Gloucester, Cheltenham & Tewkesbury Joint Core Strategy

Level 2 Strategic Flood Risk Assessment

An overview of the project

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Presentation Structure

- What is a Strategic Flood Risk Assessment (SFRA)?
- SFRA Overview
- Sequential Test & Exception Test
- Background to the Gloucester, Cheltenham & Tewkesbury Joint Core Strategy Level 2 SFRA
- Summary of the Level 2 SFRA Results
- Overview of the key findings & Development Control Policies

What is a Strategic Flood Risk Assessment?

- An SFRA is at the core of the Planning Policy Statement 25 approach (PPS25)
- A strategic study which provides an assessment of **ALL** types of flood risk to inform land use planning decisions for a defined area
  - Types of flooding: rivers, rainfall on the ground surface (surface water), rising groundwater, overwhelmed sewer and drainage systems and breached or overtopped reservoirs and canals
- Allows the Local Planning Authority to carry out the Sequential Test and where necessary Exception Test
- Allows the Local Planning Authority to allocate appropriate sites for development
- Identifies opportunities for reducing flood risk
- Considers the implications of climate change

SFRA Aims

- An SFRA aims to ensure that flood risk forms one of the material planning considerations, to help deliver sustainable development at all levels of the planning process

- The SFRA therefore informs the sustainability appraisal of the Local Development Documents (LDDs)
  - (are a set of documents specified in UK planning law which a Local Planning Authority creates to describe their strategy for development and use of land in their area of authority)

- It enables informed decisions to be made regarding site allocations in the Development Plan Documents

- The main requirement is to guide development towards the lowest flood risk area and ensure compatibility between land-use and flood risk

While flooding cannot be wholly prevented, its impacts can be avoided and reduced through good planning and management

Level 1 SFRA Overview

- Level 1 SFRA for Gloucestershire completed in September 2008
- Mapped flood risk from **all** sources to provide the evidence base to inform potential locations for development in low risk flood zones
- Mapped fluvial flood risk due to climate change
- Provided Local Planning Authorities with information to sequentially test development sites
- Identified opportunities for reducing flood risk
- Identified locations where Flood Zone maps were coarsely modelled
    - Flood Zones misaligned
    - Residual risk locations requiring further assessment

Flood Zone Overview

- **ZONE 3b**

  Functional Floodplain, 1 in 20 yr event

  (5% chance of flooding in any given year)

- **ZONE 3a High Probability**

  (1 in 100 year or 1% chance)

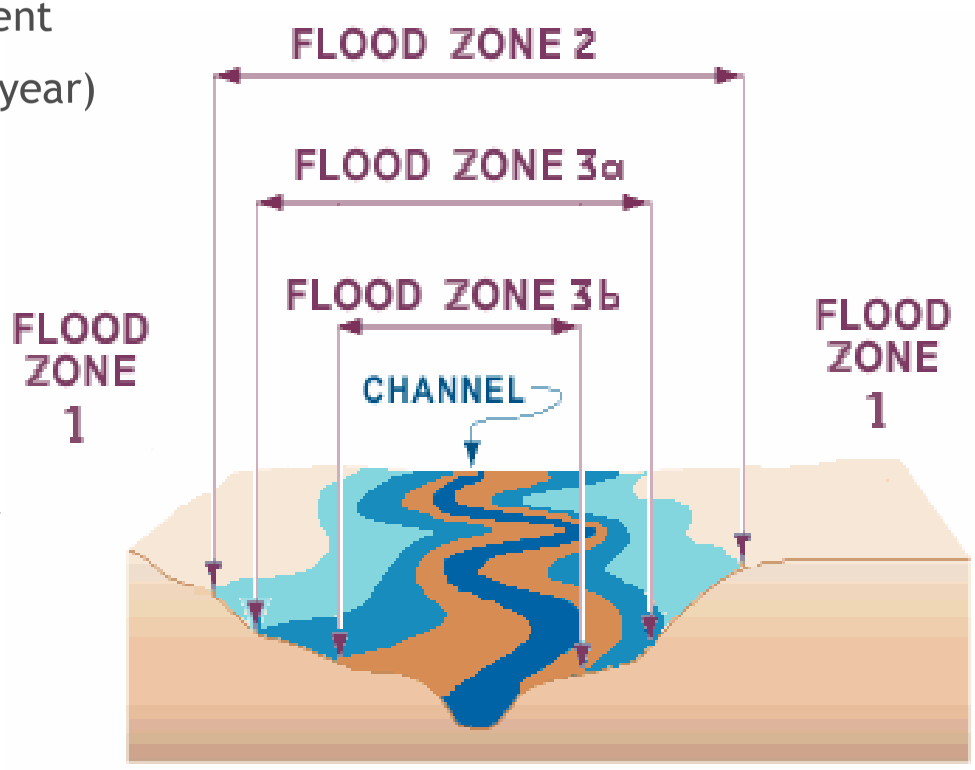
- **ZONE 2 Medium Probability**

  (between 1 in 100yr and 1 in 1000yr

  or 0.1% chance)

- **ZONE 1 Low Probability**

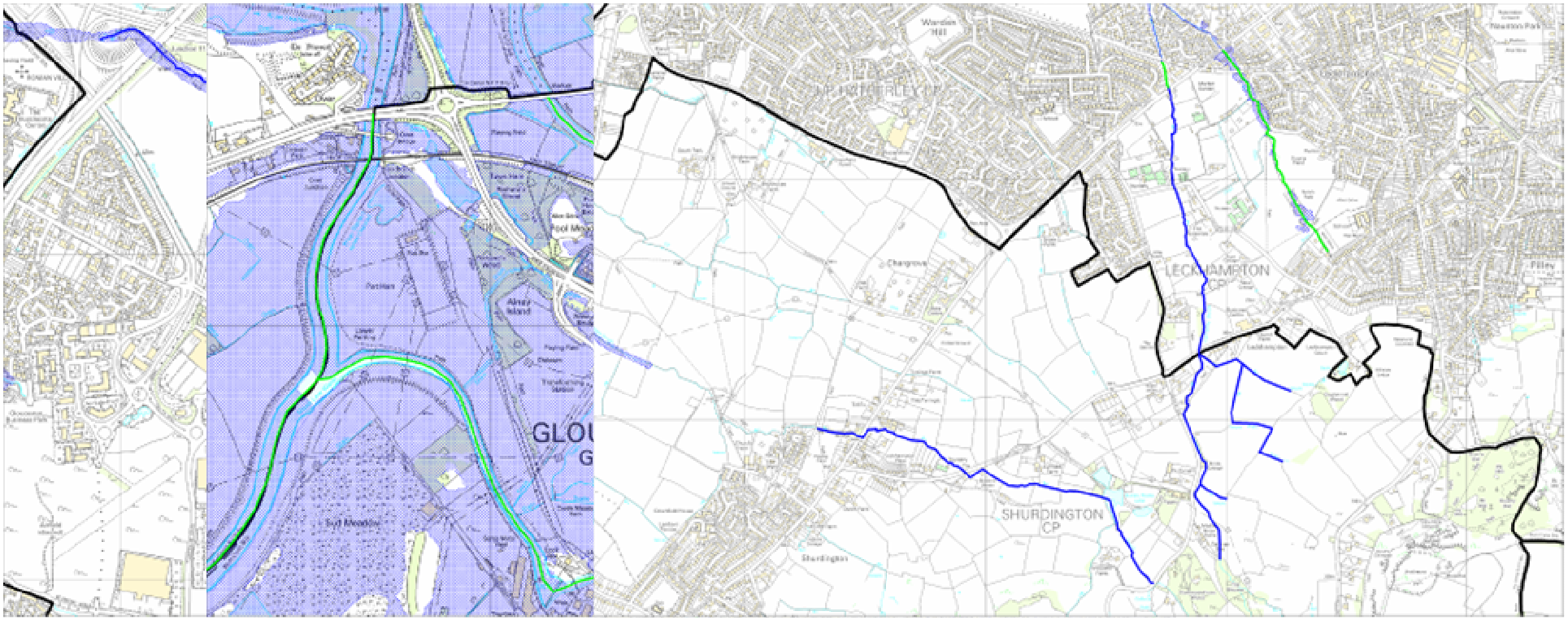
  (<1 in 1000yr)



What is a Level 2 SFRA?

