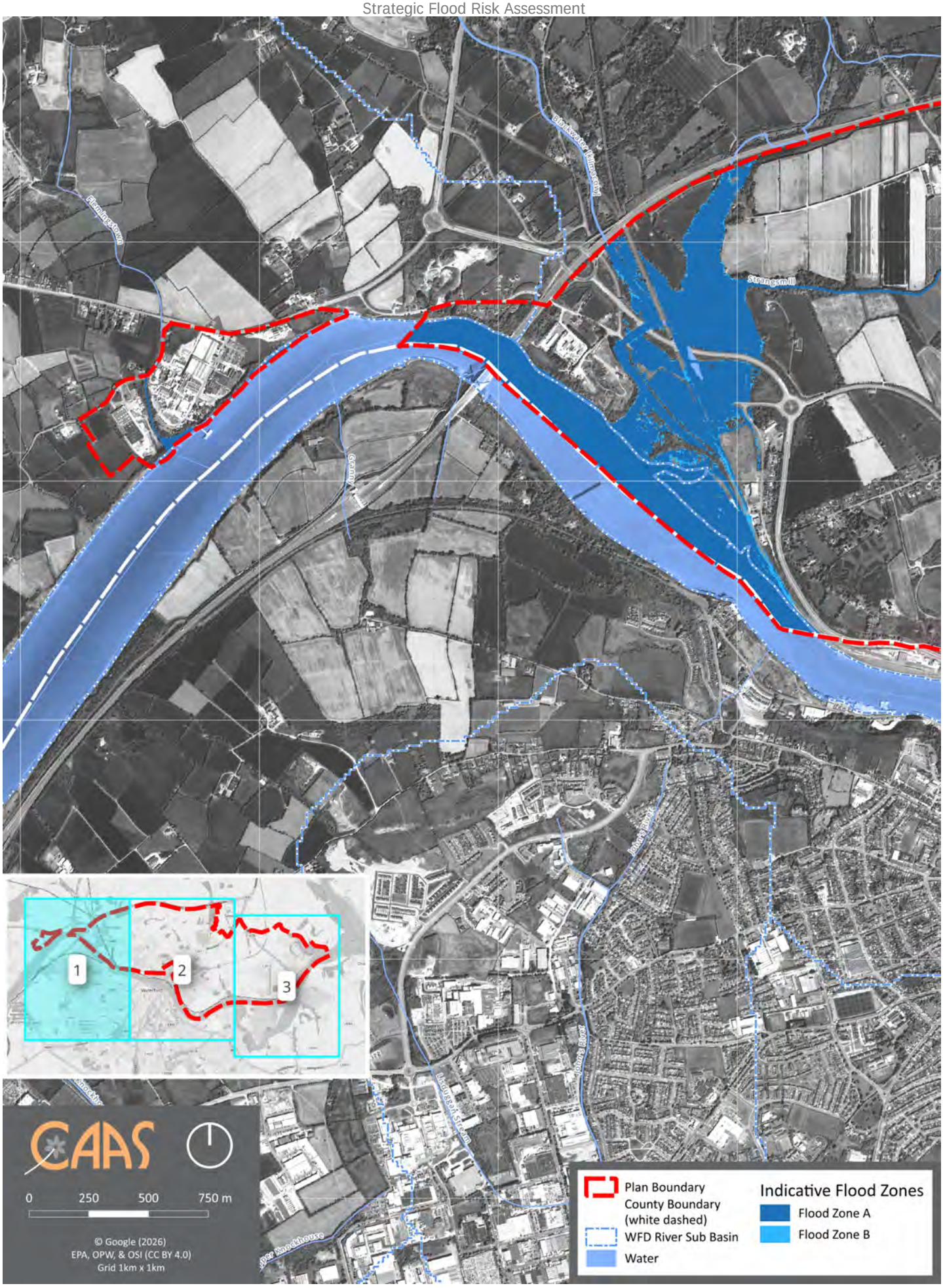
NCFHM (Coastal) High End + Climate Change Scenario Mapping



