Cheshire West and Chester Level 1 Strategic Flood Risk Assessment

Final Report

March 2026

Prepared for:

Cheshire West and Chester Council

Cheshire West and Chester

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Contract

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This report describes work commissioned by Cheshire West and Chester Council, by an instruction dated 29 January 2025. The Client's representative for the contract was Charlotte Aspinall of Cheshire West and Chester Council. Freya Nation, Laura Thompson and Mike Williamson of JBA Consulting carried out this work.

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Acknowledgements

We would like to acknowledge the assistance of the Environment Agency, Welsh Water and Canal & Rivers Trust.

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Abbreviations

ADEPT	Association of Directors of Environment, Economy, Planning & Transport
AEP	Annual Exceedance Probability
AIMS	Asset Information Management System
BNG	Biodiversity Net Gain
CaBA	Catchment Based Approach
CC	Climate Change
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plan
CIA	Cumulative Impact Assessment
CIL	Community Infrastructure Levy
CIRIA	Construction Industry Research and Information Association
DCG	Design and Construction Guidance
Defra	Department for Environment, Food and Rural Affairs
DWMP	Drainage and Wastewater Management Plan
EA	Environment Agency
EU	European Union
FAA	Flood Alert Area
FCERM	Flood and Coastal Erosion Risk Management
FFL	Finished Floor Level
FRR	Flood Risk Regulations
FMfP	Flood Map for Planning
FRA	Flood Risk Assessment
FRAP	Flood Risk Activity Permit
FRMP	Flood Risk Management Plan
FWA	Flood Warning Area
FWMA	Flood and Water Management Act
FWS	Flood Warning System
GI	Green Infrastructure
GSPZ	Groundwater Source Protection Zone
IDB	Internal Drainage Board
JBA	Jeremy Benn Associates
LASOO	Local Authority SuDS Officer Organisation
LFRMS	Local Flood Risk Management Strategy
LiDAR	Light Detection and Ranging

LLFA	Lead Local Flood Authority
LNRS	Local Nature Recovery Strategies
LPA	Local Planning Authority
mAOD	metres Above Ordnance Datum
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NRD	National Receptor Database
NVZ	Nitrate Vulnerable Zone
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RAG	Red-Amber-Green
RBD	River Basin District
RBMP	River Basin Management Plan
REUL	Retained EU Law
RFCC	Regional Flood and Coastal Committee
RMA	Risk Management Authorities
RoFSW	Risk of Flooding from Surface Water
SFRA	Strategic Flood Risk Assessment
SHELAA	Strategic Housing and Economic Land Availability Assessments
SMP	Shoreline Management Plan
SoP	Standard of Protection
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
WCS	Water Cycle Study
WFD	Water Framework Directive
WRMP	Water Resources Management Plan
WwNP	Working with Natural Processes

Definitions

1D model: One-dimensional hydraulic model.

2D model: Two-dimensional hydraulic model.

Annual Exceedance Probability: The probability (expressed as a percentage) of a flood event occurring in any given year.

Brownfield: A previously developed parcel of land.

Climate change: Long term variations in global temperature and weather patterns caused by natural and human actions.

Design flood: A flood event of a given annual flood probability, which is generally taken as: fluvial (river) flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), tidal flooding likely to occur with a 0.5% annual probability (a 1 in 200 chance each year), or surface water flooding likely to occur with a 1% annual probability (a 1 in 100 change each year), plus an appropriate allowance for climate change, against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

Flood defence: Infrastructure used to protect an area against floods such as floodwalls and embankments; they are designed to a specific Standard of Protection (SoP) (design standard).

Green and blue infrastructure: A network of multi-functional green and blue spaces and other natural features, urban and rural, which is capable of delivering a wide range of environmental, economic, health and wellbeing benefits for nature, climate, local and wider communities and prosperity.

Greenfield: An undeveloped parcel of land.

Lead Local Flood Authority: The unitary authority for the area or if there is no unitary authority, the County Council for the area.

Main river: A watercourse shown as such on the statutory main river map held by the Environment Agency (EA). They are usually the larger rivers and streams. The EA has permissive powers (not duties) to carry out maintenance and improvement works on main rivers).

Major development: Defined in the National Planning Policy Framework (NPPF) as a housing development where 10 or more homes will be provided, or the site has an area of 0.5 hectares or more, or as a non-residential development with additional floorspace of 1,000m² or more, or a site of 1 hectare or more, or as otherwise provided in the Town and Country Planning (Development Management Procedure) (England) Order 2015 (gov.uk).

Natural Flood Management (NFM): Techniques that work with nature to reduce the risk of flooding for communities.

Ordinary watercourse: Any river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows but which does not form part of a

main river. The local authority or internal drainage board (IDB) has permissive powers (not duties) on ordinary watercourses.

Permissive powers: Authorities have the power to undertake flood risk management activities, but not a duty to do so. This will depend on priorities in flood risk management.

Return period: An estimate of the interval of time between events of a certain intensity or size, in this instance it refers to flood events. It is a statistical measurement denoting the average recurrence interval over an extended period of time.

Riparian owner: A riparian landowner, in a water context, owns land or property, next to a river, stream or ditch.

Risk Management Authority: The Environment Agency; Lead Local Flood Authority; a District Council in an area where there is no unitary authority; an internal drainage board; a water company and a highway authority.

Risk: In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.

Stakeholder: A person or organisation affected by the problem or solution or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.

Sustainable Drainage Systems: Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques, such as grates, gullies, and channels.

Windfall site: A site which becomes available for development unexpectedly and therefore not included as allocated land in a local planning authority's local plan.

Executive Summary

This report provides a comprehensive and robust evidence base on flood risk issues to support the production of the new Local Plan for Cheshire West and Chester. This Level 1 Strategic Flood Risk Assessment (SFRA) uses the best available information, including input from key stakeholders, and latest national planning policy and guidance, including:

- National Planning Policy Framework (NPPF) (gov.uk), last updated in February 2025.
  - At the time of writing, the proposed reforms and further changes to the NPPF are ongoing. The consultation window closed on 10 March 2026. The draft consultation version contains amendments to the structure of the NPPF, in addition to additional changes to reflect the recent updates to the Planning Practice Guidance.
  - Therefore, references to the NPPF throughout this SFRA should always be considered alongside the latest available version of the guidance.
- Planning Practice Guidance (PPG): Flood risk and coastal change (gov.uk) updated in September 2025.
- The latest Environment Agency climate change guidance (gov.uk) (updated in July 2021 and May 2022).
- The Environment Agency 'How to prepare a strategic flood risk assessment' (gov.uk) guidance, updated in August 2025.
- The Association of Directors of Environment, Economy, Planning & Transport (ADEPT) 'Strategic flood risk assessment good practice guidance' (adeptnet.org.uk), published December 2021.

Introduction

To support the new Local Plan for Cheshire West and Chester Council (the Council), the key objectives of the assessment are:

- To collate and analyse the latest available information and data for current and future (i.e. climate change) flood risk from all sources and assess how these risks may be mitigated.
- To inform decisions in the emerging Local Plan, including informing the sustainability appraisal, the selection of development sites, and planning policies.
- To provide evidence to support the application of the Sequential Test for the allocation of new development sites, to support the Council in the preparation of the new Local Plan.
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as the evidence base to inform the new Local Plan.
- To help inform on the requirements for site-specific Flood Risk Assessments (FRA).

- To provide advice for applicants carrying out site-specific FRAs, including those at risk from sources other than river flooding, or at risk of flooding in the future due to climate change, and outline specific measures or objectives that are required to manage flood risk.
- To provide the basis for applying the sequential and Exception Tests on planning applications, including by identifying sources of flooding other than the sites located in 'Flood Zones' and sites at risk of flooding in the future.
- To identify opportunities to reduce the causes and impacts of flooding and gather information on the land that is likely to be required for flood risk management structures.

Summary of the borough and flood risk

Over 357,000 people live in Cheshire West and Chester, according to the 2021 Census. The borough covers approximately 941 km^2 of land and is characterised by attractive countryside, varied landscapes and diverse settlements ranging from the historic city of Chester, the towns of Ellesmere Port, Northwich and Winsford to small rural hamlets. Chester is the central urban area of the borough.

Flood risk from all sources has been assessed in this SFRA. Parts of the borough are shown to be at risk of flooding from the following sources: fluvial watercourses, tidal watercourses, surface water, sewers, groundwater, canals and reservoirs. This study has shown that the most significant sources of flood risk across the borough are fluvial, tidal and surface water flooding. The points below summarise the findings:

Fluvial: The main rivers of the Dee and Gowy impact the west of the borough whilst the Weaver impacts the east.
Fluvial flood risk is discussed in Section 4.6 and Appendix C and the flood extents are shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

Tidal and coastal: Tidal influence from the River Dee extends as far as Chester. The Tidal Mersey affects land north of the M56 between Ellesmere Port and Frodsham. High tides coinciding with large rainfall events could result in tide locking of natural and manmade drainage systems, increasing the likelihood of flooding.
Tidal flood risk is discussed in Section 4.7 and Appendix C and the flood extents are shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

Surface Water: Surface water flood risk is widespread across the borough with land modelled at high risk of flooding across both rural and urban areas.
Surface water flood risk is discussed in Section 4.11 and Appendix C and the flood extents are shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

Climate Change: Areas at risk of flooding today are likely to become at increased risk in the future and the frequency of flooding will also increase in such areas, due to climate change. Flood extents will increase; in some locations this may be minimal, but flood depth, velocity and hazard may have more of an impact due to climate change. This SFRA

provides an assessment of the impacts of climate change on fluvial, tidal and surface water flood risk. The approach to climate change is discussed in Section 5, the potential effects of climate change on fluvial, tidal and surface water risk are discussed in Appendix C, and the flood extents are also shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

Sewer: United Utilities and Dŵr Cymru Welsh Water provide water and sewerage services across the borough. Dŵr Cymru Welsh Water have provided details of historic sewer flood risk incidents in the borough. The areas with the most Dŵr Cymru Welsh Water flood incident records are Chester, Saltney, Christleton, Huntington and Little Neston. No historic sewer flooding information was made available by United Utilities for consideration within this SFRA. Sewer flood risk is discussed in Section 4.12.

Groundwater: Areas of greatest risk of groundwater emergence are spread across the borough.
There is no national groundwater flood dataset to inform the areas at risk from groundwater flooding; however, emergence mapping when considered in conjunction with topography and surface water flow paths can indicate areas where groundwater is likely to emerge, and the flow paths it may take once above the ground. Groundwater flood risk is discussed in Section 4.13, and the JBA emergence maps are shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

Canals: The Manchester Ship Canal runs through the north of the borough. The Shropshire Union Canal is joined by the River Dee in Chester. The Trent and Mersey Canal and Weaver Navigation are both located within the east of the borough. Llangollen Canal is located along part of the southern boundary of the borough and neighbouring authorities Cheshire East and Shropshire.
Within the borough, the Canal & River Trust holds records of 11 canal breach and three overtopping incidents. Canal flood risk is discussed in Section 4.14.1.

Reservoirs: There are 11 reservoirs located within the borough, and 18 located outside the borough, which present a potential risk of flooding within the borough.
The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach, and this risk should be considered in any site-specific FRAs (where relevant) in accordance with the updated PPG: Flood risk and coastal change. Reservoir flood risk is discussed in Section 4.14.2. The 'Dry Day', 'Wet Day', and 'Fluvial Contribution' flood extents are shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

Defences: The EA Asset Information Management System (AIMS) dataset provides information on flood defence assets across the borough.
There are flood walls and embankments along the River Dee at Chester and the River Weaver at Northwich. Demountable defences and flood gates are also present in Northwich. There are embankments along the Weaver between Northwich and Frodsham; as well as along the Dee at Aldford and upstream along Aldford Brook. North of Bridge Trafford and through Ellesmere Port, there are embankments along the River Gowy and

Mill Brook. Upstream of Northwich, there are embankments on the Weaver Navigation at Hartford / Kingsmead.
Further information on defences across the borough is available in Section 6.4 and shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

How to use this report

The SFRA provides recommendations regarding all sources of flood risk across the borough, which can be used to inform policy on flood risk within the Council's new Local Plan. This includes how the cumulative impact of new development should be considered.

It provides the latest flood risk data and guidance to inform the Sequential Test, for both allocations and individual planning applications (Appendix H) and provides guidance on how to apply the Exception Test.

This Level 1 SFRA is a strategic assessment of flood risk and does not replace the need for site-specific FRAs, where required. This Level 1 SFRA provides guidance for the development industry and development management officers to establish when a site-specific FRA is required and to assess whether it meets the required quality standard (Section 7). This should be used alongside the EA's FRA Guidance (gov.uk). This Level 1 SFRA can also be used to help identify which locations and development may require emergency planning provision.

The Level 1 SFRA will also be helpful for developing community level flood risk policies in high flood risk areas. Similarly, all known available recorded historical flood events across the borough are listed in Section 4.3. This can be used to supplement local knowledge regarding areas worst hit by flooding. Ongoing and proposed flood alleviation schemes planned within the borough are outlined in Section 6, and Section 8.5 discusses mitigation measures, and resistance and resilience techniques which can be applied to alleviate flood risk to an area.

Table 1-1 sets out the contents of the Level 1 SFRA and how users should use the information provided through the document and appendices.

Site screening assessment

The supplied potential development allocations are shown to be at varying risk from fluvial, tidal and surface water flooding. Development consideration assessments for all sites are summarised through four strategic recommendations within Appendix F and the development sites assessment spreadsheet in Appendix E. The strategic recommendations broadly entail the following:

- Strategic Recommendation A - recommend for withdrawal if built development cannot avoid Flood Zone 3b. A Level 2 SFRA would be required to inform this;
- Strategic Recommendation B - Level 2 SFRA required due to medium or high flood risk. Exception test required if a site is proposed for uses that are more vulnerable in Flood Zone 3a;
- Strategic Recommendation C - progress to developer-led FRA; and

- Strategic Recommendation D - development could be allocated on flood risk grounds based on the evidence of this Level 1 SFRA.

A total of 2,005 sites with partial or no planning permission were screened against the latest available flood risk information:

- Strategic Recommendation A applies to 225 sites.
- Strategic Recommendation B applies to 1,325 sites.
- Strategic Recommendation C applies to 230 sites.
- Strategic Recommendation D applies to 225 sites.

See Appendix E for a full breakdown of the risk at each site and Appendix F which discusses the identified risks.

SFRA recommendations

The overarching SFRA recommendations are documented within Section 13.2. In summary, these include:

- Ensuring new development is directed to areas of lowest flood risk wherever possible, avoiding residential uses in the highest risk zones, accounting for the impacts of climate change.
- Requiring robust site-specific flood risk assessments, sustainable drainage solutions, and emergency plans for all proposals within or near flood risk areas.
- In medium risk areas, accounting for climate change impacts, ensure sensitive uses are located above ground floor level, with ground floors reserved for less vulnerable uses where appropriate.
- Maintain an appropriate undeveloped buffer zone (e.g., 8m) alongside watercourses to allow for maintenance access, protect floodplain function and habitat.
- Where development benefits from flood defences, consider the potential for defence breach and ensure safe access and escape routes are provided.