- Principal purpose is to facilitate application of the Sequential and Exception Tests, in accordance with Table D3 of PPS25

- Aids Sequential Test by providing improved flood risk maps where existing maps are of coarse resolution



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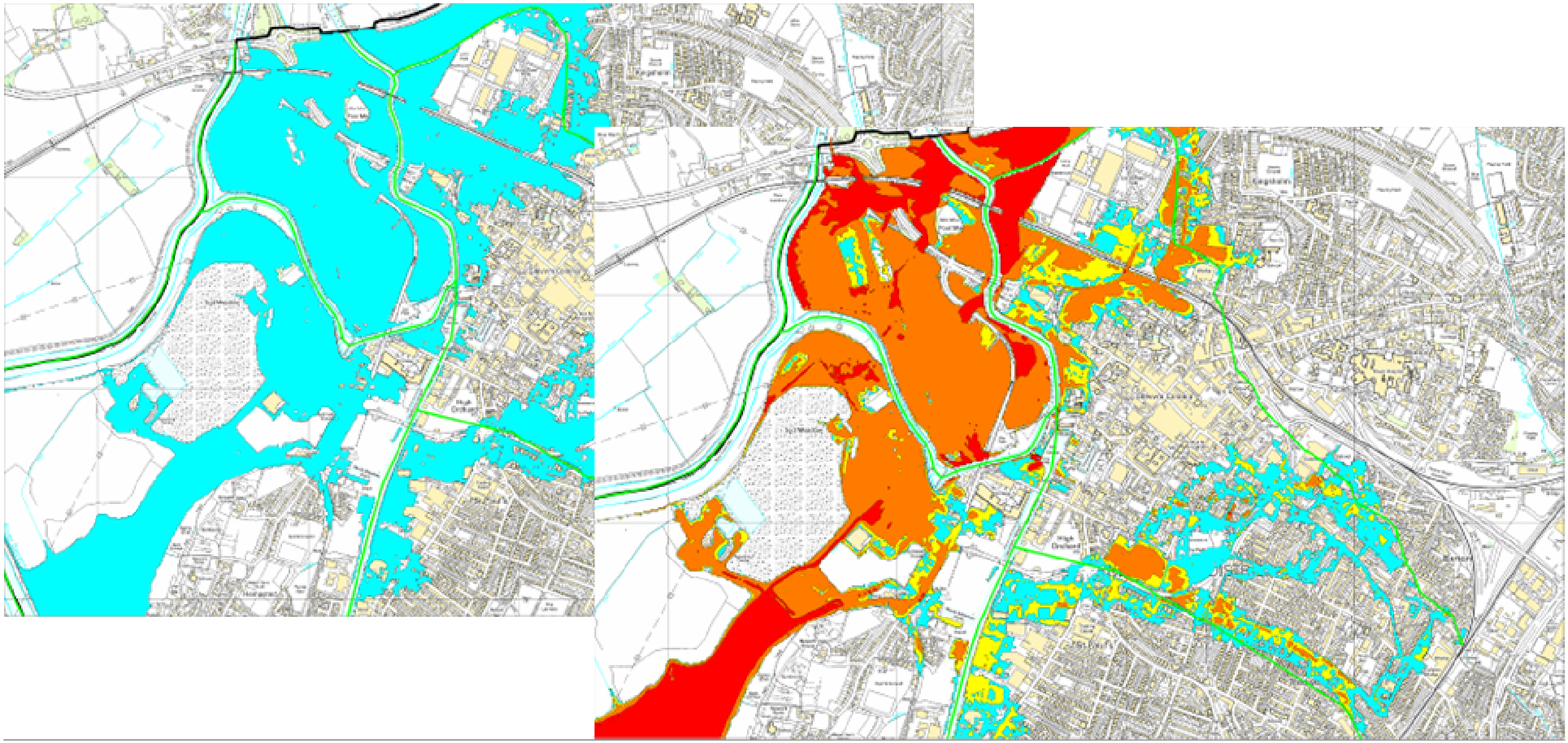
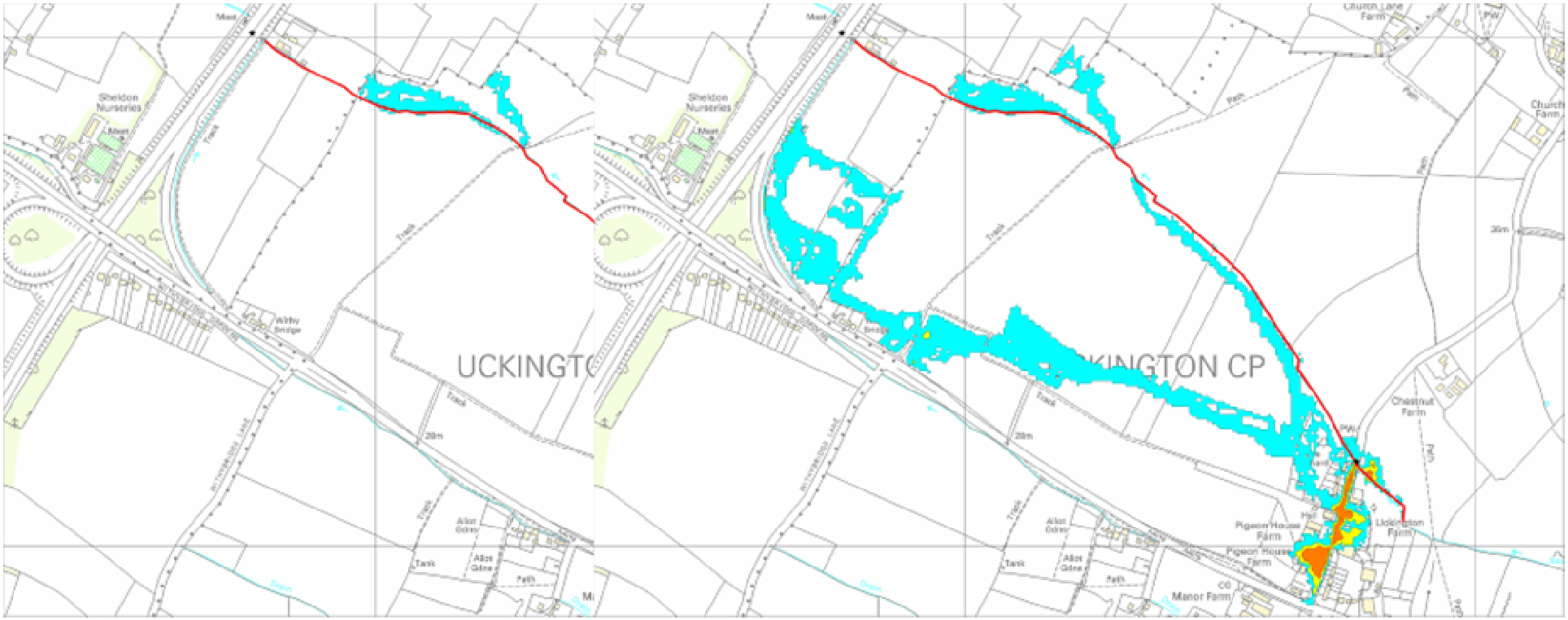
What is a Level 2 SFRA?