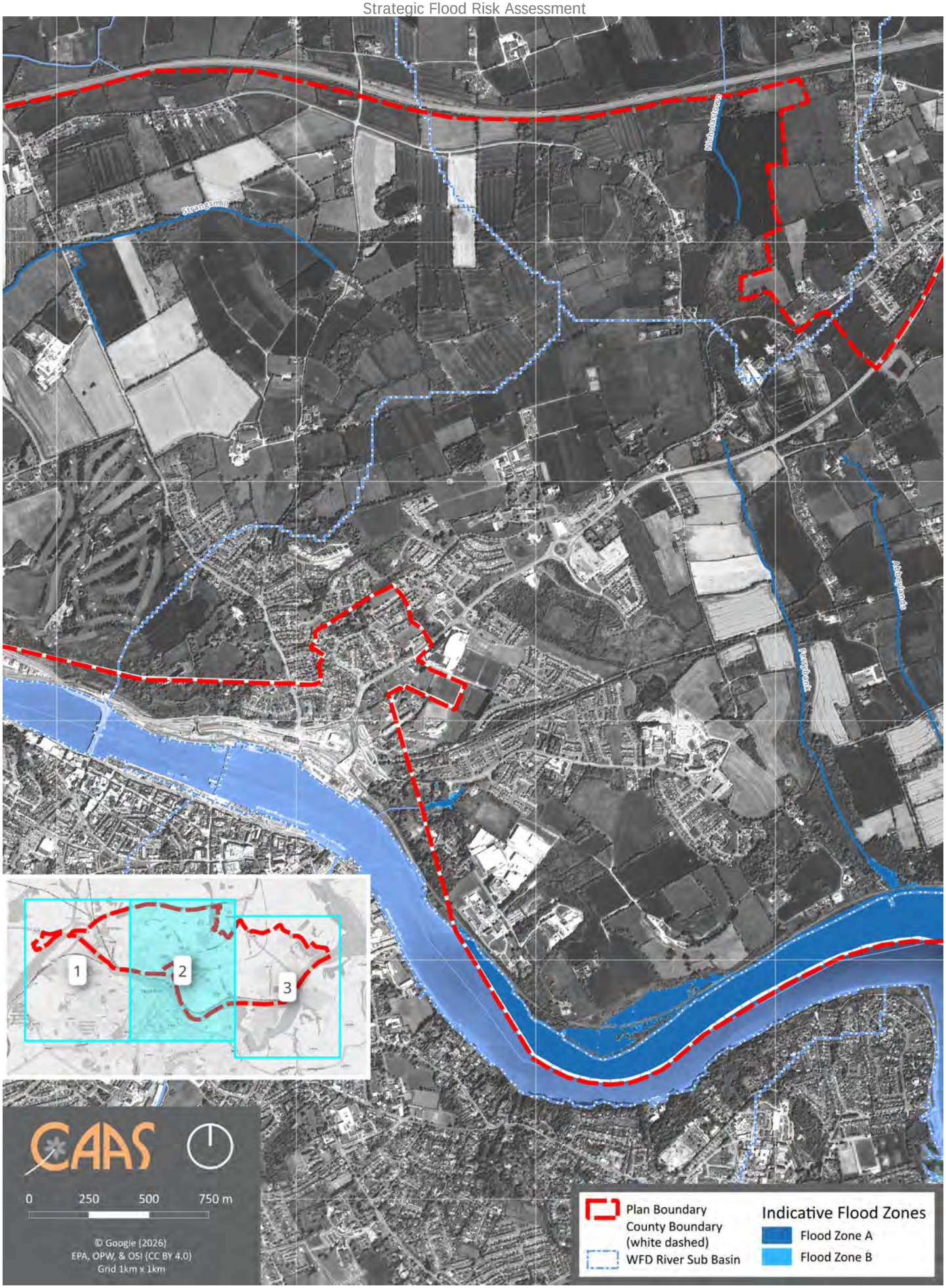
NCFHM (Coastal) High End + + Climate Change Scenario Mapping