Mapping

The SFRA mapping in Appendix J highlights (on a strategic scale) flood risk from fluvial, tidal, surface water and reservoirs sources, and where groundwater emergence may occur; as well as where the effects of climate change are most likely. The mapping is useful to provide a community level view of flood risk but may not identify if an individual property is at risk of flooding or depict small scale changes in flood risk. Local knowledge of flood mechanisms will need to be included to complement this mapping.

1 Introduction

1.1 Purpose of a Strategic Flood Risk Assessment (SFRA)

Cheshire West and Chester Council (referred to hereafter as the Council) is a unitary authority and therefore acts as the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA). In its role as LPA, the Council is responsible for producing a Local Plan, determining planning applications, enforcement in response to breaches of planning control, and supporting neighbourhood planning.

The preparation of this Strategic Flood Risk Assessment (SFRA) comes nine years after the previous SFRA, which supported the Local Plan (Part Two). Since then, there have been significant changes to national planning guidance and methodology, in particular updates to the National Planning Policy Framework (NPPF) and the Government's approach to calculating local housing need. These changes prompted the decision to commence preparation of a new Local Plan to update and replace both Local Plan (Part One) and Local Plan (Part Two). The updated SFRA forms an essential part of the evidence base required to support the new Local Plan and ensure it is robust and responsive to current national policy and local circumstances. The Council are currently compiling the evidence base to support the development of its new Local Plan. The Council currently aims to submit the Local Plan for Examination in December 2026, under the current plan-making system.

At this stage, no decisions have been made on a preferred spatial option for growth and development. The SFRA has therefore been undertaken to inform the development of strategic policies within the new Local Plan, as well as to assess sites within the Council's Land Availability Assessment and an initial set of potential growth areas identified in the Council's Regulation 18 Issues and Options document.

As set out in the National Planning Policy Framework (NPPF) (Paragraph 171) "*Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards*."

This SFRA will form a key part of the evidence base for the Council's new Local Plan and will inform future planning decisions. It will be used to assist in the formulation of land allocations for development and specific policies in relation to water management and adapting to climate change. The SFRA provides an important foundation for making informed choices about various options for growth and will ensure that decisions are made in accordance with the latest evidence on flood risk from all sources.

1.2 Relevance of the SFRA

The 'How to prepare a Strategic Flood Risk Assessment guidance' (gov.uk) (last updated August 2025), sets out the requirements that the LPA must address within their SFRA and has been used to inform this Level 1 SFRA.

This Level 1 SFRA has been developed using the best available information, supplied at the time of preparation. Appendix A details the information supplied. Over time new information will become available to inform planning decisions:

- The Environment Agency (EA) regularly reviews its hydrology, hydraulic modelling, and flood risk mapping.
- The EA has recently published the new national flood risk assessment mapping (NaFRA2) and new national coastal erosion risk mapping (NCERM). Regular updates to flood risk information datasets are ongoing.
- Other datasets used to inform this SFRA may also be updated periodically and following the publication of this SFRA, new information on flood risk may be provided by Risk Management Authorities (RMAs).

Links have been provided for relevant guidance documents and policies published by other RMAs such as the LLFA and the EA. When using this Level 1 SFRA to prepare site-specific flood risk assessments (FRA) it is important to check that the most up to date information is used.

As the data available for SFRAs and the relevant legislation is frequently changing, the SFRA should be updated to reflect changes where applicable and reasonably practicable. Under any changes in guidance or legislation, the implications on the SFRA should be considered and a review undertaken where this is deemed necessary.

1.3 Levels of SFRA

The PPG: Flood risk and coastal change (gov.uk) identifies two levels of SFRA.

Level 1 SFRAs are high-level strategic documents and do not go into detail on an individual site-specific basis. Where potential local plan site allocations are not at high or medium levels of flood risk and where development pressures are low, a Level 1 assessment may be sufficient, without the requirement to progress to a more detailed Level 2 assessment. The Level 1 assessment should be of sufficient detail to enable application of the Sequential Test, to inform the allocation of development to areas of lower flood risk.

A Level 2 assessment is required where land outside high and medium flood risk areas cannot appropriately accommodate all necessary development, creating the need to apply the NPPF's Exception Test if relevant, or if an LPA believe they may receive high numbers of applications in flood risk areas on sites not identified in the Local Plan. In these circumstances the assessment should consider the detailed nature of the flood characteristics from all sources, both now and in the future. This report fulfils the requirements of a Level 1 SFRA.

1.4 Local Plan Area

Over 357,000 people live within the borough of Cheshire West and Chester. The borough covers approximately 941 km^2 of land and is characterised by attractive countryside, varied landscapes and diverse settlements ranging from the historic City of Chester, the towns of Ellesmere Port, Northwich and Winsford to small rural hamlets. Chester is the central urban area of the borough with the ward of Chester City and the Garden Quarter having a population, according to the 2021 Census, estimated to be at 18,338.

Through the centre of the authority area, there is a prominent belt of higher ground, the Mid Cheshire Ridge, which extends from the southern border of the authority area northwards to Frodsham. The rest of the authority area is characterised by low-lying plains, marshes and wetlands.

Cheshire West and Chester Council are the LLFA for the borough. The borough is neighboured by two Welsh and six English local authorities as shown in Figure 1-1. United Utilities and Welsh Water Dŵr Cymru are the main water and sewerage service providers across the borough, as shown in Figure 1-2.

The River Dee and River Gowy are main rivers located in the west and the River Weaver in the east. Main rivers are usually larger rivers and streams. The EA has permissive powers to carry out maintenance, improvement or construction work on main rivers to manage flood risk.

There are also a number of other main rivers and ordinary watercourses along with various canalised sections of watercourse, namely the Manchester Ship Canal in the north, the Shropshire Union Canal which is joined by the River Dee in Chester, the Trent and Mersey Canal and the Weaver Navigation in the east around Northwich. Many of the watercourses located within the borough are shown in Figure 1-3. Ordinary watercourses are any watercourses that are not designated main river. These watercourses can vary in size considerably and can include rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows.

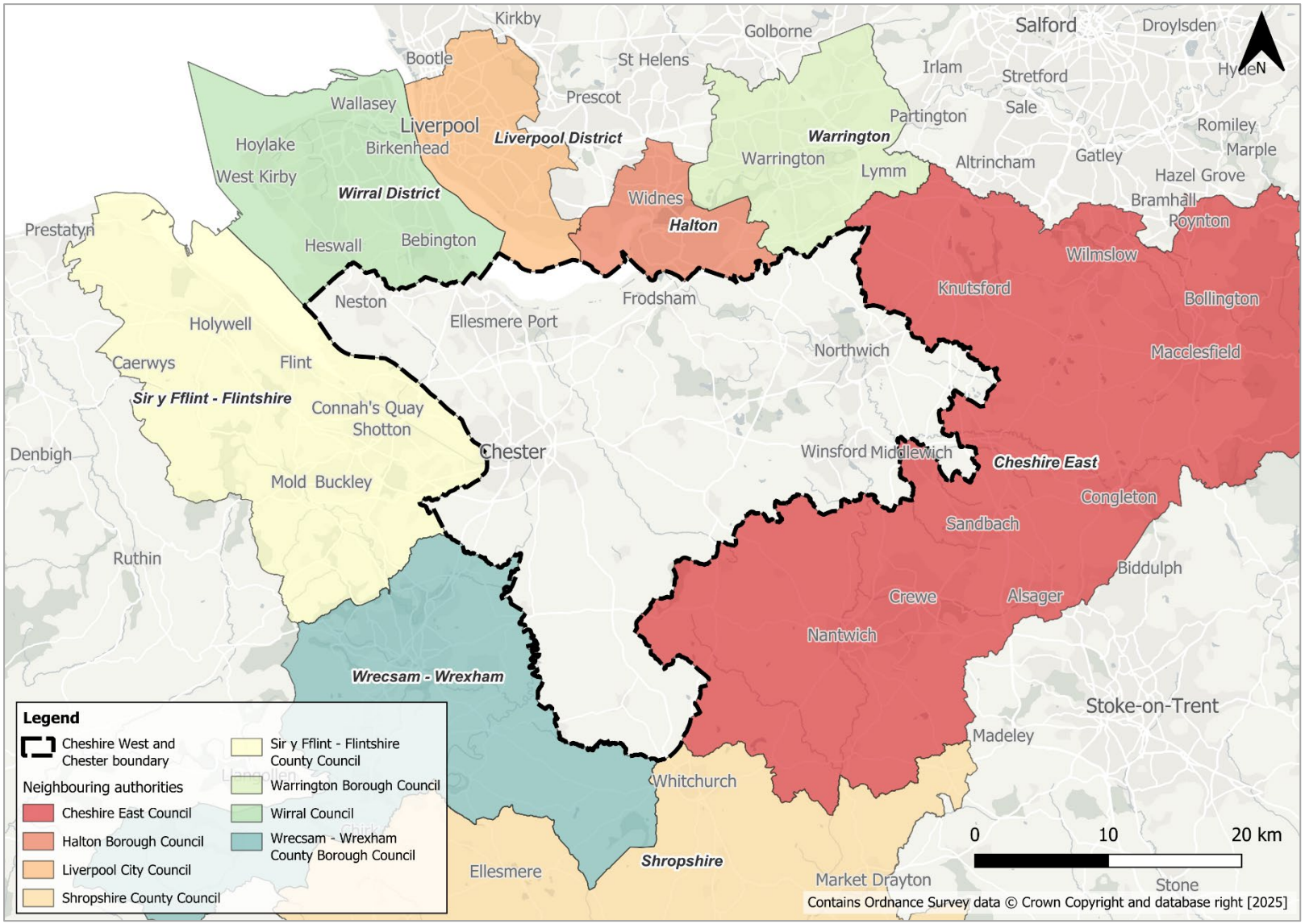


Figure 1-1: Cheshire West and Chester and its neighbouring authorities

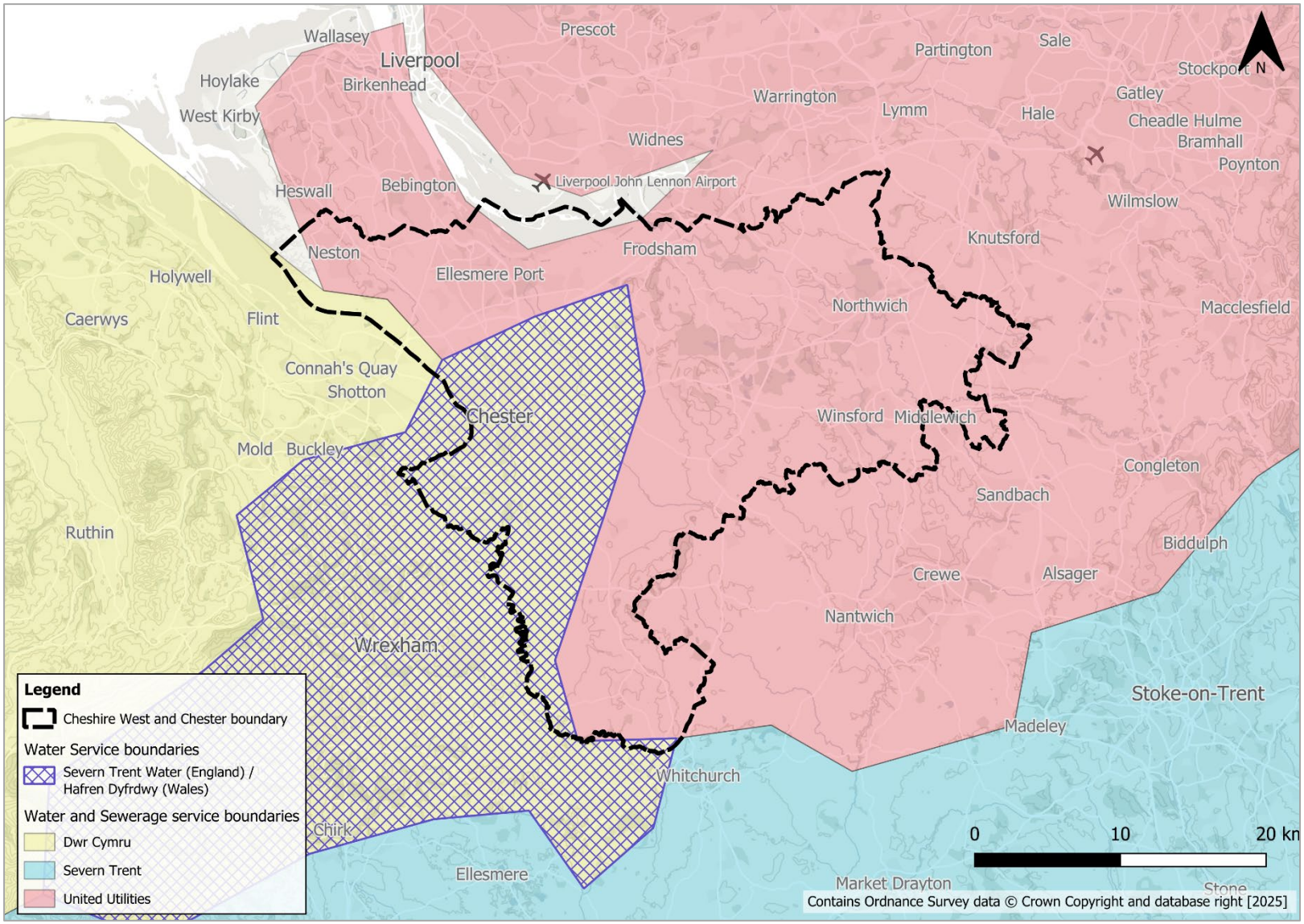


Figure 1-2: Water company coverage across the borough

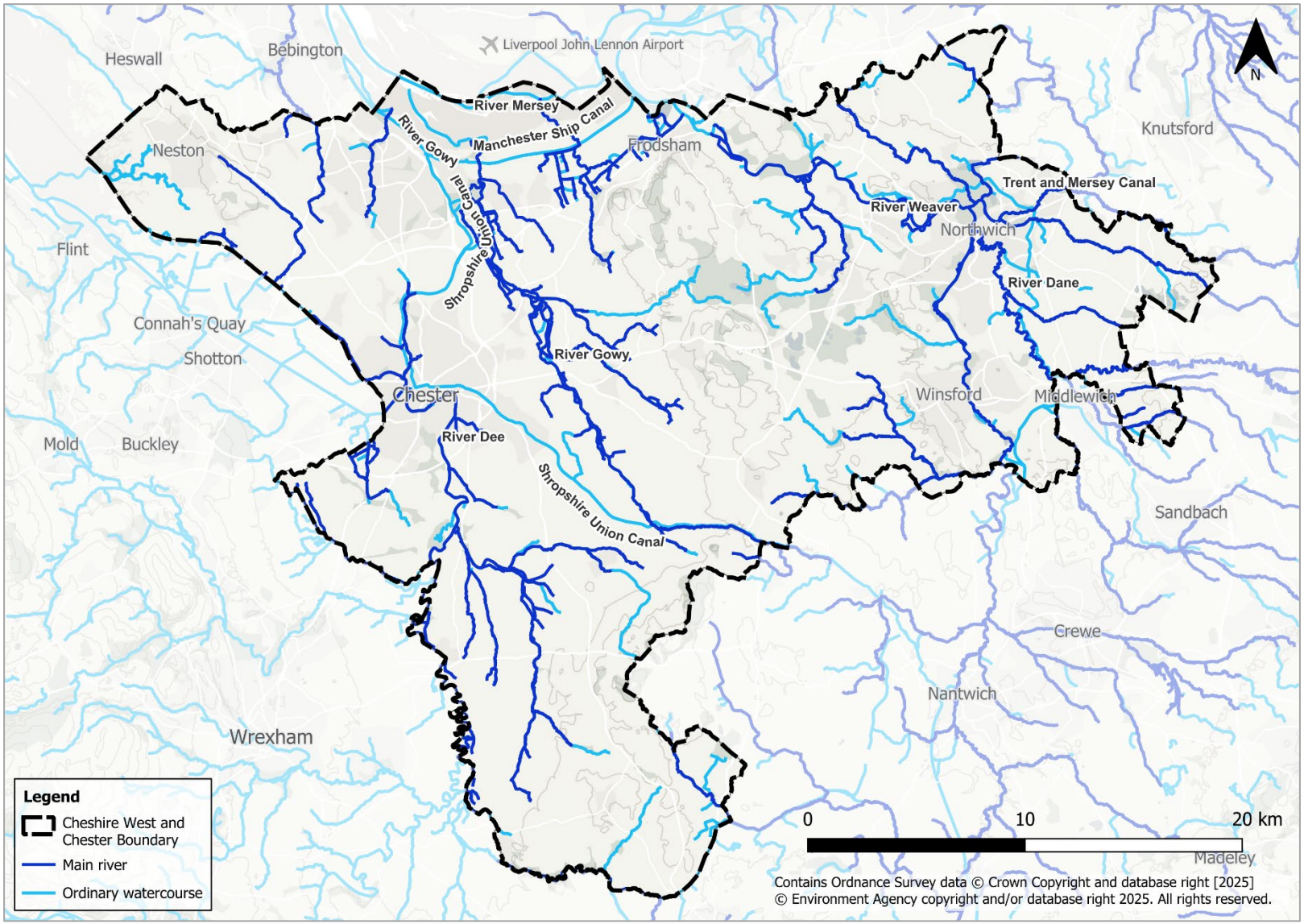


Figure 1-3: Main rivers and other watercourses across the borough

1.5 Consultation

SFRAs should be prepared in consultation with other RMAs. The following parties have been consulted during the preparation of this version of the Level 1 SFRA through requests for information and through invitations to review and comment on draft outputs:

- Environment Agency
- Lead Local Flood Authority (Cheshire West and Chester Council)
- United Utilities
- Dŵr Cymru Welsh Water
- Canal & River Trust

In addition, the following parties were consulted through data requests during the preparation of this SFRA:

- Flintshire County Council
- Wrexham County Borough Council
- Shropshire Council
- Cheshire East Council
- Warrington Borough Council
- Halton Borough Council
- Liverpool City Council
- Wirral Borough Council

The 'How to prepare a Strategic Flood Risk Assessment guidance' (gov.uk) also recommends consultation with:

- Emergency planners
- Emergency services
- Reservoir owners or undertakers
- Highways authorities
- Coastal groups
- Catchment partnerships
- Regional flood and coastal committees

1.6 Structure of this report

Table 1-1: Report contents and how to use each section.

Section	Contents	How to use
Executive summary	This section focuses on how the SFRA can be used by planners, developers and those preparing Neighbourhood Plans.	Users should refer to this section for a summary of the Level 1 findings and recommendations.
1. Introduction	This section provides a background to the study, the Local Plan stage the SFRA informs, and the Local Plan area. It also details the organisations involved in the SFRA.	Users should refer to this section for general information and context.
2. Policy and strategy for flood risk management	This section sets out the relevant legislation, policy, and strategy for flood risk management at a national, regional, and local level.	Users should refer to this section and Appendix H for any relevant policy which may underpin strategic or site-specific assessments.
3. Sequential and Exception Tests	This section provides an overview of national planning policy, application of the sequential approach, and the sequential/Exception Test process. It provides guidance for the Council and developers on the application of the sequential and Exception Test for both allocations and windfall sites, at allocation and planning application stages.	Users should use this section to understand and follow the steps required for the sequential and Exception Tests.
4. Understanding flood risk	This section introduces the concept of flood risk and provides an overview of the characteristics of flooding affecting the borough and key risks including historical flooding incidents and flood risk from all sources, as well as characteristics that influence flood risk including topography, geology and soils.	This section should be used to understand all sources of flood risk across the borough including where has flooded historically.

Section	Contents	How to use
5. Impact of climate change	This section outlines the latest climate change guidance published by the EA and how this was applied to the SFRA. It also sets out how developers should apply the guidance to inform site-specific FRAs.	This section should be used to understand the climate change allowances for a range of epochs and conditions, linked to the vulnerability of a development.
6. Flood risk infrastructure	This section provides a summary of current flood defences and asset management and future planned schemes.	This section should be used to understand if there are any defences or flood schemes in a particular area, for further detailed assessment at site specific stage.
7. Flood risk management requirements for developers	This section contains guidance for developers on FRAs, considering flood risk from all sources, and principles of managing flood risk in developments.	Developers should use this section to understand requirements for FRAs and what conditions/guidance documents should be followed.
8. Principles for site design and masterplanning	This section sets out the principles for site design through ground level modifications and consideration of the impact of defence infrastructure on planning.	Developers should use this section to understand mitigation options for FRAs.
9. Surface water management and SuDS	This section provides an overview of SuDS, including signposting to relevant guidance; guidance for developers on surface water drainage strategies and for considering any specific local standards and guidance for SuDS from the LLFA.	Developers should use this section to understand what national, regional, and local SuDS standards are applicable. Hyperlinks are provided.
10. Flood warning and emergency planning	This section provides an overview of the requirements for emergency plans, include any local emergency planning arrangements and an overview of the available flood alerts and warnings.	Developers should use this section to understand requirements for emergency planning.
11. Cumulative Impact Assessment	This section details the cumulative impact assessment, which identifies which catchments are most likely to be sensitive to increased flood risk as a result of future development.	Planners should use this section to help develop policy recommendations for the cumulative impact of development.

Section	Contents	How to use
12. Strategic flood risk solutions	This section sets out wider strategic solutions that may offer potential to reduce flood risk across the borough, including natural flood management. It also details current partnership working opportunities within the borough.	Planners should use this section to help develop policy recommendations for strategic flood risk solutions to reduce flood risk across the borough. Developers should use this section to consider options for strategic solutions and natural flood management techniques.
13. Recommendations	This section summarises sources of flood risk in the borough and outlines planning policy recommendations. It also sets out the next steps.	Developers and planners should use this as a summary of the SFRA. Developers should refer to the Level 1 SFRA recommendations when considering site specific assessments.
Appendix A	Details the data used to inform the SFRA, including when the data was provided, any associated licensing, and where the data can be obtained from.	Planners and developers should use this appendix to understand what data has been used in the SFRA, whether it has since been updated, and where to access the latest data from.
Appendix B	Sets out the methodology for the Sequential Test, including how each source of flood risk should be considered.	Planners should use this appendix to inform the application of the Sequential Test.
Appendix C	Summary of flood risk across the potential growth areas (identified in the Regulation 18 Issues and Options document) within the borough, highlighting key areas at risk from different sources.	Planners and developers should use this appendix to identify key areas of flood risk from different sources.
Appendix D	Technical note explaining the methodology behind the delineation of the functional floodplain (Flood Zone 3b) for this Level 1 SFRA.	Planners and developers should use this appendix to understand the datasets used to inform the functional floodplain extent.
Appendix E	Excel spreadsheet containing an assessment of flood risk to the potential development allocations based on Flood Zones 2, 3a and 3b, as delineated through this	Planners and developers should use this appendix to understand the level of risk to each potential allocation and associated

Section	Contents	How to use
	SFRA and accounting for climate change. Each potential allocation is assigned a strategic recommendation based on risk and developability.	recommendations for development.
Appendix F	Summarises the outcomes of the Sites Assessment process recorded in Appendix E.	Planners and developers should use this appendix to understand the level of risk to each potential allocation and associated recommendations for development.
Appendix G	Details the methodology and results for the cumulative impact assessment.	Planners should use this appendix, in conjunction with Section 11, to help develop policy recommendations for the cumulative impact of development.
Appendix H	Provides a background to the flood risk policy documents that are relevant to Cheshire West and Chester.	Planners and developers should use this appendix, in conjunction with Section 2, to understand the relevant flood and water management policy and guidance for development.
Appendix I	GIS data package consisting of all flood risk information used within the SFRA.	Planners and developers should use the flood risk data to scope out the issues they need to consider in greater detail in a site-specific FRA to support a planning application.
Appendix J	Interactive GeoPDF mapping.	Interactive GeoPDF maps displaying the flood risk information used within this SFRA.

2 Policy and strategy for flood risk management

This section, along with Appendix H, sets out the flood risk management roles and responsibilities for different organisations and relevant legislation, policy, and strategy.

2.1 Roles and responsibilities

There are different organisations in and around the borough that have responsibilities for flood risk management, known as RMAs. These are listed in Table 2-1 with a summary of their responsibilities.

Further information on the roles and responsibilities of the RMAs is available in Annex A of the National Flood and Coastal Erosion Risk Management Strategy (FCERM) (gov.uk) for England. The Local Government Association (gov.uk) also provide further information on the roles and responsibilities for managing flood risk.

The National flood risk standing advice for local planning authorities (gov.uk) provides advice on when to consult the EA.

Table 2-1: Roles and responsibilities for RMAs.

Risk Management Authority	Strategic Level	Operational Level	Planning role
EA	Strategic overview for all sources of flooding, National Strategy, and general supervision	Main River (e.g., River Weaver, River Dane, River Gowy) and reservoirs (Flood Risk Activity Permits (FRAPs), enforcement, and works)	Statutory consultee for certain development in Flood Zones 2 and 3 and all works within 20 metres of a main river
Cheshire West and Chester Council as LLFA	Coordination of local flood risk management and maintaining a Local Flood Risk Management Strategy (LFRMS)	Surface water, groundwater, and ordinary watercourses (consenting, enforcement, and works)	Statutory consultee for major developments
Cheshire West and Chester Council as the Coast Protection Authority	Responsible for developing a Shoreline Management Plan	Carrying out coast protection work (including constructing and maintaining works)	Non-statutory consultee for major developments

Risk Management Authority	Strategic Level	Operational Level	Planning role
United Utilities Dŵr Cymru Welsh Water	Asset Management Plans, supported by Periodic Reviews (business cases), develop drainage and wastewater management plans (DWMPs)	Public sewers and some reservoirs	Non-statutory consultee
Highways Authorities - National Highways for motorways and trunk roads and Cheshire West and Chester Council for non-trunk roads	Highway drainage policy and planning	Highway drainage	Statutory consultee regarding highways design standards and adoptions

2.1.1 Riparian ownership

Land and property owners are responsible for the maintenance of watercourses either on or next to their properties, called Riparian Owners. Riparian Owners are also responsible for the protection of their properties from flooding as well as other management activities, for example by maintaining riverbeds/banks, controlling invasive species, and allowing the flow of water to pass without obstruction. More information can be found on the Government website in the EA publication 'Owning a watercourse' (gov.uk).

When it comes to undertaking works to reduce flood risk, the EA, and the LLFA do have permissive powers, but limited resources must be prioritised and targeted to where they can have the greatest effect. Permissive powers mean that RMAs are permitted to undertake works on watercourses but are not obliged.

3 Sequential and Exception Tests

This section summarises national planning policy for development and flood risk and the application of the sequential and exceptions tests for both planners and developers.

3.1 National Planning Policy Framework and Guidance

The NPPF (February 2025) (gov.uk) sets out the Government's planning policies for England. It must be considered in the preparation of local plans and is a material consideration in planning decisions. The NPPF advises on how flood risk should be considered to guide the location of future development and FRA requirements. The NPPF states that:

"*Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards*" (Paragraph 171).

The Flood Risk and Coastal Change PPG (gov.uk), last updated September 2025, sets out how the policy should be implemented. Diagram 1 in the PPG (Paragraph: 007 Reference ID: 7-007-20220825) sets out how flood risk should be considered in the preparation of local plans. The PPG states that:

"A strategic Flood Risk Assessment should be used to apply the Sequential Test and, where necessary, the Exception Test when determining land use allocations" (paragraph 009).

At the time of writing, the proposed reforms and further changes to the NPPF are ongoing. The consultation window closed on 10 March 2026. The draft consultation version contains amendments to the structure of the NPPF, in addition to additional changes to reflect the recent updates to the Planning Practice Guidance.

3.2 The Sequential Test

Firstly, land at the lowest risk of flooding from all sources should be considered for development. A test is applied called the 'Sequential Test' to do this. Figure 3-1 summarises the Sequential Test. The LPA will apply the Sequential Test to strategic allocations. As set out in the FRA Standing Advice (gov.uk,) for all other developments, evidence must be supplied to the LPA, with a planning application, that the development has passed the test if any proposed building, access and escape route, land-raising or other vulnerable element will be:

- In Flood Zone 2 or 3 of the Flood Map for Planning (FMfP), See Section 4.5 for information on the FMfP;
- In Flood Zone 3b and your development is not incompatible;

- Within 'Flood Zones plus climate change' of the FMfP, showing it is at increased risk of flooding from rivers or the sea in the future;
- In Flood Zone 1 and the FMfP shows it is at risk of flooding from surface water;
- In Flood Zone 1 and the SFRA shows it will be at increased risk of flooding during its lifetime; or
- Subject to sources of flooding other than from rivers or the sea.

The LPA should define a suitable search area for the consideration of alternative sites in the Sequential Test*. Based on the latest updates to the PPG, sites can be considered 'reasonably available' if their location is suitable for the type of development proposed, they are able to meet the same development needs and they have a reasonable prospect of being developed at the same time as the proposal (Paragraph: 027a Reference ID: 7-027a-20220825).

* For CWaC, the area of search is the whole borough (unless other site specific/local circumstances relating to the catchment area for the type of development proposed apply (see also para 3.4.1 below).

The Sequential Test can be undertaken as part of a local plan sustainability appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of Strategic Housing Land/Employment Land Availability Assessments.