- Aids Exception Test by providing hazard maps to enable the Sequential Approach in a Flood Zone



What is a Level 2 SFRA?

- If development is to be located behind defences or near impounded water (e.g. a canal with raised banks), a Level 2 SFRA should assess breach and overtopping scenarios - allows residual risk areas to be mapped



- Allows appropriate site-specific policies to be developed using modelling results

What is the Sequential Test?

- A process which seeks to allocate all new development in Flood Zone 1
- Where this is not possible, development in Flood Zone 2 should be considered (applying Exception Test if required)
- Where this is not possible, development in Flood Zone 3 should be considered (applying Exception Test if required)
- Process demonstrates that there are no alternative sites available in areas with a lower probability of flooding
- Within each Zone, development should be directed to sites with the lowest probability of flooding
- Higher vulnerability uses (e.g. emergency services, basement dwellings, caravans, installations requiring hazardous substances content) should be sited in areas with the least flood risk
- If there are no reasonable available sites in Flood Zone 1, the vulnerability of the development should be taken into account when looking to place development in Flood Zones 2 or 3

Sequential Test

Table D.3[22]: Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability classification (see Table D2)		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see Table D.1)	Zone 1	✔	✔	✔	✔	✔
	Zone 2	✔	✔	Exception Test required	✔	✔
	Zone 3a	Exception Test required	✔	✗	Exception Test required	✔
	Zone 3b 'Functional Floodplain'	Exception Test required	✔	✗	✗	✗

Key:

✔ Development is appropriate

✗ Development should not be permitted

What is the Exception Test?

For the Exception Test to be passed:

- (1) Demonstrate the development provides sustainability benefits that outweigh flood risk
- (2) Development should be on developable previously developed land (PDL), if not, there should be no reasonably available developable PDL sites
- (3) Demonstrate that development will be safe without increasing flood risk elsewhere

Gloucester, Cheltenham & Tewkesbury JCS
Level 2 SFRA

Level 2 SFRA Aims & Objectives

Asses flood risk in defined study areas to provide the Local Planning Authority with detailed overview of flood risk enabling robust Sequential & Exception testing

- Develop 2D hydraulic models to provide a detailed assessment of flood risk
- Undertake hydrological analysis if none already exists
- Produce Flood Zones 2, 3a, 3a Climate Change & 3b
- Produce flood extent and flood hazard maps
- Understand influence of flood defences & model residual risk
- Understand risk posed by potential culvert blockage & model residual risk
- Use modelled results in conjunction with existing surface water mapping (Gloucestershire SWMP) to assess suitability of potential development sites for future development
- Undertake County wide mapping of soil classifications & groundwater protection zones to outline suitable Sustainable Urban Drainage (SUDS) techniques
- Provide appropriate policies for future development
- Provide appropriate Development Control policies & Flood Risk Assessment (FRA) Guidance

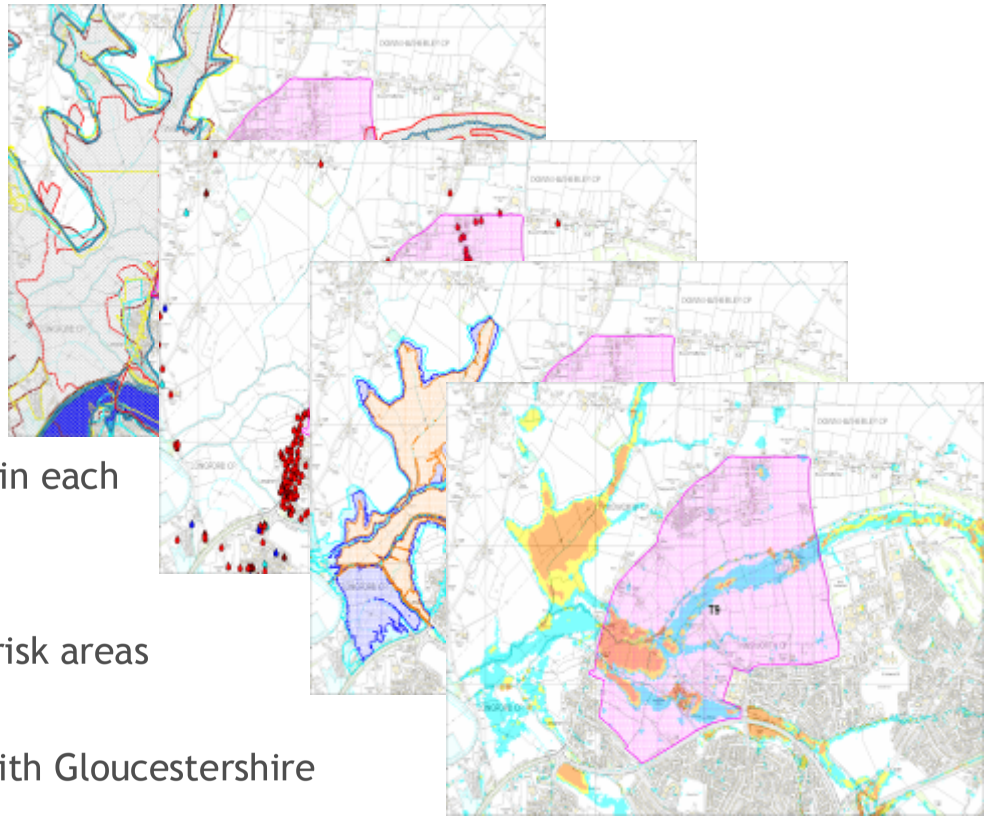
Modelled Areas & Potential Sites

- A series of strategically important sites were identified at the start of the commission

- From these sites, those identified as being at a higher flood risk based on the information gathered in the Level 1 SFRA were selected for further assessment

- As the JCS develops, further testing of alternative sites may be required

Level 2 Strategic Flood Risk Assessment Methodology



- Assessment of historic flood risk from **all** sources
- Hydrological assessment & hydraulic modelling of each study area
- Review flood extent and flood hazard within each modelled area
- Use modelled outputs to identify residual risk areas
- Review modelled outputs in conjunction with Gloucestershire SWMP surface water maps
- Undertook site assessments for potential development areas already identified & put forward recommendations and planning policies

As the Joint Core Strategy develops further testing of alternative sites may be required

Sustainable Urban Drainage (SUDS) Assessment

- Undertook an overview of suitable Sustainable Urban Drainage Systems (SUDS) for JCS area
- Produced maps demonstrating soil classification & groundwater source protection zones
- Produced a technical document advising as to the most appropriate SUDS techniques applicable to future developments
- Produced a User Guide to enable the user to easily identify suitable SUDS for any given site based on local ground conditions