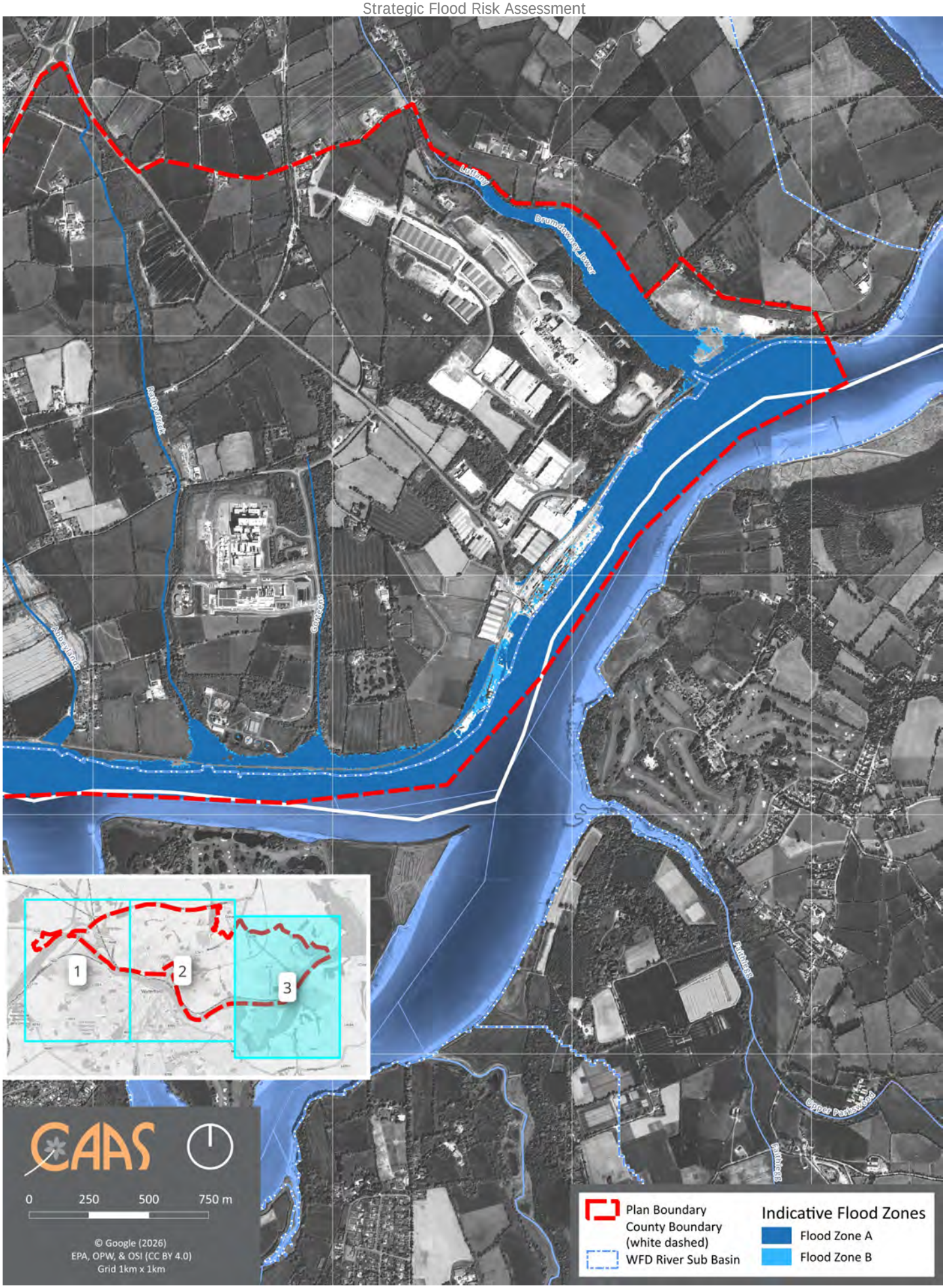
GSI's Synthetic Aperture Radar Seasonal Flood Mapping



Flood Zones A and B (1 of 3)



Flood Zones A and B (2 of 3)



Flood Zones A and B (3 of 3)

Appendix III: Response to Submission

As per the Chief Executive's Report on Submissions to Material Alterations to Proposed Variation 6 to the Kilkenny City and County Development Plan 2021, responses to the OPW's submission made during the public display of material alterations are appended to this SFRA Report.

KK-C367-7	OPW	Flooding and Strategic Flood Risk Assessment	1. The OPW, as lead agency for flood risk management in Ireland, welcomes the opportunity to comment on Material Alterations to Proposed Variation No.6 to the Kilkenny City & County Development Plan 2021-2027 (Ferrybank - Belview). This submission is made specifically concerning flood risk management. Further submissions on the material alterations may be made by the OPW concerning the estate portfolio, heritage and other areas of responsibility. The National Planning Framework (2025) sets out National Policy Objective 78 to "*Promote sustainable development by ensuring flooding and flood risk management informs place-making by:* a. *Avoiding inappropriate development in areas at risk of flooding that do not pass the Justification Test, in accordance*	**Response**: 1. Noted. 2. An overlay of Flood Zone and available future scenario mapping and adopted land use zoning will be prepared and included in final Plan/SFRA documents. 3. Noted. Flood Zone extent mapping was included for the watercourses referred to in the SFRA that accompanied the Draft Plan on display in the submission, however it was recognised in response to the OPW's previous comments that an extent of these Flood Zones may not have been easily visible at the resolution provided due to the size of the Flood Zones within the context of the Plan area. The Flood Zone map was therefore updated, with higher resolution maps provided for inclusion alongside the Proposed Material Alterations (within