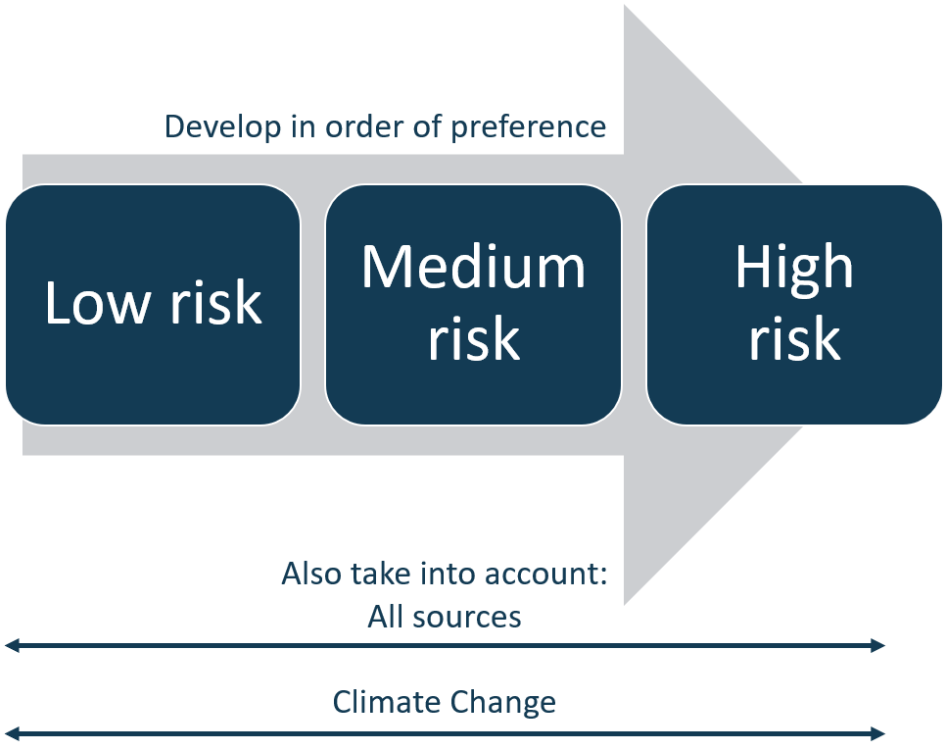


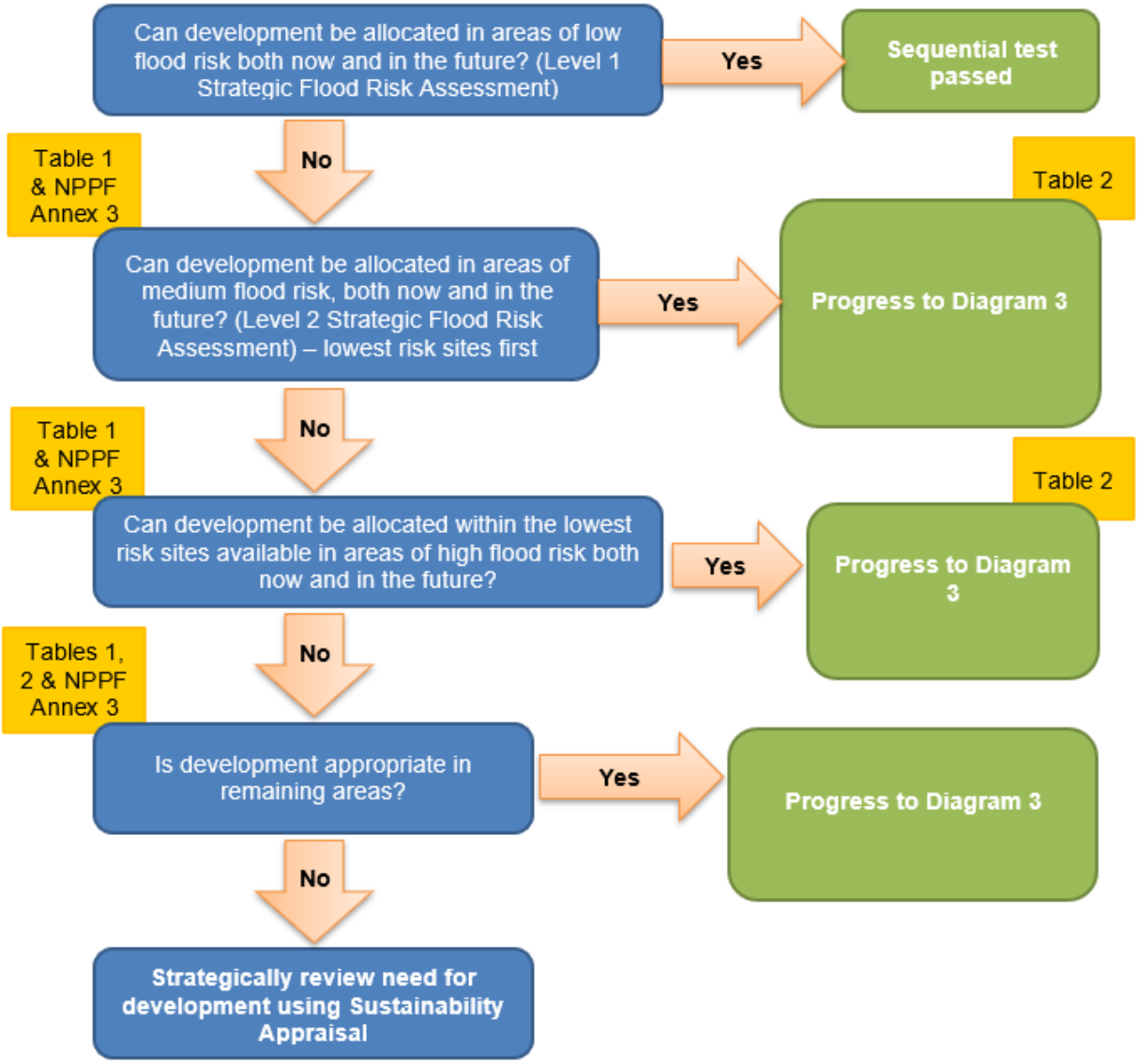
Figure 3-1: The Sequential Test

Whether any further work is needed to decide if the land is suitable for development will depend on both the vulnerability of the development and the Flood Zone it is within. Table 2 of the PPG (gov.uk) (Paragraph: 079 Reference ID: 7-079-20220825) shows whether, having applied the Sequential Test first, the vulnerability of development is not compatible

with a particular Flood Zone and where the Exception Test is required to determine the suitability of that vulnerability of development to the Flood Zone.

Figure 3-2 illustrates the Sequential Test as a process flow diagram using the information contained in this SFRA to assess potential development allocations against areas of flood risk and development vulnerability compatibilities. This is a stepwise process, but a complex one, as several of the criteria used are qualitative and based on experienced judgement. The process must be documented, and evidence used to support decisions recorded.

In addition, the risk of flooding from other sources and the impact of climate change must be considered when considering which sites are suitable to allocate. Appendix B addresses the use of flood risk information in the application of the Sequential Test.



† Diagram 2 of PPG: Flood Risk and Coastal Change (paragraph 026, Reference ID 7-026-20220825) Revised September 2025.

Figure 3-2: Application of the Sequential Test for plan preparation

3.2.1 The risk-based approach

The NPPF takes a risk-based approach to development in flood risk areas.

Since July 2021, the approach has adjusted the requirement for the Sequential Test (as defined in Paragraph 172 of the NPPF) so that all sources of flood risk are to be included in the consideration.

The PPG further states:

"*Other forms of flooding need to be treated consistently with river and tidal flooding in mapping probability and assessing vulnerability, so that the sequential approach can be applied across all areas of flood risk*" (paragraph 023).

The general implications of these approaches are summarised as follows:

- The Sequential Test must be based on mapping that enables decision making according to a prioritisation based on a risk-based sequence (for river flooding national mapping is available that describes low, medium and high-risk Flood Zones but comparable mapping of this specific type and quality is not available for other sources; for river flooding the risk zones are based on the assumption that no flood risk management features are present, with the exception of Flood Zone 3b (the functional floodplain)).
- The other sources of flood risk that can potentially be included in the Sequential Test are surface water, groundwater, sewer flooding and reservoir flooding (or other water impounding features such as canals).
- It follows that proposed new development placed in locations at high or medium risk from flooding from other sources now and in the future (note that the explicit requirement to include climate change in the test, as set out in the September 2025 PPG may require the preparation of additional modelling and mapping or use of proxies) should be accompanied by evidence that the site can remain safe for its lifetime and pass the Exception Test (if applicable) (through a Level 2 SFRA).

A basic requirement for the Sequential Test to be performed is that appropriate, competent mapping can be prepared to enable logical comparison of the flood risk from different sources at alternative locations, both now and in the future, as this is fundamental to establishing a logical “risk sequence”.

Appendix B describes the implications of including different sources of flooding both now and in the future in the Sequential Test. It also highlights matters to be considered and identifies a recommended approach.

3.3 The Exception Test

It will not always be possible for all new development to be located on land that is not at risk from flooding. To further inform whether land should be allocated, or planning permission granted, a greater understanding of the scale and nature of the flood risks is required. In these instances, the Exception Test will be required. Diagram 3 of the PPG (gov.uk)

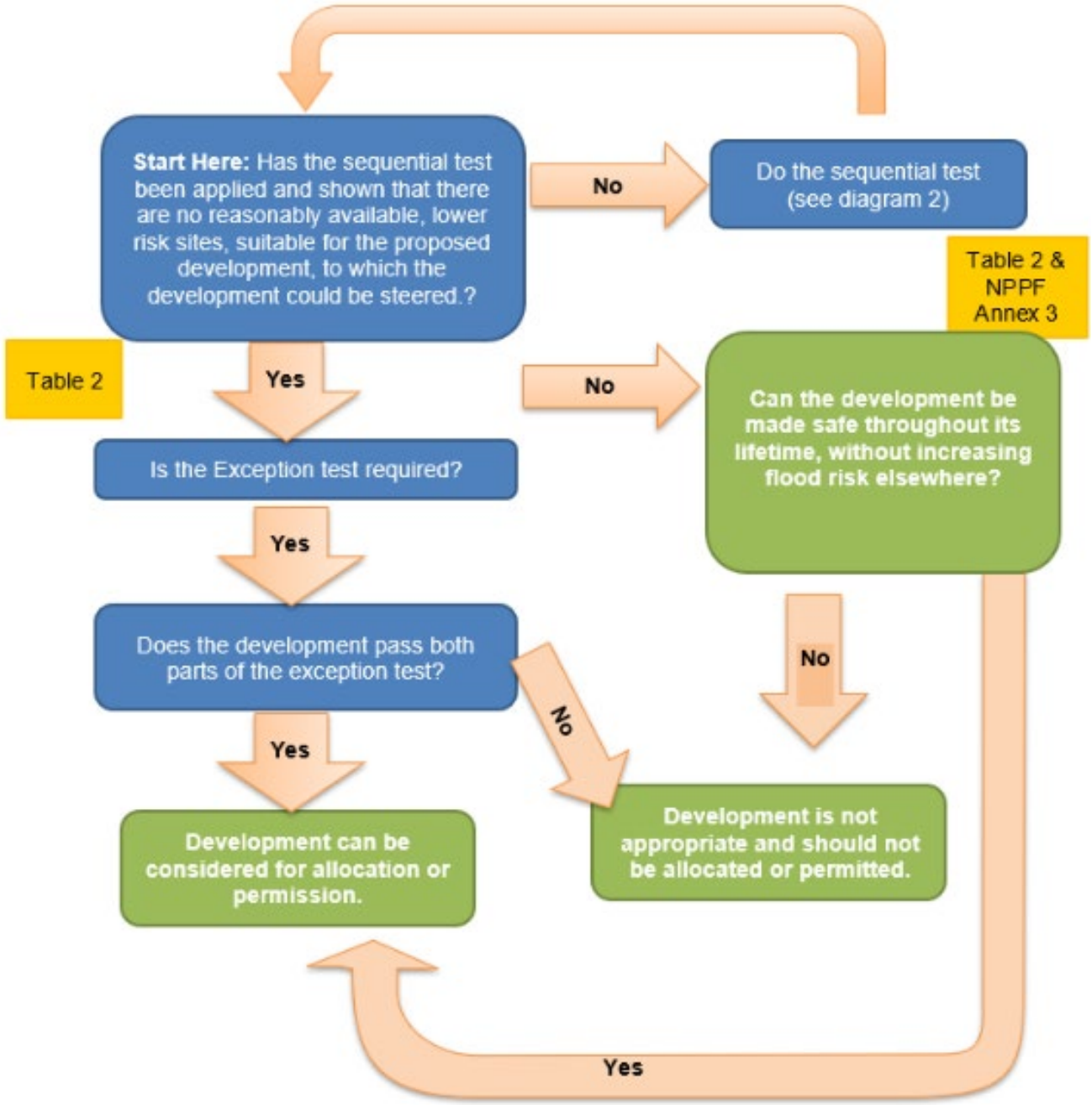
(Paragraph: 033 Reference ID: 7-033-20220825) summarises the Exception Test (Figure 3-3).

Table 2 of the PPG (gov.uk) sets out the requirements for the Exception Test but does not reflect the need to avoid flood risk from sources other than rivers and the sea. There is no guidance on how to consider other sources of flood risk. The Exception Test should only be applied, following the application of the Sequential Test, in the following instances:

- 'Essential infrastructure' in Flood Zone 3a or 3b.
- 'Highly vulnerable' development in Flood Zone 2 (this is NOT permitted in Flood Zone 3a or 3b).
- 'More vulnerable' development in Flood Zone 3a (this is NOT permitted in Flood Zone 3b).

While the Exception Test is not explicitly required for sites at risk from other sources of flooding, the LPA should follow a similar principle where sites are proposed that are at risk from other sources of flooding, carefully weighing up the wider benefits of development against the risk, ensuring that site users can be kept safe through the lifetime of the development and ensuring residual risk can be safely managed.

For sites proposed for allocation within the local plan, the LPA should use the information in this SFRA to inform the Exception Test. At the planning application stage, the developer must design the site such that it is appropriately flood resistant and resilient in line with the recommendations in national and local planning policy and supporting guidance and those set out in this SFRA. This should demonstrate that the site will still pass the flood risk element of the Exception Test based on the detailed site level analysis.



† Diagram 3 of PPG: Flood Risk and Coastal Change (paragraph 033, Reference ID 7-033-20220825) Revised September 2025.

Figure 3-3: Application of the Exception Test to plan preparation

There are two parts to demonstrating whether a development passes the Exception Test that should be considered by the LPA when allocating development sites (and developers when required - see Section 3.3 for Exception Test requirements for individual planning applications).

Part A: Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk.

The LPA will need to set out the criteria used to assess the Exception Test and provide clear advice to enable applicants to provide evidence to demonstrate that it has been

passed. If the application fails to prove this, the LPA should consider whether the use of planning conditions and/or planning obligations could allow it to pass the Exception Test. If this is not possible, this part of the Exception Test has failed, and development should not be considered for allocation or granting planning permission.

Wider sustainability objectives should be considered, such as those set out in local plan sustainability appraisals. These generally consider matters such as the local economy, biodiversity, green infrastructure, housing, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.

The sustainability issues the development will address and how far doing so will outweigh the flood risk concerns for the site should also be considered, e.g., by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area, etc.

Part B: Demonstrating that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The LPA will need to set out the criteria used to assess the Exception Test and provide clear advice to enable applicants to provide evidence to demonstrate that it has been passed. If the application fails to prove this, the LPA should consider whether the use of planning conditions and/or planning obligations could allow it to pass the Exception Test. If this is not possible, this part of the Exception Test has failed, and planning permission should be refused.

In circumstances where the potential effects of proposed development are material, a Level 2 SFRA is likely to be needed to inform the Exception Test for strategic allocations to provide evidence that the principle of development can be supported. At the planning application stage, a site-specific FRA will be needed. Both will need to consider the undefended and residual risk and how this will be managed over the lifetime of the development.

3.4 Applying the Sequential Test and Exception Test to individual planning applications

3.4.1 Applying the Sequential Test

The LPA are responsible for considering the extent to which Sequential Test considerations have been satisfied.

Developers should consult with the LPA in the first instance before commencing on a site-specific FRA to determine the Sequential Test requirements for their site, including search area. Developers are required to apply the Sequential Test to all development sites, unless the site is:

- A strategic allocation and the test has already been carried out by the LPA as part of preparing the local plan, or

- A change of use (except to a caravan, camping or chalet site, or to a mobile home or park home site), or
- A minor development (householder development, small non-residential extensions with a footprint of less than 250m²), or
- A development in Flood Zone 1 unless there are other flood risk issues in the area of the development (i.e. surface water, groundwater, reservoir, sewer flooding).