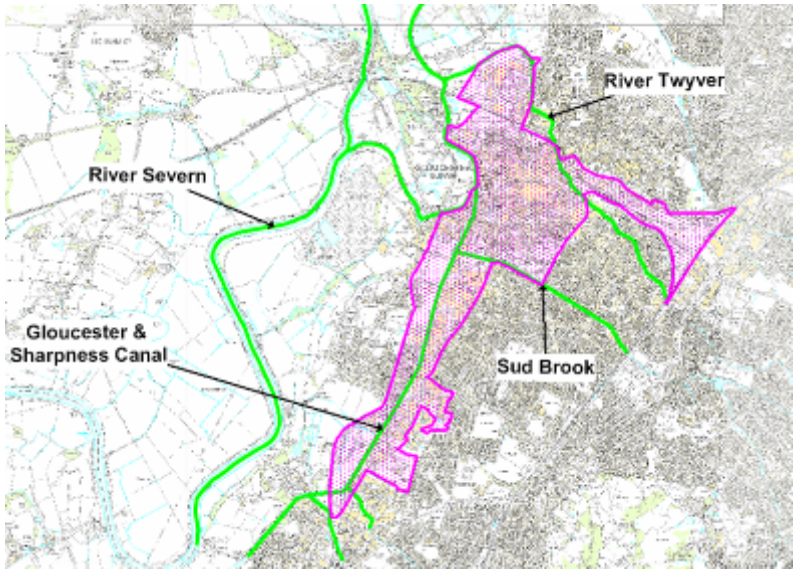
Gloucester, Cheltenham & Tewkesbury Joint Core Strategy

Level 2 Strategic Flood Risk Assessment (SFRA)

Key Findings

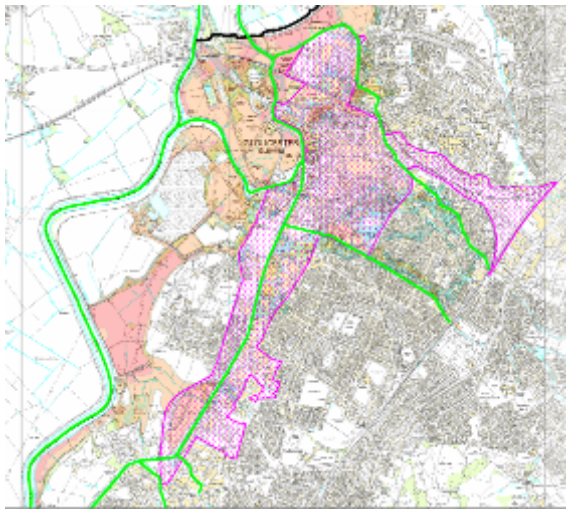
Gloucester City - Overview

- Modelling focused on River Severn and interactions with the Gloucester & Sharpness Canal, and, downstream sections of the Sud Brook & River Twyver
- Gloucester City is a complex urban area with major regeneration sites
- Aims & Objectives:
  - Understand impact of flood events
  - Improve Flood Zone information
  - Produce flood extent & hazard maps
  - Assess residual risk from culvert blockage
    - Sud Brook – Culvert under Trier Way
    - River Twyver – Rose Cottages Culvert



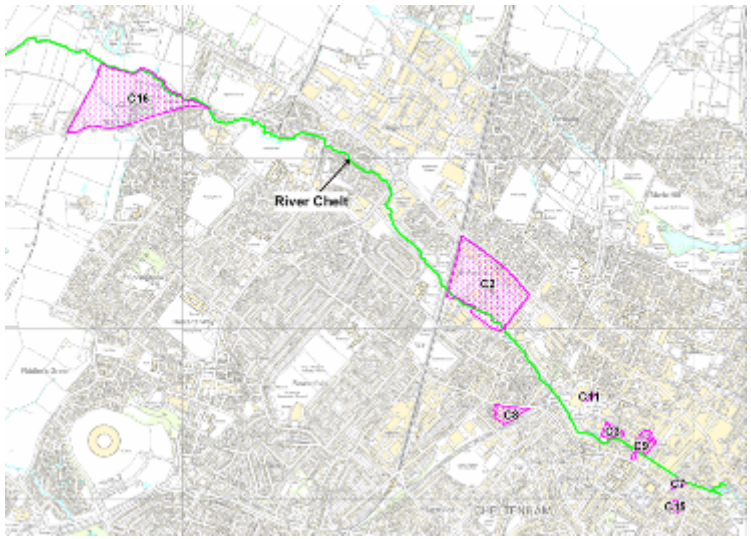
Gloucester City - Results

- Large parts of the city centre area are at risk of flooding from fluvial, tidal, canal overtopping & surface water
- Two distinct types of flooding in Gloucester:
  - Flooding from River Severn coming out of bank causing tributaries to back-up
  - Flooding from constrained urban watercourses, where integrated flooding problems exist
- Flood hazard is predominantly significant to extreme
- Surface water flooding affects a number of locations with key flow routes identified
- Modelling of culvert blockage showed only a small increase in water level with no significant increase in flood extent or hazard
- No raised section of canal which would affect the site. However some areas of overtopping were identified



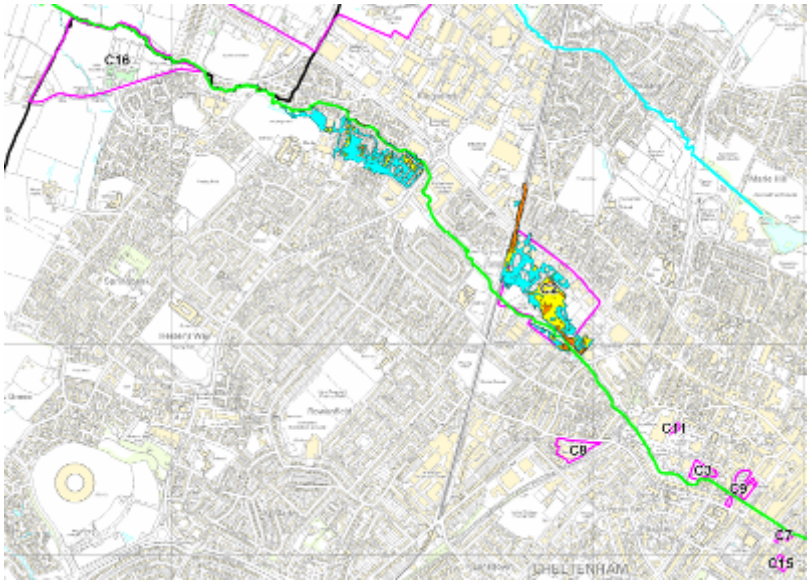
River Chelt at Cheltenham - Overview

- Modelling focused on the main River Chelt through town centre
- Strategic Housing Land Availabilty Assessment (SHLAA) sites along River Chelt were assessed
- Aims & Objectives:
  - Utilise the existing ‘defended’ model of the River Chelt to assess fluvial flood risk to identified sites
  - Produce flood extent & hazard maps
  - Assess residual risk from culvert blockage