			with the Guidelines on the Planning System and Flood Risk Management; b. *Taking account of the potential impacts of climate change on flooding and flood risk, in line with national policy regarding climate adaptation.".* 2. **Flood Zone Map:** The OPW had previously commented that "It is difficult to assess if the sequential approach has been followed without the inclusion of Flood Zone mapping overlaid on the land use zoning mapping. Kilkenny County Council should provide such a map and consider its inclusion in Appendix 4 Ferrybank - Belview Framework Plan Maps". This comment has not been addressed in the material alterations, while higher resolution maps of the flood zones have been provided these maps are still not overlaid with the land use zoning. 3. **Flood Risk Assessment:** The OPW had previously commented *"Only a proportion of the plan area is located within the Waterford AFA. The watercourses within the AFA area were assessed as part of the National CFRAM programme. There are watercourses outside the AFA which have no flood risk extents shown on the flood risk mapping provided in the SFRA. While the National Indicative Fluvial Mapping (NIFM) programme produced mapping for watercourses greater than 5km2 that were not included in the National CFRAM programme, these watercourses appear to have not met the criteria for inclusion in NIFM.*	Appendix 3, not the main Proposed Material Alterations document). These updated versions of the Flood Zone maps, which include flood extents for the water courses referred to in the submission, will be included in the final SFRA to accompany the adopted Plan. It is acknowledged that the catchments referred to in the submission were not modelled as part of the OPW's AFA for the National Catchment-based Flood Risk Assessment and Management (CFRAM) programme or as part of the OPW's National Indicative Fluvial Mapping (NIFM) programme. The CFRAM programme covered those areas, in each county, where, based on initial analysis, the flood risk was determined to be potentially significant from one or more sources of flooding. The NIFM programme covered catchments greater than 5km2 in areas for which flood maps were not produced under the National CFRAM Programme. This is due to the size of the catchments in question – they are quite small. When delineating the flood zones associated with these catchments the following factors[5], were considered. • Catchment size – the catchments are quite small; • Stream order, with the water bodies being lower order water bodies; • A digital terrain model derived from photogrammetry; generally sloping topography with well-defined valleys within which most of the water bodies are situated; • Relevant Planning history of the lands. • In field observations, including sources of flooding, likely routes for flood waters and bridges/culverts, including Ballyvalla Bridge upgrade.[6]

[6] While the PFRA is no longer a reliable model for flood risk the Planning Authority did have regard to it in assessing flood risk.

			The lands along either side of these watercourses have been zoned as Passive Open Space, however it is unclear how the area of these zonings have been arrived at without flood extents. The zonings outside these Passive Open Space zonings are BETP – Business, Enterprise and Technology Parks, SR – Strategic Reserve, Agriculture, Public Utility and PFI – Port Facilities and Industry. Kilkenny County Council should review if stage 3 flood risk assessments are required to inform the land use zonings and the SFRA. An evaluation of site-specific flood risk assessments may also assist with establishing flood zones". Kilkenny County Council require a detailed site specific flood risk assessment where there is an overlap of flood zones A and B and land use zonings. Without flood zones a site specific flood risk assessment may not be carried out for development that may be at a risk of flooding. Kilkenny County Council should review if stage 3 flood risk assessments are required to inform the land use zonings, the SFRA and for planning decisions. Zoning Map Amendment No. 6 as part of Material Alteration No. 12 proposes rezoning *Strategic Reserve as New Residential.* There is a watercourse in the vicinity of these lands which Kilkenny County Council have not produced flood zones for. *Residential* is highly vulnerable development and would not be appropriate in flood zone A and B.	Furthermore, Kilkenny County Council require: a detailed site specific flood risk assessment where flood risk may be an issue for any proposed development and any area within or adjoining flood zone A or B, or flood risk area, to be the subject of a site-specific Flood Risk Assessment appropriate to the type and scale of the development being proposed (City and County Development Plan Section 10.2.6.2 Development Management Requirements). The Variation (INF-DM1) requires that: "Where flood risk may be an issue for any proposed development, including pluvial flood risk, a flood risk assessment shall be carried out that is appropriate to the scale and nature of the development and the risks arising. This shall be undertaken in accordance with the Flood Risk Assessment Guidelines, including the sequential approach. Proposals for mitigation and management of flood risk will only be considered where avoidance is not possible and where development can be clearly justified with the Guidelines' Justification Test." Lands zoned Passive Open Space (where future built development would be significantly limited) has taken into account the Flood Zones and, taking a precautionary approach as outlined in the Guidelines, covers areas significantly beyond the Flood Zones. As per above, Flood Zones have been included. 4. An overlay of Flood Zone and available future scenario mapping and adopted land use zoning will be prepared and included in final Plan/SFRA documents.