The September 2025 update to the PPG sets out that the Sequential Test is also not required where *"a site-specific flood risk assessment demonstrates clearly that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development […], without increasing flood risk elsewhere"* (PPG, Paragraph 027).

It should also be noted that residential sub-divisions are exempt from the definition of minor development and therefore, by default, should also be subject to the Sequential Test.

This SFRA contains information on all sources of flooding and considers the impact of climate change. This should be considered when a developer undertakes the Sequential Test, including the consideration of reasonably available sites at lower flood risk.

It is a requirement that *'the sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk)*' (NPPF, Paragraph 175).

For CWaC, the area of search for alternative sites is the whole borough (unless other site specific/local circumstances relating to the catchment area for the type of development proposed apply). To determine the appropriate search area criteria for proposals that require a specific location, include information on the catchment area for the type of development being proposed. For some sites this may be clear, e.g. school catchments, in other cases it may be identified by other local plan policies. For some sites, e.g. regional distribution sites, it may be suitable to widen the search area beyond LPA administrative boundaries.

The sources of information on reasonably available sites may include but is not restricted to:

- Site allocations in local plans.
- Site allocations in Neighbourhood Plans.
- Sites with planning permission but not yet built out.
- Strategic Housing and Economic Land Availability Assessments (SHELAAs)/five-year land supply/annual monitoring reports.
- Locally listed sites for sale.

As stated in the September 2025 update to the PPG *"…where there are large areas in Flood Zones 2 and 3 (e.g. coastal towns and settlements on major rivers) and development*

is needed in those areas to sustain the existing community, sites outside them are unlikely to provide reasonable alternatives" (PPG, Paragraph 027a).

It may be that a number of smaller sites or part of a larger site at lower flood risk form a suitable alternative to a development site at high flood risk. Ownership or landowner agreement are not acceptable as reasons not to consider alternatives.

The PPG also states that the absence of a 5-year land supply is not a relevant consideration for the Sequential Test for individual applications (paragraph: 028)

3.4.2 Applying the Exception Test

Where a development proposal is in accordance with an allocation made in a local plan following the application of the Sequential and Exception Tests, the Exception Test will only be required to be repeated if:

- Elements of the development that were key to it satisfying the Exception Test at the plan-making stage (such as wider sustainability benefits to the community or measures to reduce flood risk overall) have changed or are not included in the proposed development; or
- The understanding of current or future flood risk has changed significantly.

For developments that have not been allocated in the local plan or where the Sequential Test was not applied at the development plan stage and new information becomes available that identifies a flood risk, developers must undertake the sequential and Exception Tests and present this information to the LPA for approval. The Level 1 SFRA can be used to scope the flooding issues that a site-specific FRA should investigate in more detail to inform the Exception Test for windfall sites.

The applicant will need to provide information that the application can pass both parts of the Exception Test.

4 Understanding flood risk

This section explores what flood risk is, key sources of flooding in the borough, and the factors that affect flooding including topography, soils, and geology.

This is a strategic summary of the risk in the borough to inform the application of the sequential and exceptions tests, if required. Developers should use this section of the SFRA together with the flood risk data included on the Council's online interactive mapping service and SFRA mapping in Appendix J to scope out the flood risk issues they need to consider in greater detail in a site-specific FRA to support a planning application. Information in this section should not be used to inform flood risk at a property-level.

4.1 Defining flood risk

Section 3 (subsection 1) of the Flood and Water Management Act 2010 (FWMA) (gov.uk) defines the risk of a potentially harmful event (such as flooding) as '*a risk in respect of an occurrence is assessed and expressed (as for insurance and scientific purposes) as a combination of the probability of the occurrence with its potential consequences*.' Figure 4-1 sets out this definition of risk.

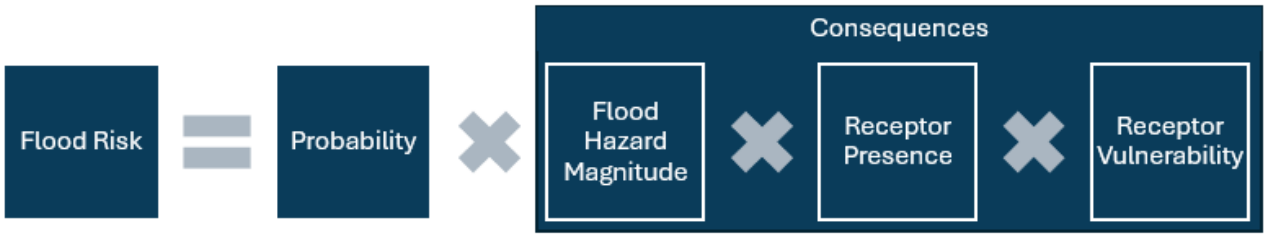


Figure 4-1: Conceptual model depicting how flood risk can be defined

4.1.1 Probability

The probability of flooding is expressed as a percentage based on the average frequency measured or extrapolated from records over many years. For example, **a 1% AEP indicates the flood level that has a 1% chance of occurring in any one year**, not that it will occur at least once every hundred years.

4.1.2 Consequences

The consequences of flooding include fatalities, property damage, disruption to lives and businesses, with severe implications for people (e.g., financial loss, emotional distress, health problems). Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality), the receptors that are present and the vulnerability of these receptors (type of development, nature, e.g., age-structure, of the population, presence, and reliability of mitigation measures etc).

4.1.3 Source-Pathway-Receptor model

Flood risk can be assessed using the Source-Pathway-Receptor model (Figure 4-2) where:

- The source is the origin of the floodwater, principally rainfall.
- A pathway is a route or means by which a receptor can be affected by flooding, which includes rivers, drains, sewers, and overland flow.
- A receptor is something that can be adversely affected by flooding, which includes people, their property, and the environment.

Figure 4-2: Source-Pathway-Receptor model

This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. All these elements must be present for flood risk to arise. Having applied the Source-Pathway-Receptor model it is possible to mitigate the flood risk by addressing the source (often very difficult), blocking, or altering the pathway, or removing the receptor, e.g., steer development away.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk. It is therefore important to define the components of flood risk to apply this guidance in a consistent manner.

4.2 Topography, geology, and soils

Topography, geology and soil are all important in influencing the way the catchment responds to a rainfall event. The degree to which a material allows water to percolate through it, the permeability, affects the extent of overland flow and therefore the amount of runoff reaching the watercourse. Steep slopes or clay rich (low permeability) soils will promote rapid surface runoff, whereas more permeable rock such as limestone and sandstone may result in a more subdued response due to greater infiltration.

4.2.1 Topography

The National LIDAR Programme (gov.uk) provides elevation data at a 1m spatial resolution for all of England.

As shown in Figure 4-3, the majority of the borough is relatively flat with the Dee and the Mersey estuaries in the west and the north respectively. There are hills towards the south of the borough, near the villages of Brown Knowl and Burwardsley. There are also hills within Delamere Forest, towards the centre of the borough.

4.2.2 Geology

Bedrock across the borough largely consists of till-diamicton. Alluvium is also present along watercourses (Figure 4-4). Glacial sand and gravel are present across the eastern side of Delamere Forest and part of Northwich; as well as beneath villages including Allostock, Sandiway, Hartford, Sutton Weaver and Higher Whitley. Glacial sand and gravel tend to be highly permeable, allowing water to flow freely through it. The permeability of alluvium can vary depending on its composition, though it is typically moderately to highly permeable. Till-diamicton has relatively low permeability due to the presence of fine particles like clay and silt. There are also two small areas of peat within the borough: north of Bridge Trafford, along the River Gowy; and north of Antrobus, to the west of Park Moss Nature Reserve. The permeability of peat varies. Upper layers of peat tend to be less compacted and therefore more permeable than lower layers.

A map detailing the extents of this bedrock and further superficial geology across the borough can be viewed online in the British Geology Society Geology Viewer (bgs.ac.uk).

The EA also provides mapping, on the Magic Map, of different types of aquifers, the underground layers of water-bearing permeable rock from which groundwater can be extracted. Aquifers are designated as either principal or secondary aquifers. Principal aquifers are designated by the EA as strategically important rock units that have high permeability and water storage capacity.

Much of the bedrock on the western side of the borough, including beneath Chester, Ellesmere Port and Neston is classified as a Principal aquifer. On the eastern side of the borough, Frodsham, along with many villages including Tarporley, Tiverton, Sutton Weaver and Sandiway are above bedrock classified as a Secondary B aquifer. Halite bedrock is also present around Northwich, which affects the use of infiltration SuDS due to dissolution.

4.2.3 Soils

Soils across the borough are varied. Soilscapes are a classification of soils in England and Wales, conveying a summary of the regional differences in the soil landscapes. Around Delamere Forest, Soilscapes 6 (freely draining slightly acid loamy soils), 10 (freely draining slightly acid sandy soils) and 14 (freely draining very acid sandy and loamy soils) are present. These soils are freely draining to local groundwater and rivers. These soils may be vulnerable to leaching of nitrates and pesticides to groundwater. Soilscape 18 (slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils) is present

across a large part of the borough. This soil is slowly permeable and seasonally wet. Drainage to the stream network may is impeded. Along rivers, floodplain soils with naturally high groundwater are present. These soils are also vulnerable to pollution from floodwaters. The use of infiltration SuDS should be carefully considered. The British Geological Survey website (bgs.ac.uk) provides data on soils across the borough.

The Coal Mining Reporting Area in Neston, as identified on the Mining Remediation Authority web mapping, indicates potential for ground instability and mining hazards due to historic coal extraction. This may mean that is unsuitable for installation of infiltration SuDS within this area. In addition, parts of Northwich and Winsford area affected by historic salt and brine extraction, which can result in ground subsidence and stability issues. Therefore, site-specific ground investigations should be undertaken in these areas to determine the suitability of infiltration SuDS.