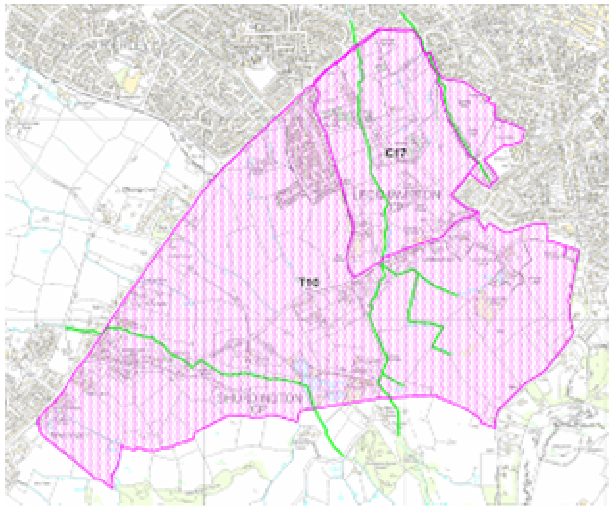
River Chelt at Cheltenham - Results

- Fluvial flood risk is low due to the presence of the River Chelt Flood Alleviation Scheme with only two sites affected by Flood Zone 3a (**C2** & **C16**)
- Site **C2** water backs-up behind railway structure
- Flood Zone 2 affects the majority of sites – flood hazard significant
- Modelling of culvert blockage showed no significant increase in flood extent or hazard
- Surface water flooding is a significant risk – however risk areas largely coincide with fluvial flood risk areas
- Site **C16** identified surface water flow path



Hatherley Brook & Ham Brook at Leckhampton & Shurdington - Overview

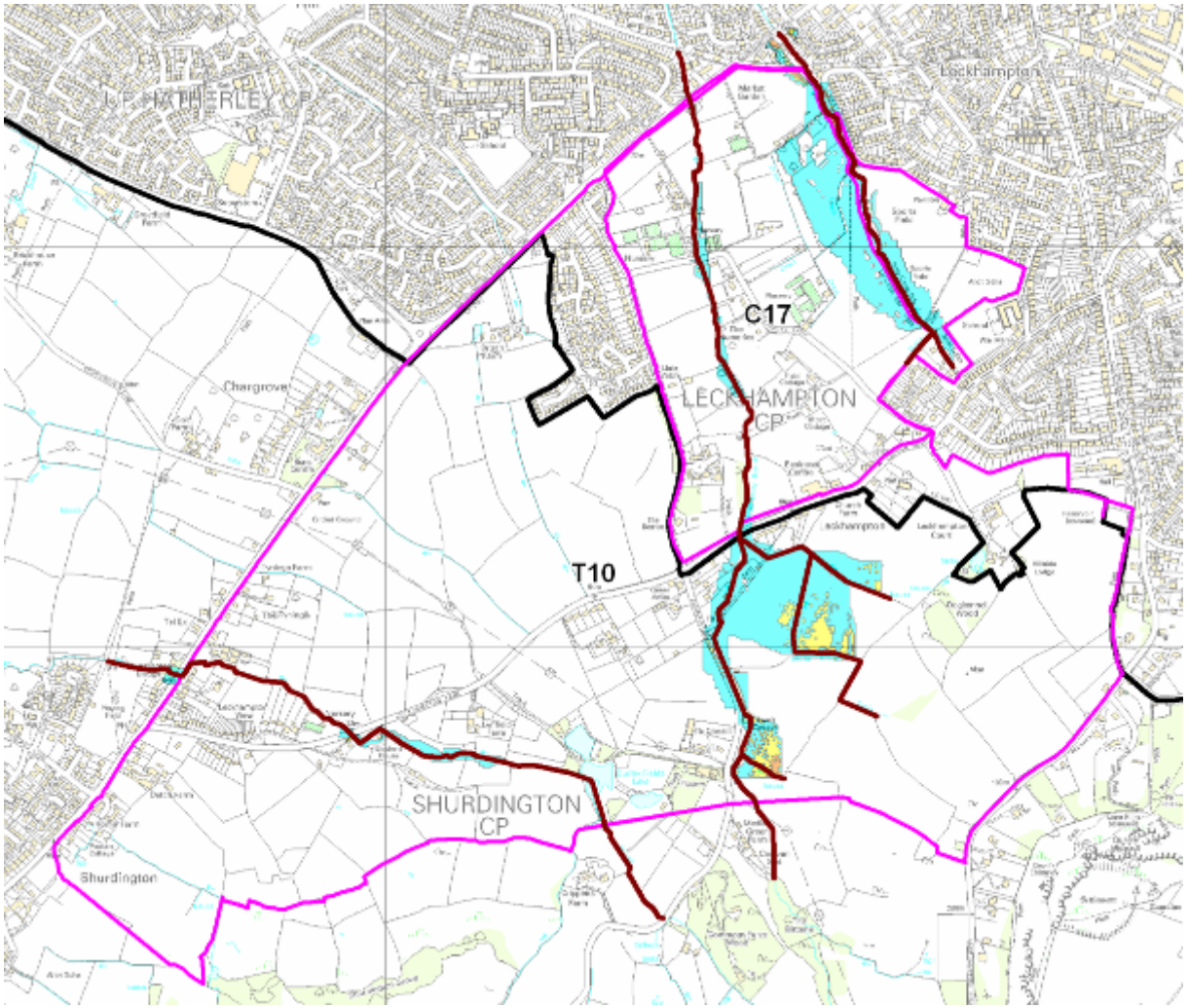
- Level 1 SFRA highlighted misalignments in the existing Flood Zone maps
- Hydraulic model did not extent for the full length of the Hatherley Brook
- No existing hydraulic model of the Ham Brook
- Aims & Objectives:
  - Construct a hydraulic model of the site & undertake hydrological analysis to obtain improved understanding of flood risk
  - Produce flood extent & hazard maps
  - Assess residual risk from culvert blockage



Hatherley Brook & Ham Brook at Leckhampton & Shurdington - Results

- Fluvial flooding affects areas immediately adjacent to the modelled watercourses
- Two key risk areas identified along Hatherley Brook (upstream Church Road & rural land adjacent to eastern branch)
- A number of existing roads affected by flooding
- Flood hazard predominantly low
- There is a residual risk from culvert blockage – however only a marginal increase in flood extent
- Significant surface water runoff is generated from the area to the south
- Areas of historic flooding identified outside the modelled flood risk areas

Hatherley Brook & Ham Brook at Leckhampton & Shurdington - Results



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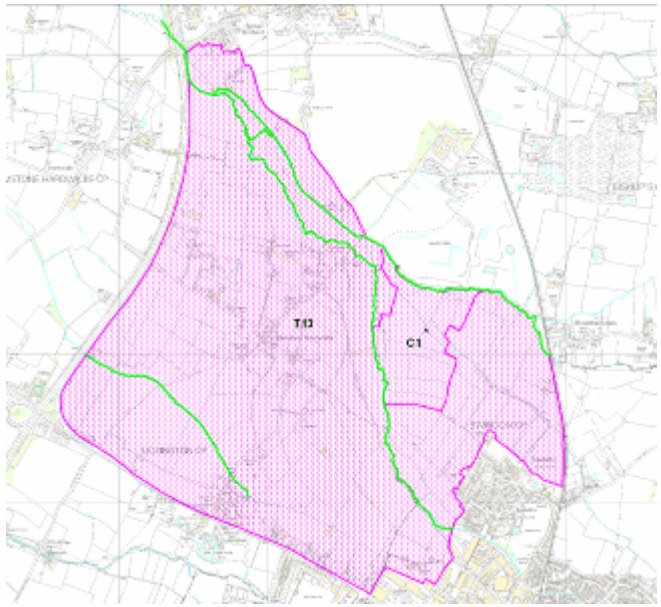
River Swilgate, Hyde Brook & Leigh Brook at Swindon - Overview