			Zoning Map Amendment No. 8 and 9 as part of Material Alteration No. 12 proposes rezoning *Agriculture* and *Strategic Reserve as BETP – Business, Enterprise and Technology Parks*. There are watercourses in the vicinity of these lands which Kilkenny County Council have not produced flood zones for. *Agriculture and Business, Enterprise and Technology Parks* zoning types would be considered less vulnerable development and would not be appropriate in flood zone A. Zoning Map Amendment No. 8 and 9 as part of Material Alteration No. 12 proposes rezoning *Agriculture* and *Strategic Reserve as BETP – Business, Enterprise and Technology Parks*. There are water courses in the vicinity of these lands which Kilkenny County Council have not produced flood zones for *Agriculture* and *Business, Enterprise and Technology Parks* zoning types would be considered less vulnerable development and would not be appropriate in flood zone A. 4. The OPW had previously commented that "*In line with the Guidelines, while Flood Zones are defined on the basis of current flood risk, planning authorities need to consider such impacts in the preparation of plans, such as by avoiding development in areas potentially prone to flooding in the future, providing space for future flood defences, specifying minimum floor levels and setting specific development management objectives. The potential future flood extents included in Appendix II of*	Climate change considerations have been integrated into the existing provisions of the County Development Plan and into the Proposed Variation with which future developments will need to comply with[7]. Furthermore, the Council will add into Section 5.7 Land Use Zones of the Local Planning Framework: the following text to address the climate change . *Uses on lands associated with Mid-Range and High-End NIFM/NCFHM future climate scenario risk areas, outside of Flood Zones A or B, shall be limited to less vulnerable and water compatible development. This limitation shall take primacy over any other related land use zoning provision. Detailed, site-specific Flood Risk Assessment will be required in these areas.".* See also KK-C367-20 - submission from the OPR.