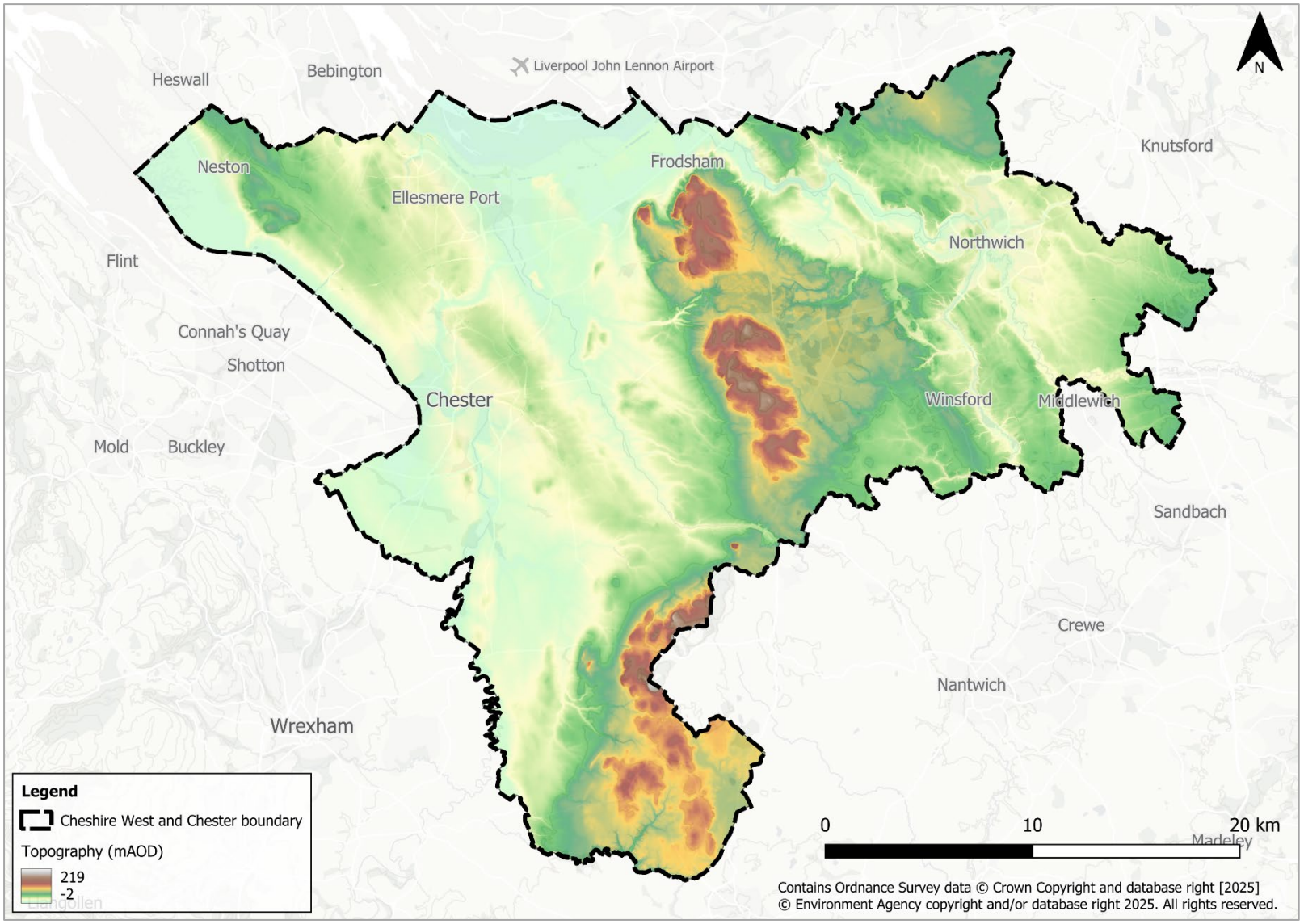


Figure 4-3: EA 1m LiDAR data showing the topography across the borough

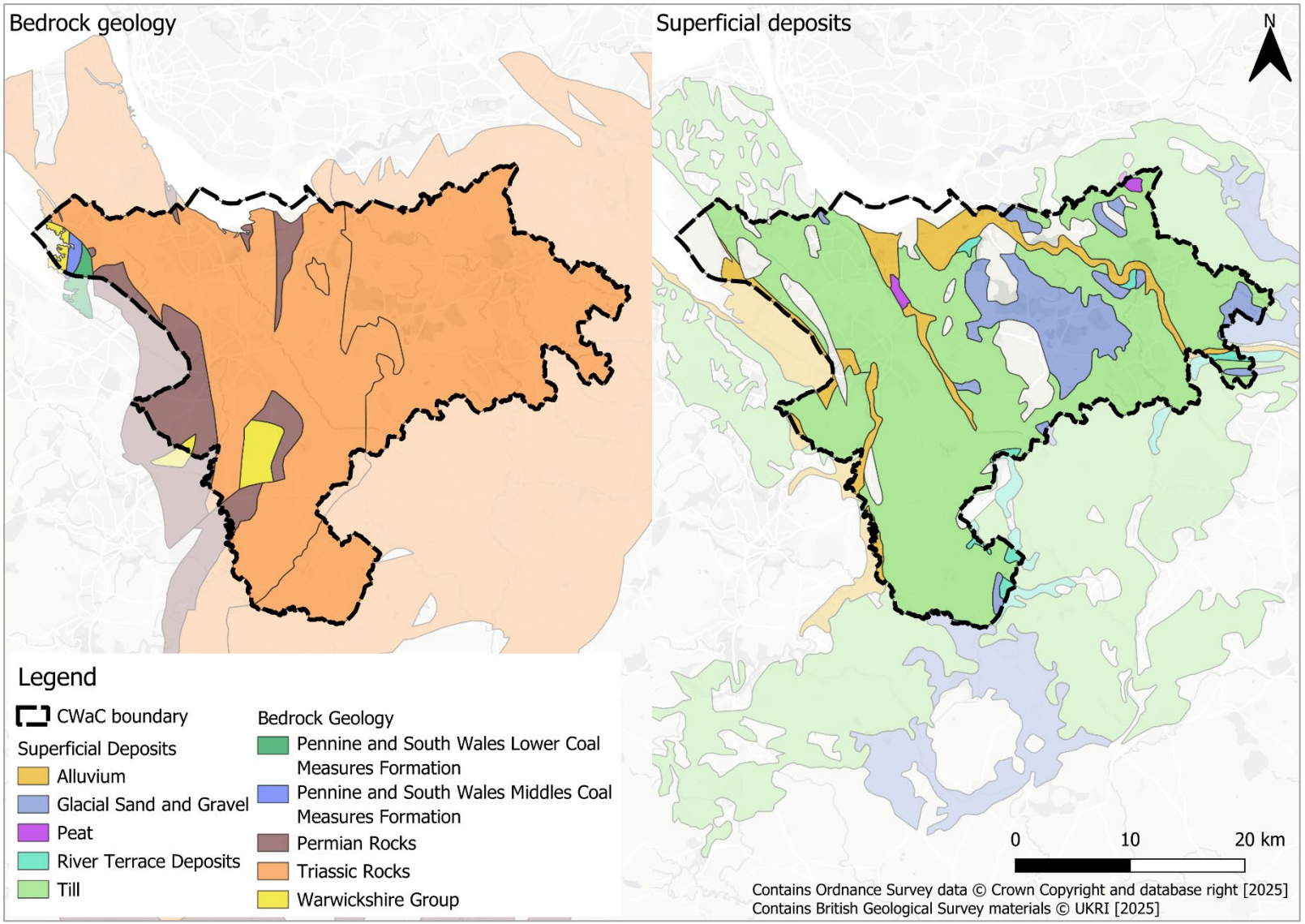


Figure 4-4: Bedrock geology and superficial deposits across the borough

4.3 Historical flooding

Records of past flood events can help to build a picture of areas and locations that may be prone to flooding and to help confirm flood modelling outputs. Historic flood events can also help RMAs to target where flood risk management or resilience works may be required based on tangible evidence.

4.3.1 LLFA historic flood records

LLFA's are required, under the FWMA (2010), to maintain and update a historic flood incidents database as and when any locally significant flood incidents occur. The LLFA has a statutory responsibility to investigate and report upon any 'locally significant' flood events. Details of these events are usually recorded in Section 19 reports which can be found on Cheshire West and Chester Council's website, these include:

- June 2016 - Ellesmere Port
- October 2019 - Northwich
- August 2023 - Great Sutton

The main source of flooding in Northwich, during the October 2019 event, was the rainfall event itself combined with elevated river levels and surface water flooding. During the flooding in Great Sutton in August 2023, heavy rainfall overwhelmed the highway drainage system and also raised water levels in Rivacre Brook resulting in out of bank flow. Information on the June 2016 Section 19 report covering Ellesmere Port can be requested from Cheshire West and Chester Council.

4.3.1.1 Section 19 investigations Storm Christoph - January 2021

As a result of Storm Christoph, the Council produced 20 Section 19 investigations which have been grouped into four areas of the borough; Chester, Ellesmere Port and Neston, Northwich and Winsford, and Rural areas. Flooding was reported in 28 separate areas across the borough which affected approximately 436 residential and commercial properties of which 195 experienced internal flooding. The flooding was widespread, with hotspots such as Acton Bridge and Weaverham, Northwich town centre, Tattenhall, Ellesmere Port and Hooton.

During Storm Christoph, flooding occurred as a result of out of bank flow from watercourses, overland flow and surface runoff, surface water ponding and surcharging of the drainage systems providing surface, highway and combined drainage. Areas were affected by one or multiple sources of flooding.

4.3.1.2 Section 19 investigations Storm Babet - October 2023

In response to the flooding experienced during Storm Babet, the Council produced 16 Section 19 investigations for the areas of the borough impacted consisting of:

- Acton Bridge and Weaverham
- Blacon

- Chester
- Christleton
- Crowton
- Great Barrow
- Higher Whitley
- Hooton
- Lower Kinnerton
- Malpas
- Neston
- Northwich
- Saughall
- Tattenhall
- Willaston
- Winsford

An overarching main report has also been produced. Flooding was reported in 16 separate areas. 59 residential and commercial properties were reported to have flooded internally. Hotspots of internal flooding included Chester, Lower Kinnerton and Blacon. Parts of Ashton Hayes, Dodleston, Lache and Vicars Cross were also impacted during the storm event. However, flooding was restricted to highways and separate reports have therefore not been produced for these areas.

During Storm Babet, flooding occurred largely as a result of surcharging of the drainage systems providing surface, highway and combined drainage, backing up of water at culvert inlets resulting in out of bank flow from watercourses, overland flow and surface runoff. There were also some instances of groundwater flooding, out of bank flow due to blockages in watercourses and flooding from balancing ponds/SuDS ponds. Areas were affected by one or multiple sources of flooding.

4.3.2 Historic fluvial and tidal flooding

The Cheshire West and Chester PFRA (2011) identifies four instances that the channel capacity was exceeded on a main river, including the River Dee, and 29 instances on ordinary watercourses based on internal records collected by the council. The EA's Recorded Flood Outlines (RFO) dataset also indicates past fluvial flooding in various areas within the borough, including in and around Chester, Lower Kinnerton, Dodleston, Aldford, Winsford, Guilden Sutton, Mickle Trafford, Thornton-le-Moors, Crowton and Acton Bridge (Section 4.3.2.1).

4.3.2.1 EA Historic Flood Map and Recorded Flood Outlines

The Historic Flood Map (HFM) is a spatial dataset showing the maximum extent of all recorded historic flood outlines from rivers, the sea and groundwater and shows areas of land that have previously been flooded across England. Records began in 1946 when predecessor bodies to the EA started collecting information about flooding incidents. The HFM accounts for the presence of defences, structures, and other infrastructure where

such features existed at the time of flooding. It includes flood extents that may have been affected by residual flooding such as overtopping, breaches or blockages. It is also possible that historic flood extents may have changed and that some areas would not flood at present i.e., if a flood defence has been built.

The HFM does not contain any information regarding the specific flood source, return period or date of flooding, nor does the absence of the HFM in an area mean that an area has never flooded, only that records of historic flooding do not exist. The RFO dataset however does include details of flood events. The difference between the two datasets is that the HFM only contains flood outlines that are 'considered and accepted' by the EA following adequate verification of the RFO dataset using certain criteria.

Figure 4-5 shows the EA's Recorded Flood Outlines across the borough, grouped by flood incident cause. The recorded historic flood events are largely confined to the River Dee floodplain, as a result of main river channel capacity exceedance. Historic main river flooding has also been recorded along the River Weaver at Northwich and Winsford; River Dane at Northwich; and along the River Gowy near Mickle Trafford. Flooding due to local drainage / surface water issues was recorded in Northwich in October 2021 during Storm Christoph in January 2021.

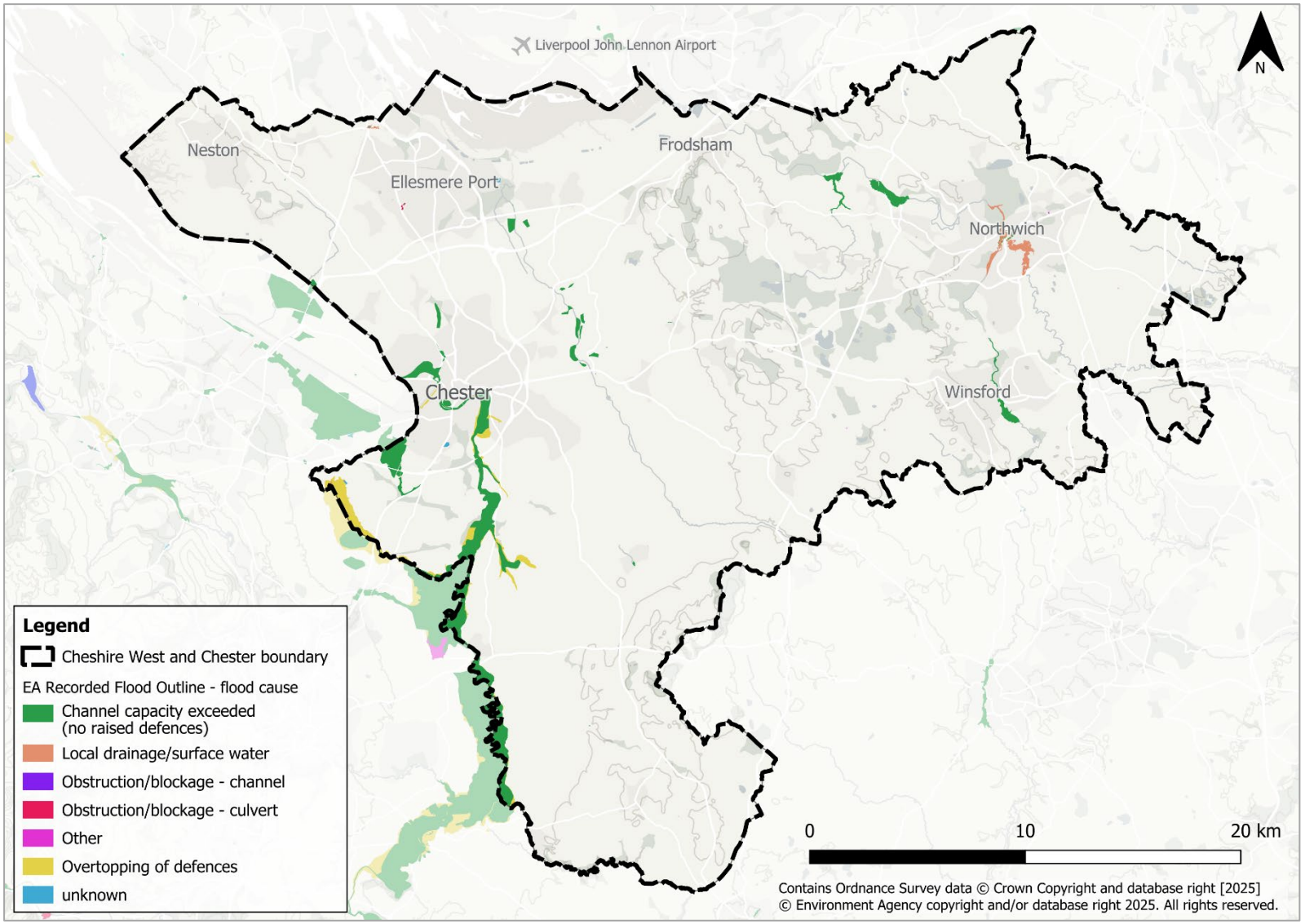


Figure 4-5: Environment Agency Recorded Flood Outlines in the authority area

4.3.3 Historic surface water flooding

According to the Cheshire West and Chester Local Flood Risk Management Strategy, localised agricultural land management and ground saturation, proved to be a major contributing factor during the second half of 2012 causing significant surface water flooding. The Cheshire West and Chester PFRA (2011) identifies 97 recorded historic surface water flooding incidents in the borough based on internal data, with substantial clusters of incidents in Ellesmere Port and Neston. Smaller clusters were noted in the urban areas of Chester and Northwich, though surface water incidents were recorded across the borough.

During Storm Christoph (as detailed in the Section 19 Main Report), overland flow from surface water runoff contributed to flooding at Acton Bridge and Weaverham, Ashton Hayes, Antrobus, Davenham, Great Barrow, Hooton, Mickle Trafford, Northwich, Saughall, Upton Park, Kingsley, Kelsall and Tilston. The areas that experienced highway flooding only, and no damage to property, included Comberbach, Dutton, Great Boughton, Guildon Sutton, Lach Dennis and Lostock, Sproston and Wettenhall.

The Section 19 investigation into flooding in Great Sutton in August 2023 concludes that heavy rainfall overwhelmed the highway drainage system and also raised water levels in Rivacre Brook resulting in water backing up at Archers Brook culvert, overtopping the bank and flooding properties on Kendal Drive.

The Section 19 investigations into the October 2023 Storm Babet flooding found that parts of Chester, Acton Bridge and Weaverham, Christleton, Crowton, Higher Whitley, Hooton Green, Neston, No Man's Heath, Northwich, Saughall, Tattenhall, Willaston and Winsford were impacted by surface water flooding.

4.3.4 Historic sewer flooding

The Cheshire West and Chester PFRA (2011) collected historic flooding incident data from the sewerage undertakers within the borough; United Utilities and Welsh Water. However, it is noted that the data is unlikely to be directly comparable due to potential differences in the data collection methodology used by the utility companies. Welsh Water provided data on historic instances of sewer flooding collected over a number of years. There were 490 reported incidents between 2001 and mid 2024 across all Welsh Water sewer assets, mainly clustered around the larger urban area of Chester with smaller clusters of incidents in the towns of Ellesmere Port, Malpas, Northwich, Frodsham and Winsford.

The Storm Christoph Section 19 Main Report explains surcharging of drainage networks (including highway, surface and combined) occurred in Acton Bridge and Weaverham, Ashton Hayes, Antrobus, Blacon, Davenham, Ellesmere Port, Hooton, Northwich, Saughall, Tattenhall, Willaston and Tarpoley.

The Storm Babet Section 19 flood investigations detail flooding, as a result of a surcharging sewer in Chester. Flooding due to surcharging highway and / or surface water drainage systems also occurred in Chester, Acton Bridge and Weaverham, Christleton, Higher Whitley, Northwich, Saughall, Willaston and Winsford.

4.3.5 Historic groundwater flooding

The EA's Catchment Flood Management Plans (CFMPs) state that groundwater flooding has occurred in some areas of the borough. These are localised issues and the risk of groundwater flooding is considered to be low at a catchment scale. There are no records of historic groundwater flooding that are considered as having significant harmful consequences.

Possible groundwater flooding is mentioned in the Section 19 flood investigation report for Storm Babet flooding in Neston, although the detailed flood mechanism is unknown.

4.4 NaFRA2

The National Flood Risk Assessment 2 (NaFRA2) is an assessment of flood risk from rivers, the sea and surface water using detailed local modelling and technical expertise. It shows the probability of flooding from rivers, the sea and surface water and takes into account flood defences. The benefits of NaFRA2 include:

- Improved data resolution - modelling uses higher resolution topography data and also considers flood defences in more detail, including their asset condition and standard of protection,
- Multiple sources of flooding - modelling includes interactions between fluvial, coastal and surface water flooding, providing a more integrated picture of flood risk,
- Climate change integration - modelling now accounts for future climate change scenarios, including sea level rise and increased rainfall, to help with future development planning.

While NaFRA2 represents a significant improvement in national and local flood risk modelling, it's important to recognise that the assessment may not be fully accurate in all areas. The models rely on a range of data sources, assumptions, and generalisations which, although robust at a national scale, may not capture all local conditions or recent changes on the ground. For example, small-scale drainage, recent developments, or informal flood defences may not be included.