- Level 1 SFRA highlighted that existing Flood Zone maps are misaligned at a number of locations & did not cover all of the watercourse within the site

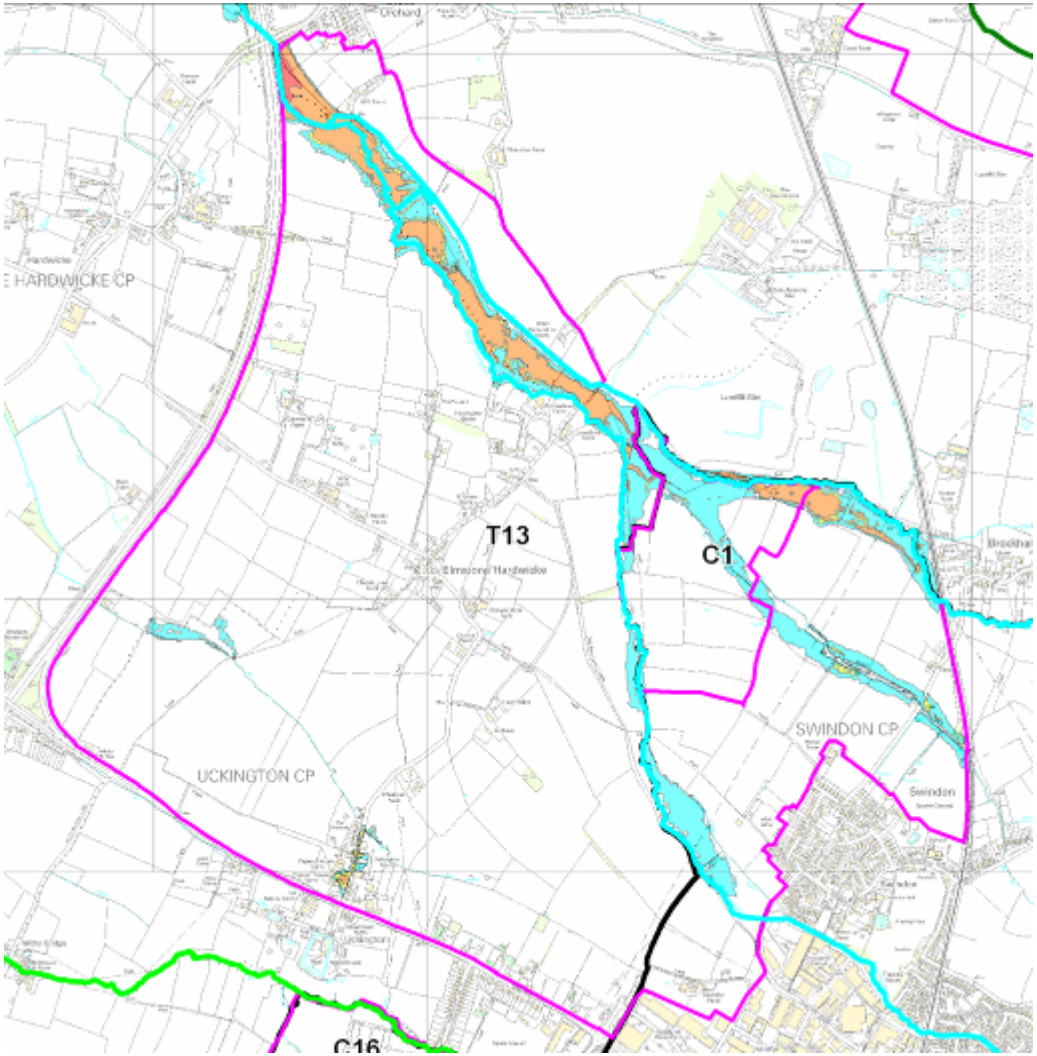
- Aims & Objectives:
  - Construct a hydraulic model of the site & undertake hydrological analysis to obtain improved understanding of flood risk
  - Produce flood extent & hazard maps
  - Assess residual risk from blockage of culvert beneath the M5 & Leigh Brook at Uckington



River Swilgate, Hyde Brook & Leigh Brook at Swindon - Results

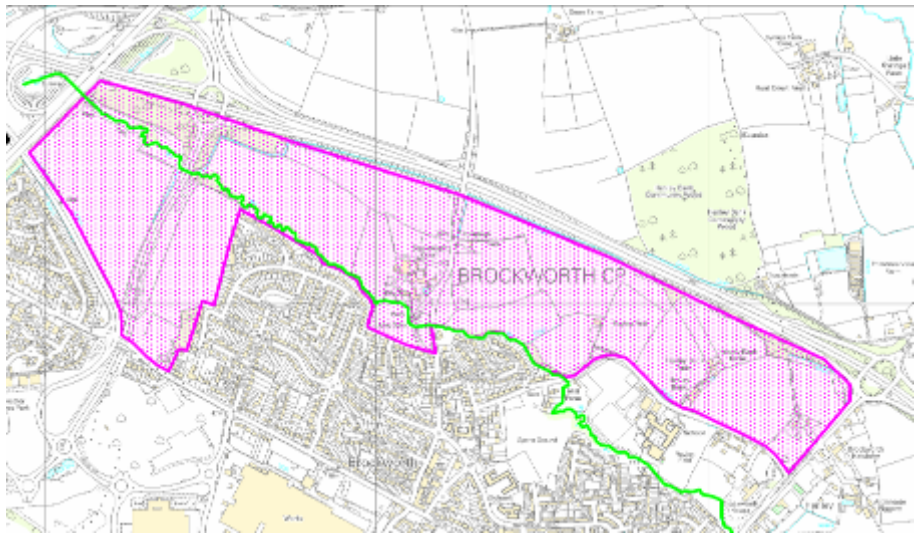
- Fluvial flood risk largely confined to area adjacent to the modelled watercourses
- Main risk areas are within the upper reaches of the Hyde Brook (west of Brockhampton) & rural floodplain adjacent to the River Swilgate
- Residual risk of culvert blockage identified upstream of M5 culvert & along the Leigh Brook at Uckington
- Surface water risk areas general coincide with fluvial risk areas; however hazard tends to be higher upstream of structures
- Important surface water flow routes identified to north and south of site – overland flow from adjacent hills

River Swilgate, Hyde Brook & Leigh Brook at Swindon - Results



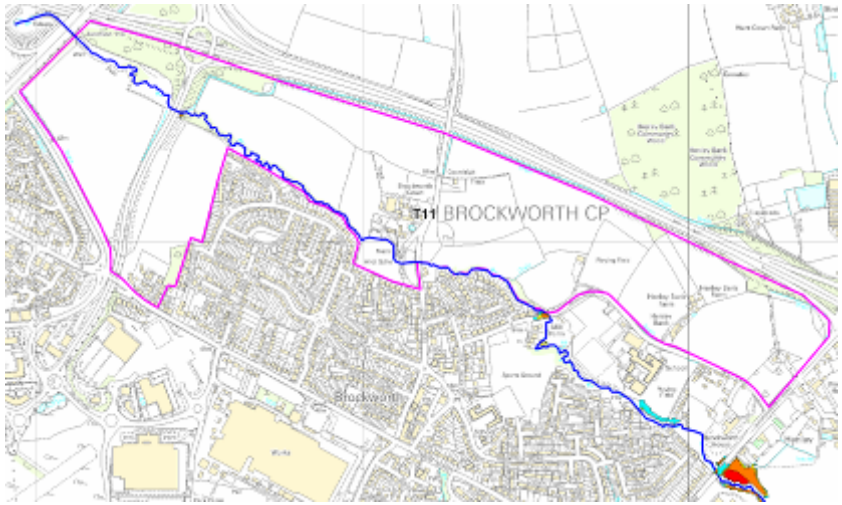
Horsbere Brook at Brockworth - Overview

- Existing Flood Zone maps misaligned
- Existing 1D-2D model did not extend as far upstream as the Brockworth area
- Aims & Objectives:
  - Extend existing model upstream
  - Produce flood extent & hazard maps
  - Assess residual risk from blockage of key structures within site