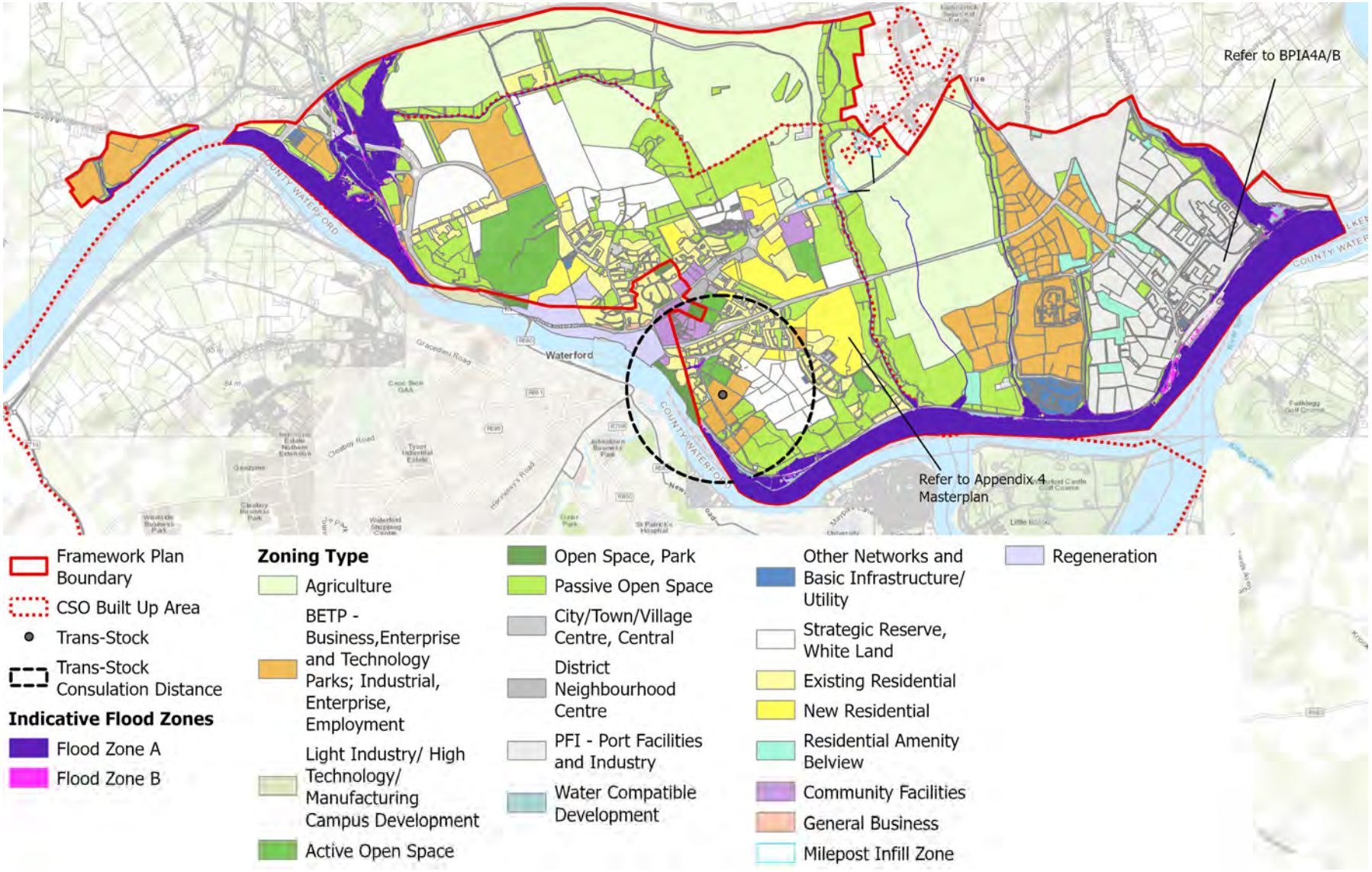
[7] Including Local Planning Framework Development Management Standard INF-DM4 Flood risk assessments shall apply the precautionary approach and shall consider climate change impacts and adaptation measures, including details of structural and non-structural flood risk management measures. The SFRA datasets and the most up to date CFRAM Programme climate scenario mapping, together with the allowances to be provided for future flood risk management provided in the OPW's (2019) Flood Risk Management Climate Change Sectoral Adaptation Plan and the guidance on potential future scenarios contained therein, should be consulted by prospective applicants for developments in this regard

				the SFRA might be shown overlaid with the land use zonings, to highlight any developments that could potentially be affected by climate change. Areas in the vicinity of the unmapped watercourses could also be potentially at risk of flooding in the future, however this could only be established through modeling of the watercourses". This comment has not been addressed in the material alterations. No fluvial or coastal CFRAM future scenario mapping is available for the Plan area. The future scenario mapping that is currently available are the indicative OPW datasets produced as part of the National Indicative Fluvial Mapping (NIFM) and the National Coastal Flood Hazard Mapping (NCFHM). Zoning Map Amendment No. 7 and 10 as part of Material Alteration No. 12 proposes rezoning *Regeneration* as *New Residential* and *Passive Open Space* as *BETP – Business, Enterprise and Technology Parks.* While these lands are not in present day extents, they could be at risk of flooding in the future. If further information is required, please do not hesitate to contact the OPW (floodplanning@opw.ie).	