Additionally, while surface water flooding is now considered, it is particularly complex to model accurately due to its dependence on local rainfall intensity, terrain, and infrastructure. As such, users should treat the NaFRA2 outlines as a strategic tool for understanding broad areas of risk and seek local or site-specific assessments where detailed accuracy is required.

Work is currently underway to correct these inaccuracies with the next release, at the time of writing, being planned for January 2026. Chester and Northwich are areas where there may be some inaccuracies with the current data.

4.5 Flood Map for Planning

The EA published a revised Flood Map for Planning on 25 March 2025, including for the datasets described below, which should be used to inform application of the Sequential

Test. However, there should be local agreement with the EA on the suitability of the 3.3% annual exceedance probability (AEP) defended dataset and the Rivers and Sea data for use in applying the Sequential Test.

4.5.1 Flood Zones

Fluvial and tidal flood risk is assessed based on Flood Zones of the Flood Map for Planning. The definitions of the Flood Zones are provided below. The Flood Zones do not consider defences, except when considering the functional floodplain (which is distinct from the Flood Map for Planning). This is important for planning long-term developments, as long-term policy and funding for maintaining flood defences over the lifetime of a development may change over time.

The Flood Zones are:

- Flood Zone 1: Low risk: less than a 0.1% chance of river or sea flooding in any given year.
- Flood Zone 2: Medium risk: between a 1% and 0.1% chance of river or sea flooding in any given year.
- Flood Zone 3a: High risk: between a 3.3% and 1% chance of river flooding in any given year or between a 3.3% and 2% change of flooding from the sea.
- Flood Zone 3b: Functional Floodplain: land where water has to flow or be stored in times of flood (greater than a 3.3% chance of river or sea flooding in any given year, accounting for defences). Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes. Annex 3 of the NPPF (gov.uk) provides information on flood risk vulnerability.

Important note on Flood Zone information in this SFRA

The Flood Zone maps for the borough are provided on the Council's online interactive mapping service and SFRA mapping in Appendix J. These have been derived from the EA's Flood Map for Planning (FMfP) (gov.uk) and detailed hydraulic modelling received from the EA and LLFA.

Flood Zones 2 and 3a within this SFRA are largely similar in extent as the online EA's Flood Map for Planning (FMfP) (which incorporates latest modelled data). There may be some instances where detailed model extents have been superseded by new national modelling where they were not deemed to be of sufficient quality for inclusion within the FMfP. Table 4-1 documents the detailed models provided by the EA for consideration within this assessment.

Table 4-1: Environment Agency detailed models

Model	Watercourse(s)	Model year
Balderton	Balderton Brook	2014

Model	Watercourse(s)	Model year
Dee CFMP	River Dee, River Alwen, River Ceiriog, River Alyn, River Clywedog	2008
Finchett's Gutter	Finchett's Gutter, Sealand Main Drain, Bache Brook	2015
Gonger	Gonger Brook	2009
Gowy	River Gowy and tributaries	2017
Ince and Frodsham	Ince Marshes, Hornsmill Brook, Frodsham Marshes, River Weaver, MSC	2011
Lower Dee	River Dee	2007
Lower Dee Fluvial	River Dee	2010
Lower Weaver	River Weaver	2019
Mersey Estuary	River Mersey	2016
Middlewich	River Weaver, River Wheelock, River Dane, River Croco, Alum Brook, Howty Brook, Loach Brook, Sanderson Brook, Dane-in-Shaw Brook	2009
Mill Windle	Mill Brook, Windle Brook	2010
Manchester Ship Canal	Manchester Ship Canal	2016
Northwich	River Weaver	2003
Northwich	River Weaver, River Dane	2017
Rivacre Brook	Rivacre Brook	2017
River Weaver	River Weaver	2010
Shotwick Brook	Shotwick Brook	2007
Tattenhall	Mill Brook	2014
Tidal Dee	River Dee	2007
Tidal Dee	River Dee	2015
Wade, Crow, Red Lion Brook	Wade Brook (also known as Crow Brook and Red Lion Brook)	2010

The EA Flood Zones do not cover all catchments or ordinary watercourses with areas <3km². Where the EA have suitable data for smaller catchments, this will also be shown in the Flood Zones. As a result, whilst the EA Flood Zones may show an area is in Flood Zone 1, there may be a flood risk from a smaller watercourse(s) not shown in the Flood Zones. Flood defences should be considered when delineating the functional floodplain.

Further work should be undertaken as part of a detailed site-specific FRA to define and refine the extent of Flood Zone 3b where no detailed modelling exists. Caution should also be applied where the conservative Flood Zone 3b extent encompasses existing urban areas which would not otherwise be "designed to flood". Developers should consult the LPA on the derivation of the functional floodplain. The methodology for functional floodplain delineation is set out within the technical note in Appendix D.

4.5.2 3.3% AEP defended dataset

Present day and future defended 3.3% (1 in 30 year) AEP of flooding from rivers and the sea. This dataset should be the starting point for LPAs to delineate the functional floodplain (Flood Zone 3b) and a future Flood Zone 3b through the SFRA, subject to local agreement with the EA.

- The specific climate change scenarios used include:
  - Central allowance for the 2080s epoch (2070-2125) for risk of flooding from rivers
  - Upper End allowance for risk of flooding from the sea, accounting for cumulative sea level rise to 2125.

4.5.3 Rivers and Sea data

This data is designed to support the use of the Flood Zones and includes flood events with and without defences for present day and with the impacts of climate change:

- Present day and future defended and undefended:
  - Undefended: 0.1% AEP (1 in 1000) rivers and sea
  - Undefended: 1% AEP (1 in 100) rivers and 0.5% AEP (1 in 200) sea
  - Defended: 0.1% AEP (1 in 1000) rivers and sea
  - Defended: 1% AEP (1 in 100) rivers, 0.5% AEP (1 in 200) sea

The Rivers and Sea data may show inconsistent results where localised or national modelling has been used or where there is currently poor quality of data.

4.6 Fluvial flood risk across the borough

According to the EA's Flood Map for Planning (as shown in Figure 4-6), the majority of fluvial flood risk comes from the fluvial River Dee, the River Gowy, the River Weaver and their tributaries in the west, central and eastern areas of the borough respectively. These areas include rural land, and the towns of Chester, Winsford and Northwich. In the north of the borough, industrial areas on the bank of the Manchester Ship Canal are within Flood

Zones 2 and 3. Risk comes from the River Gowy and its tributaries as well as from tributaries of the River Mersey.

The fluvial flood risk within the Council's proposed broad growth areas across the borough are detailed in Appendix C and shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

The impacts of climate change on fluvial flooding are discussed in Section 5.2.

4.7 Tidal flood risk across the borough

According to the EA's Flood Map for Planning (as shown in Figure 4-6), areas located along the Dee Estuary such as Neston, Little Neston and Parkgate; and along the Mersey Estuary such as Ellesmere Port, are most susceptible to tidal flooding.

The tidal flood risk within the Council's potential growth areas (identified in the Local Plan Regulation 18 Issues and Options document) across the borough is detailed in Appendix C and shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

The impacts of climate change on tidal flooding are discussed in Section 5.4.

4.8 Wave overtopping

Tidal flood risk can be assessed using Extreme Still Water Sea Levels (ESWSL). An ESWSL is the level the sea is expected to reach during a storm event for a particular magnitude tidal flood event as a result of the combination of tides and surges. As these levels are based on ‘still’ water, the effect of short-term fluctuations in sea level associated with wind and swell waves are not included in these predictions but should be considered at locations where wind and wave effects are influential.

In exposed locations along the coast, and within the major estuaries, landward flooding is more likely to occur as a consequence of wave overtopping than inundation. Wave overtopping is a term, which encompasses a number of complex physical processes, which result in the transfer of water from the sea onto the coastal floodplain. The amount of wave overtopping that occurs during an extreme event is dependent on the local water depth, the properties of incoming waves and the geometry of local flood defences. Wave overtopping is one of the principal mechanisms of flooding for the coastal frontage.

4.9 Hydraulic locking

Hydraulic locking or tide locking occurs when watercourses and drainage systems are unable to discharge during the high tide period, which can result in watercourses and / or sewer drainage networks exceeding capacity.

4.10 Coastal erosion risk

In coastal locations the risk of flooding is linked to the stability of the coastline. If the coast is eroding, then the potential effect is that tidal flood defences near to the sea will be lost

and flood risk will increase. To maintain an appropriate standard of safety from flooding it is sometimes necessary to implement works to slow down or stop the rate of coastal erosion and so maintain the integrity of the tidal defences.

Areas susceptible to coastal erosion, as outlined in the Shoreline Management Plan for Great Ormes Head to Scotland (SMP 22) include Little Neston, Parkgate and Burton Point, all within the Dee Estuary. There are some areas adjacent to the Mersey Estuary documented as being susceptible to future coastal erosion, notably north of Ellesmere Port, however these areas are not anticipated to extend any further south than the Manchester Ship Canal.

4.10.1 Coastal change

The NPPF defines Coastal Change Management Areas (CCMAs) as areas identified in a local plan as likely to be affected by physical change to the shoreline through erosion, coastal landslip, permanent inundation, or coastal accretion.

The PPG states a CCMA will only be defined where rates of shoreline change are significant over the next 100 years, taking account of climate change. They will not need to be defined where the accepted shoreline management plan policy is to hold or advance the line (maintain existing defences or build new defences) for the whole period covered by the plan, subject to evidence of how this may be secured.

The shoreline management plan policy for Burton Point to Thurstaston Cliffs (policy unit 11A5.5) for the short, medium and long-term, is No Active Intervention. This section of coastline includes the town of Neston and Burton village to the south. The Council may decide to identify this area as a CCMA within the new Local Plan.

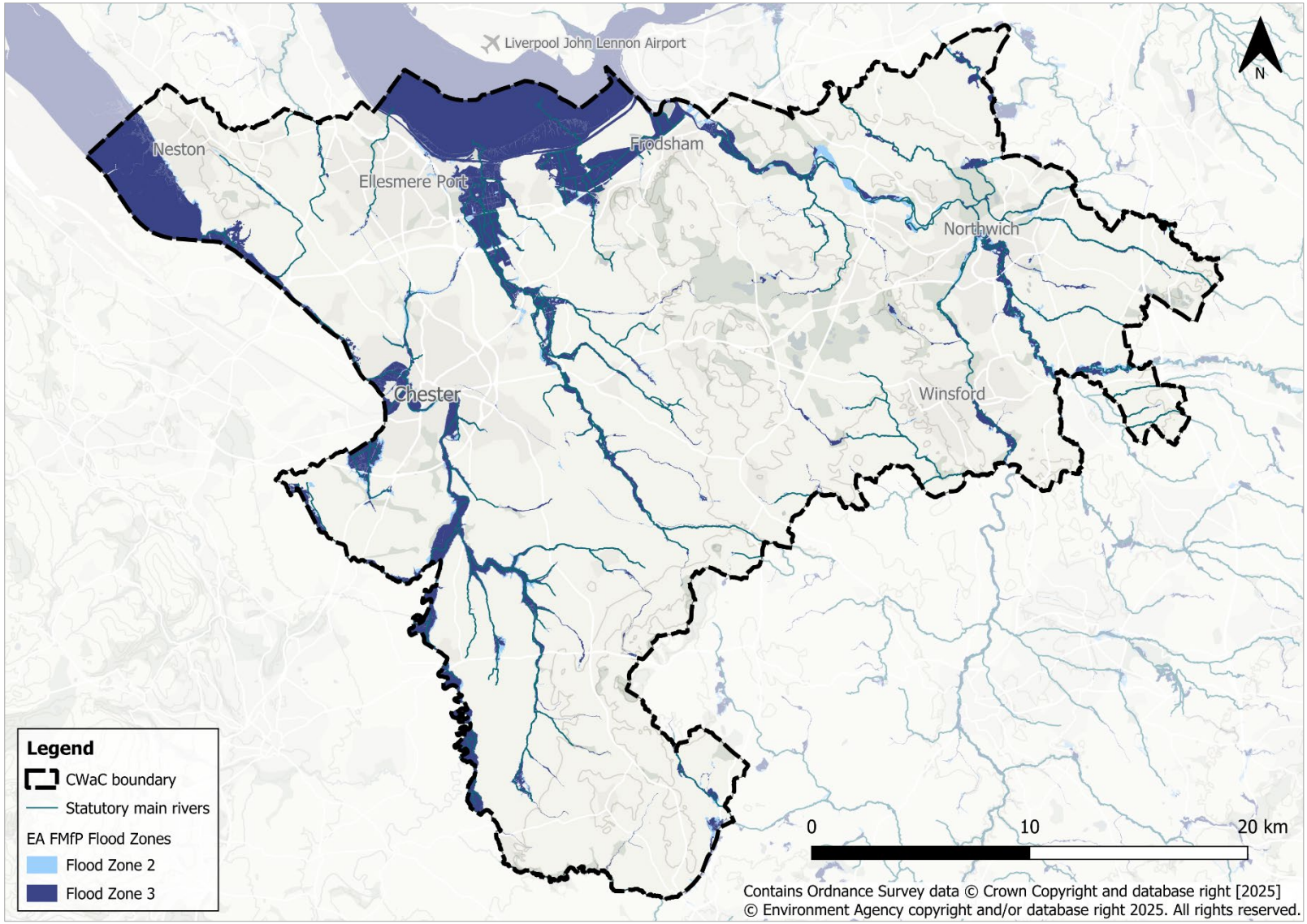


Figure 4-6: EA's Flood Map for Planning for Rivers and Sea - Flood Zones

4.11 Surface water flood risk

Surface water runoff is most likely to be caused by intense downpours e.g. thunderstorms. At times, the amount of water falling can completely overwhelm the drainage network, which is not designed to cope with extreme storms. The flooding can also be complicated by blockages to drainage networks, sewers being at capacity and/or high-water levels in watercourses that cause local drainage networks to back up.

The EA's Risk of Flooding from Surface Water mapping (RoFSW) (gov.uk) has been used to assess surface water risk within this SFRA. These maps are intended to provide a consistent standard of assessment for surface water flood risk across England and Wales in order to help LLFAs, the EA, and any potential developers to focus their management of surface water flood risk.

Risk of Flooding from Surface Water is now included in the Flood Map for Planning and includes for the following present day events:

- 0.1% AEP (1 in 1000 year)
- 1% AEP (1 in 100 year)
- 3.3% AEP (1 in 30 year)

The RoFSW should not be used to understand flood risk for individual properties but is suitable for high level assessments such as SFRAs for local authorities.

The EA's RoFSW (as shown in Figure 4-7) highlights several communities in the borough at risk from surface water flooding. Modelled high risk of surface water flooding is widespread across the borough. Surface water flow paths generally follow the topography of existing watercourses, although there are some areas at risk from isolated ponding. Additionally, surface water flow routes are also established on roads in the more urban areas within the borough highlighting risk to transport networks while posing a risk to buildings which water can be routed to.

Surface water flood risk within the potential broad growth areas across the borough is described in Appendix C. The RoFSW mapping for the borough can be found on the Council's online interactive mapping service and SFRA mapping in Appendix J.

The impacts of climate change on surface water flooding are discussed in Section 5.3.