Horsbere Brook at Brockworth - Results

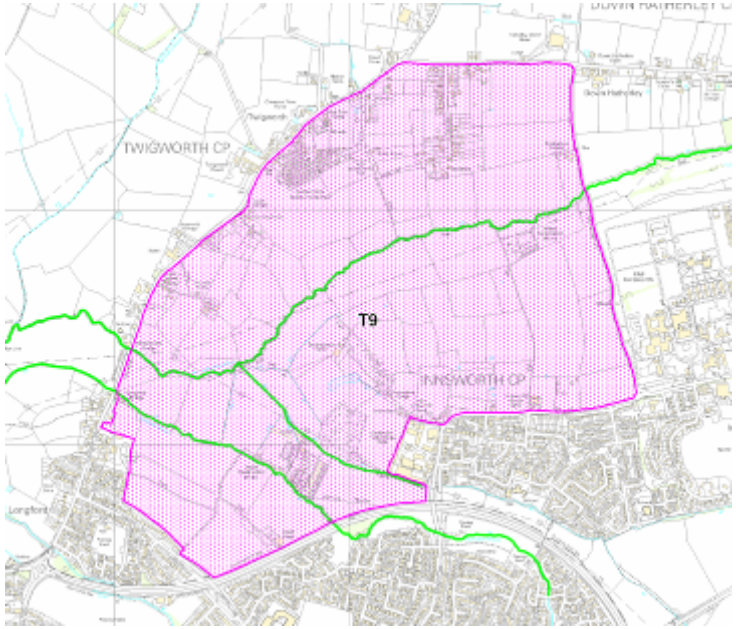
- Low risk of fluvial flooding
- A number of key structures which restrict flow:
  - Upstream of Shurdington Road, Mill Lane & Court Road
- Residual risk from culvert blockage identified at Mill Lane & Court Road
- Surface water risk areas are greater in extent than fluvial flood risk area with some isolated areas of risk (e.g. towards north of site adjacent to A417)



Hatherley Brook & Horsbere Brook at Innsworth - Overview

- Existing 1D-2D modelling was available but no hazard maps

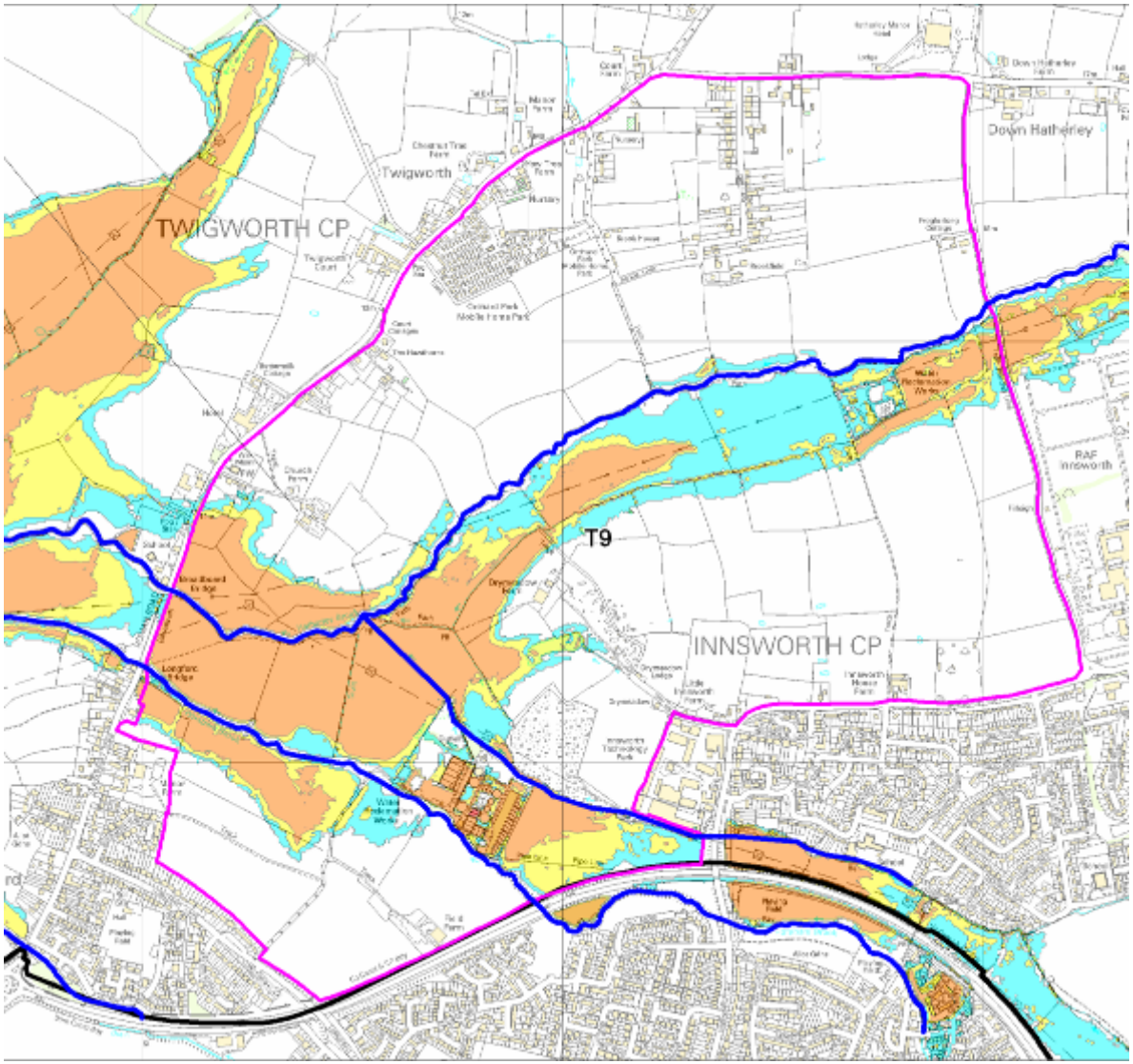
- Aims & Objectives:
  - Interrogate the model to produce flood hazard maps
  - Assess residual risk from culvert blockage at Tewkesbury Road



Hatherley Brook & Horsbere Brook at Innsworth - Results

- Large parts of site affected by both fluvial & surface water flooding – particularly in lower reaches of Hatherley & Horsebere Brooks between A38 (Tewkesbury Road) & River Severn
- Flood hazard predominantly ‘significant’ within FZ3
- There is also a risk of fluvial flooding in upper reaches of Hatherley Brook – affecting mainly rural floodplain
- Residual risk from culvert blockage at the A38 – increased flood extent and hazard with parts of the road affected
- Modelled flood risk areas correspond well with historic flood risk areas