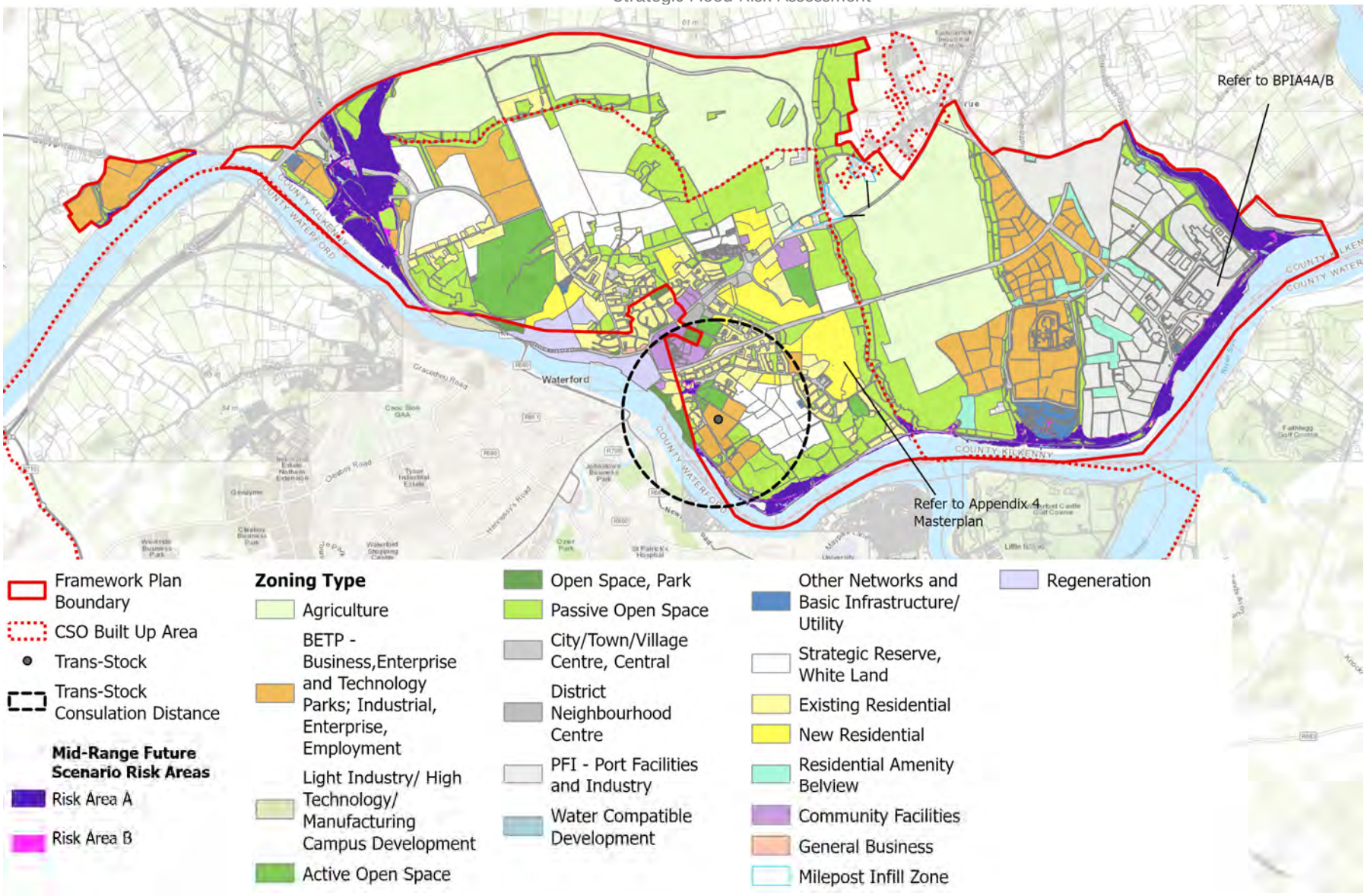
Recommendation:

1. No further amendment required.
2. An overlay of Flood Zone and available future scenario mapping and adopted land use zoning will be prepared and included in final Plan/SFRA documents.
3. Update Flood Zone mapping in the SFRA have been updated with higher resolution maps. This table responding to the OPW's submission will be appended to the SFRA Report that accompanies the adopted Plan.
4. An overlay of Flood Zone and available future scenario mapping and adopted land use zoning will be prepared and included in final Plan/SFRA documents. Furthermore, the Council may consider the following for integration into the Local Planning Framework: "There are a number of instances where future climate scenario risk areas (see SFRA) overlap with land-use zoning objectives. Uses on lands associated with Mid-Range and High-End NIFM/NCFHM future climate scenario risk areas, outside of Flood Zones A or B, shall be limited to less vulnerable and water compatible development. development. This limitation shall take primacy over any other related land use zoning provision. Detailed, site-specific Flood Risk Assessment will be required in these areas."