Hatherley Brook & Horsbere Brook at Innsworth - Results



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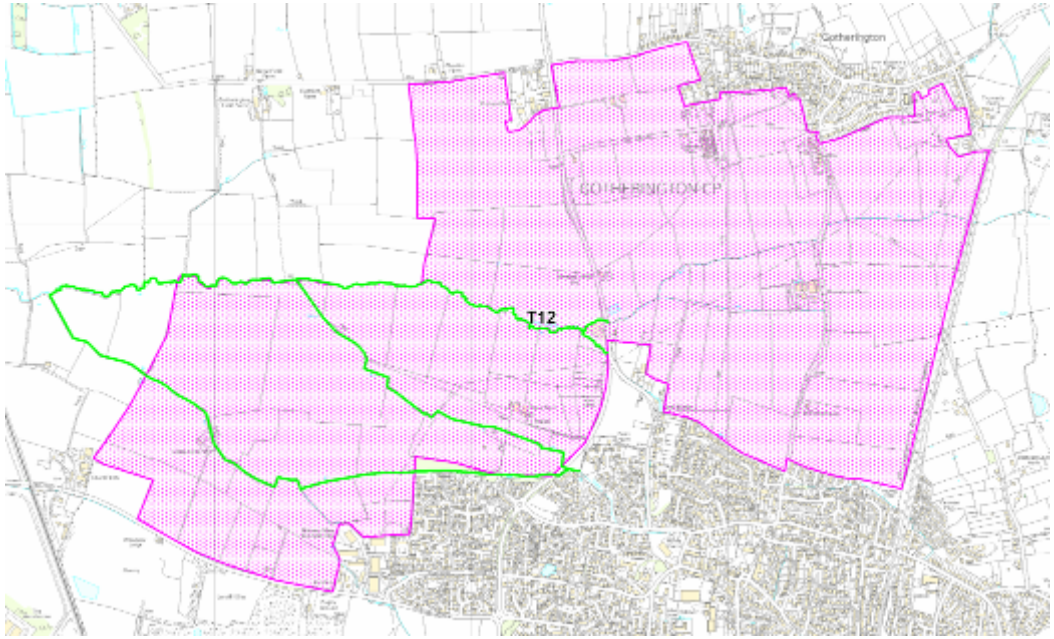
Dean Brook & Tributaries at Bishop's Cleeve - Overview

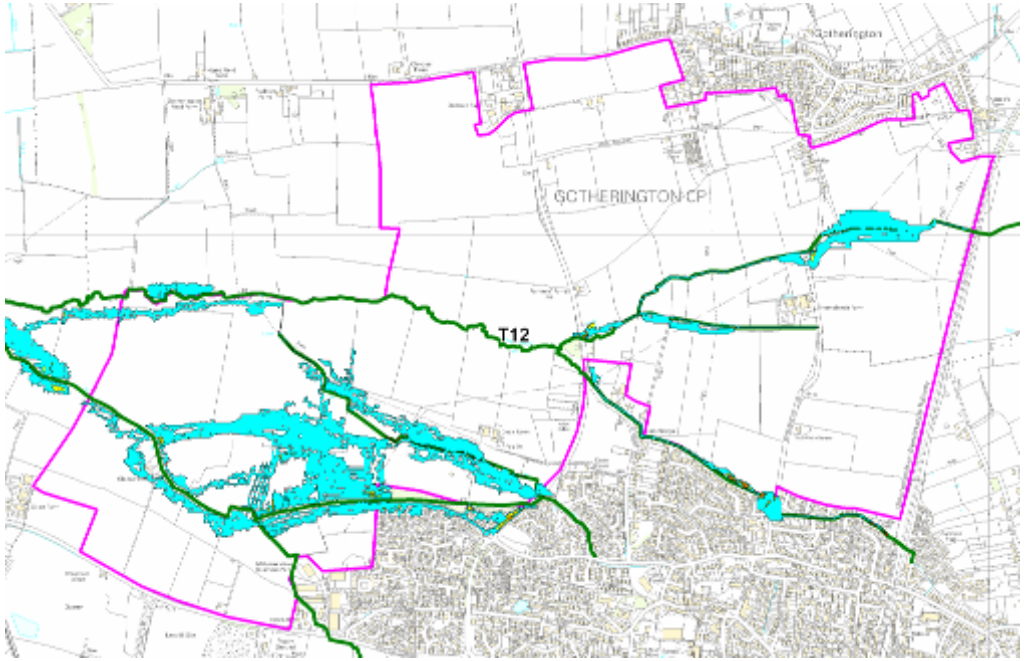
- Existing Flood Zone maps were misaligned and did not incorporate adjoining tributaries

- Aims & Objectives:
  - Produce a 2D model of the watercourses
  - Produce flood hazard maps



Dean Brook & Tributaries at Bishop's Cleeve - Overview

- Main fluvial flood risk is within the area to the north west of Bishop's Cleeve, within the lower reaches of the modelled extents
- A residual risk of flooding from culvert blockage has been identified in the area upstream of the railway
- Surface water flooding is greater in extent than fluvial flooding at some locations
- However flood hazard is predominantly low



Summary of Key Findings

- The Level 1 & 2 SFRA documents provide a key evidence base for the Joint Core Strategy
- They will assist in developing the overarching strategy and identification of potential sites for accommodating long term development needs
- Areas of ‘significant’ and ‘extreme’ flood hazard should be safeguarded from development in **all** cases
- Historic records show incidents of flooding outside of the modelled flood risk areas. Such areas should be treated as Flood Zone 3a with regard to the Sequential Test process
- The Sequential Test should be used to locate all new development outside identified residual risk areas

Summary of Key Findings

- In some areas high hazard surface water risk areas affect locations outside of Flood Zones 2 and 3. Such areas should be treated as Flood Zone 3a with regard to the Sequential Test process

- Where high hazard surface water flow routes have been identified these should be taken into consideration in the design layout of sites and left clear

- Areas of existing open space acting as informal flood storage areas should be safeguarded from development

- Within the modelled areas a number of roads have been shown to be at risk. It must be ensured that safe access and egress can be achieved

- Incidents of canal overtopping have been identified. LPA should use the canal Flood Zones to Sequentially Test new development in same way as fluvial flood zones

Development Control Policies 1

- The Sequential Test should be used to allocate all new development in least risky areas, giving highest priority to Flood Zone 1
- Avoid development in the Greenfield functional floodplain and identify opportunities for making space for water
- Apply the sequential approach within development sites by locating the most vulnerable elements in the lowest risk areas
- Avoid development in high hazard surface water risk areas and take important flow routes into consideration in design layout
- Avoid development adjacent to canals and within high hazard risk areas. Consult the relevant organisation for development proposed within 20m of the canal
- Enhance and restore the river corridor identifying opportunities for river restoration and enhancement

Development Control Policies 2

- De-culvert where possible. Where not possible an assessment of the structural integrity of the culvert should be carried out prior to development
- Set development back from watercourses leaving a minimum 8m wide undeveloped buffer strip
- Reduce surface water runoff from new developments
- Maintain existing flood storage areas – both formal and informal
- New developments adjacent to watercourses should have a maintenance strategy for clearing and maintaining the channel
- Ensure development is safe – for residential developments dry pedestrian access and egress should be provided for the 1 in 100 year plus climate change floodplain

Thank you for listening
Questions