Appendix IV: Additional Overlay Mapping of Adopted Zoning and Flood Data

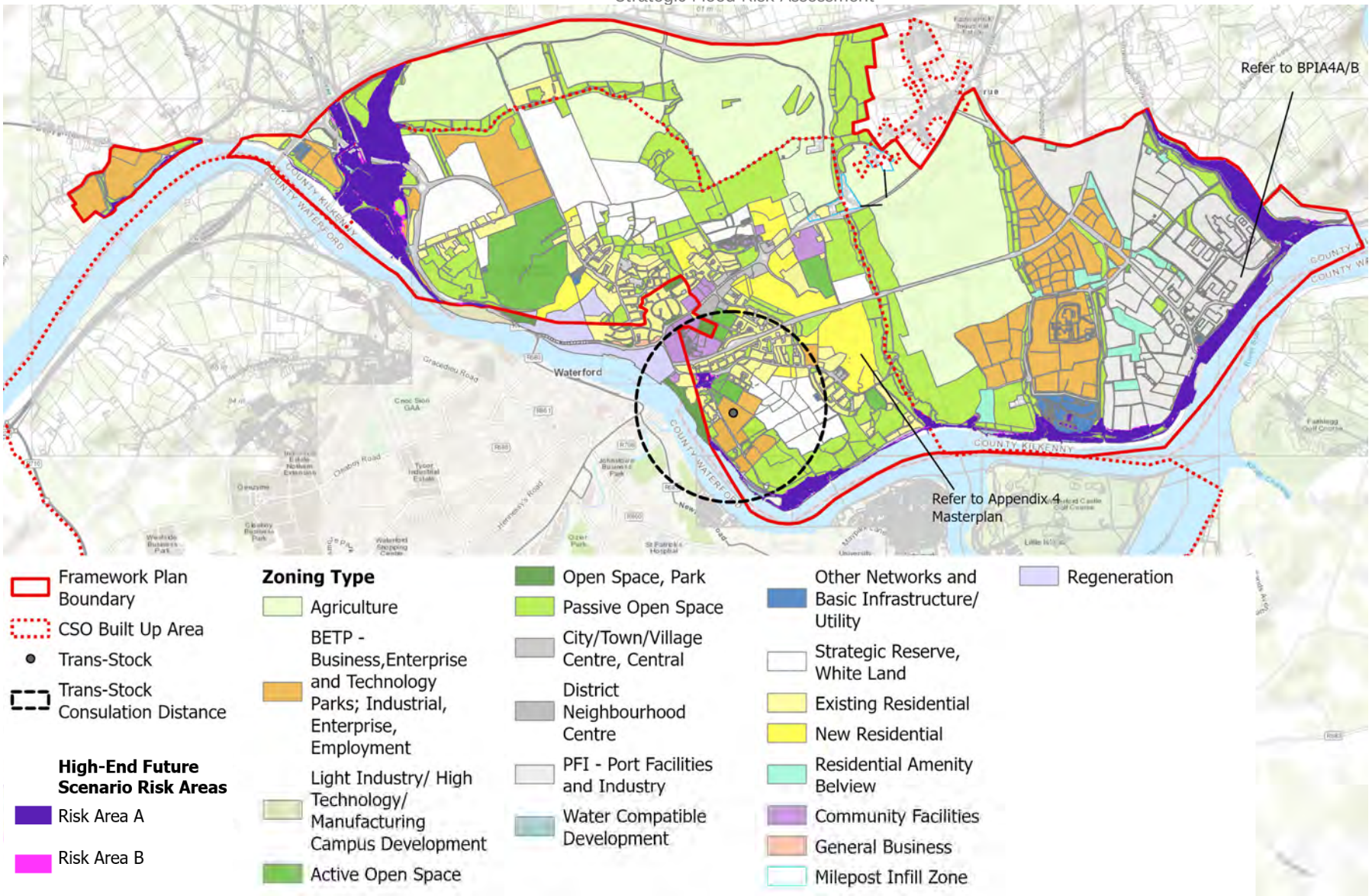


Adopted Land Use Zoning Overlay with Flood Zones



Adopted Land Use Zoning Overlay with Mid-Range Future Climate Scenario Risk Areas[13]

[13] **Mid-Range Risk Areas**: **A**, comprising CFRAM fluvial 1%AEP, NIFM 1%AEP, NCFHM 0.5%AEP; **B**, comprising CFRAM fluvial 0.1%AEP, NIFM 0.1%AEP, NCFHM 0.1%AEP.



Adopted Land Use Zoning Overlay with High-End Future Climate Scenario Risk Areas[14]

[14] **High-End Risk Areas**: **A**, comprising CFRAM fluvial 1%AEP, NIFM 1%AEP, NCFHM 0.5%AEP; **B**, comprising CFRAM fluvial 0.1%AEP, NIFM 0.1%AEP, NCFHM 0.1%AEP.