4.12 Sewer flood risk

Sewer flooding occurs when intense rainfall/river flooding overloads sewer capacity (surface water, foul or combined), and/or when sewers cannot discharge to watercourses due to high water levels. Sewer flooding can also be caused by blockages, collapses, equipment failure or groundwater leaking into sewer pipes.

Since 1980, the Sewers for Adoption guidelines mean that new surface water sewers have been designed to have capacity for a 3.3% AEP rainfall event, although until recently this did not apply to smaller private systems. This means that sewers can be overwhelmed in larger rainfall and flood events.

New developments should not cause additional pressures on existing sewers due to the requirements to maintain greenfield runoff rates. However, increases in rainfall as a result of climate change can lead to existing sewers becoming overloaded, although this can be reduced through the use of well-designed SuDS to reduce surface water runoff.

United Utilities and Dŵr Cymru Welsh Water are the water companies responsible for the management of the sewerage networks across the borough. Dŵr Cymru Welsh Water's area of coverage area incorporates Chester, and surrounding villages including Neston, Saughall, Tarvin, Tattenhall, Farndon and Malpas.

As of 2024, Dŵr Cymru Welsh Water hold record of 17 internal and 65 external sewer flooding incidents. These records include incidents between 2015 and 2024. Dŵr Cymru Welsh Water have also modelled 16 potential external sewer flooding incidents.

The areas with the most flood incident records are Chester, Saltney, Christleton, Huntington and Little Neston.

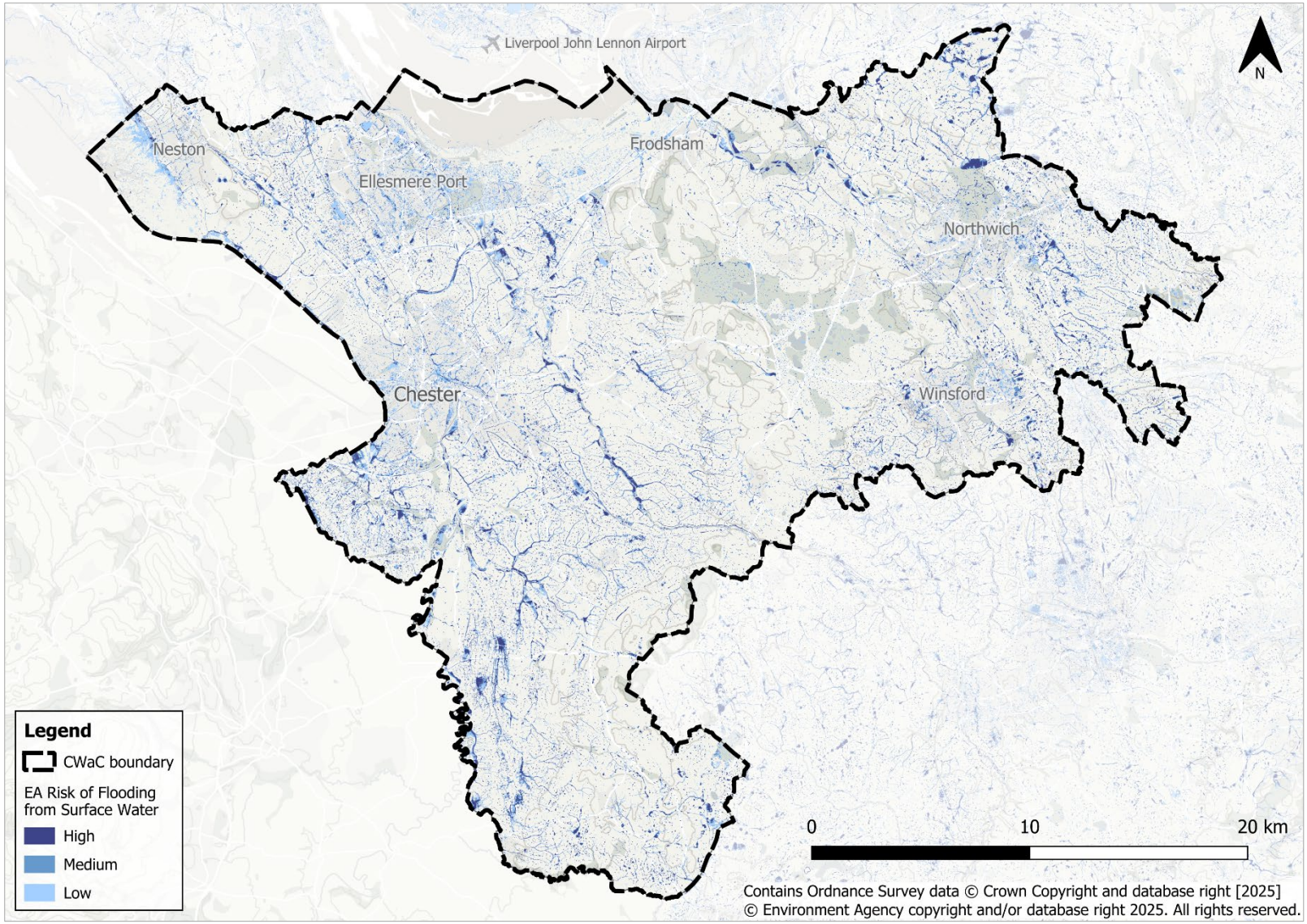


Figure 4-7: Risk of Flooding from Surface Water mapping

4.13 Groundwater flood risk

In general, less is known about groundwater flooding than other sources of flooding and availability of data is limited. Groundwater flooding can be caused by:

- High water tables, influenced by the type of bedrock and superficial geology.
- Seasonal flows in dry valleys, which are particularly common in areas of chalk geology.
- Rebounding groundwater levels, where these have been historically lowered for industrial or mining purposes.
- Where there are long culverts that prevent water easily getting into watercourses.
- Perched aquifers underlain by impermeable geology, particularly in low lying areas.

Groundwater flooding is different to other types of flooding. It can last for days, weeks, or even months and is much harder to predict and warn for. Monitoring does occur in certain areas, for example where there are major aquifers or in areas of historic mining.

The JBA Groundwater Emergence map shows the likelihood of groundwater emergence posing a risk to both surface and subsurface assets, based on predicted groundwater levels during a 1% AEP event. This divides groundwater emergence into five categories (Table 4-2).

Table 4-2: JBA Groundwater Emergence Map category descriptions.

Risk category number	Category	Potential risk
4	Groundwater levels are either at or very near (within 0.025m of) the ground surface.	Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
3	Groundwater levels are between 0.025m and 0.5m below the ground surface.	Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
2	Groundwater levels are between 0.5m and 5m below the ground surface.	There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
1	Groundwater levels are at least 5m below the ground surface.	Flooding from groundwater is not likely.
0	No risk.	This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.

It should be noted that this dataset only identifies areas likely to be at risk of groundwater emergence and does not allow prediction of the likelihood of groundwater flooding or quantification of the volumes of groundwater that might be expected to emerge in a given area.

This JBA Groundwater Emergence map is shown in Figure 4-8 and on the Council's online interactive mapping service. Areas with the greatest risk of groundwater emergence include:

- Aldford
- Allostock
- Burton
- Chester
- Chorlton
- Clutton
- Delamere
- Dunham on the Hill
- Frodsham
- Great Sutton, Ellesmere Port
- Helsby
- Norley
- Tattenhall
- Tilston
- Whitegate

A site-specific assessment for groundwater may be required to fully inform the likelihood of emergence to subsurface and surface areas. This may involve seasonal percolation testing and ground investigations.

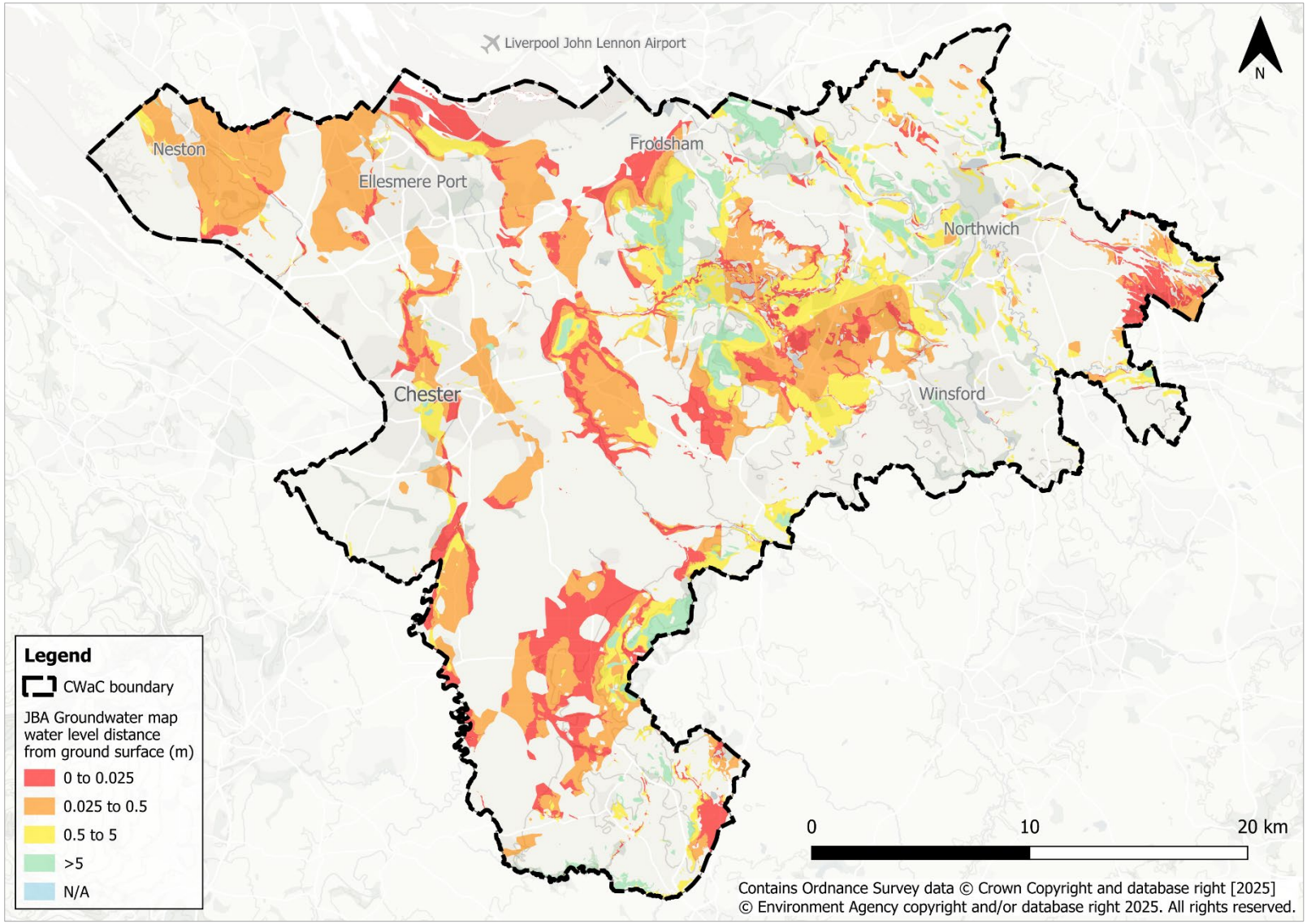


Figure 4-8: JBA Groundwater Emergence Map

4.14 Residual risk

Residual risk comes in two main forms (PPG: Flood Risk and Coastal Change Paragraph: 041):

- Residual risk from flood risk management infrastructure.
- Residual risk to a development once any site-specific flood mitigation measures are taken into account.

Examples of residual flood risk from flood risk management infrastructure include:

- A breach of a raised flood defence, blockage of a surface water conveyance system (culvert) or failure of a pumped drainage system;
- Failure of a reservoir / impounded waterbody; and
- A flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot accommodate.

This SFRA does not assess the probability of failure. However, in accordance with the NPPF, all sources of flooding need to be considered. If a breach or overtopping event were to occur, then the consequences to people and property could be high. It is the responsibility of the developer to fully assess flood risk, propose measures to mitigate it and demonstrate that any residual risks can be safely managed.

Examples of residual flood risk to a development to consider include:

- The depth of internal flooding predicted after any raising of land or finished floor levels;
- The flood hazard to which people would be exposed on access or escape routes after they have been raised; and
- A failure of flood forecasting or flood warning and the risks associated with people not receiving warnings or acting upon them.

4.14.1 Canal flood risk

Canals are regulated waterbodies and are unlikely to flood unless there is a sudden failure of an embankment or a sudden ingress of water from a river in areas where they interact closely. Embankment failure can be caused by:

- Lack of or poor maintenance.
- Culvert collapse.
- Overtopping.
- Animal burrowing.
- Subsidence/sudden failure e.g., collapse of former mine workings.
- Utility or development works close or encroaching onto the footings of a canal embankment.

Flooding from a breach of a canal embankment is largely dictated by canal and ground levels, canal embankment construction, breach characteristics and the volume of water

within the canal that can discharge into the lower lying areas behind the embankment. The volume of water released during a breach is dependent on the pound length (i.e. the distance between locks) and how quickly the operating authorities can react to prevent further water loss, for example by the fitting of stop boards to restrict the length of the canal that can empty through the breach, or repair of the breach. The Canal & River Trust monitor embankments at the highest risk of failure for canalised systems that they own.

The Manchester Ship Canal runs through the north of the borough, owned by the Peel Group. All other canals within the borough are owned and maintained by the Canal & River Trust. The Shropshire Union Canal is joined by the River Dee in Chester. The Trent and Mersey Canal and Weaver Navigation are both located within the east of the borough. Llangollen Canal is located along part of the southern boundary of the borough and neighbouring authorities Cheshire East and Shropshire. Within the borough, the Canal & River Trust holds record of 11 canal breach and three overtopping incidents. Details of these incidents are shown in Table 4-3.

Table 4-3: Canal & River Trust canal breach and overtopping incident records

Date	Canal	Location	Incident type	Details
1770	Trent and Mersey	Near Dutton Hall	Breach	Failure during or shortly after construction
21/07/1907	Trent and Mersey	Marbury	Breach	Embankment failure from leakage through subsidence
21/07/1907	Trent and Mersey	Marbury	Breach	Long term geotechnical instability
24/01/1989	Trent and Mersey	Little Leigh	Breach	Embankment failure from leakage
1991	Shropshire Union	Stanthrone / Middlewich	Breach	Minor breach
19/01/2005	Trent and Mersey	Dutton	Breach	Dutton Railway culvert failure adjacent to canal
30/01/2009	Shropshire Union	Near Tattenhall	Overtopping	Flooding to towpath
25/09/2012	Trent and Mersey	Dutton	Breach	Geotechnical instability
25/09/2012	Trent and Mersey	Croxton	Overtopping	Collapse of embankment. Inflow from River Croco lead to increased levels in the pound
25/10/2013	Shropshire Union	Moston	Breach	Culvert failure from dredging operations
25/10/2013	Shropshire Union	Moston	Breach	Culvert failure from dredging operations
27/11/2014	Trent and Mersey	Dutton	Breach	Embankment leak

Date	Canal	Location	Incident type	Details
16/03/2018	Trent and Mersey	Middlewich	Breach	Unknown
01/04/2019	Llangollen Canal	Near Povey's lock	Overtopping	Flooding to ditch and towpath. Water backed up in ditch, due to debris build up, and flowed over canal towpath into the canal.

The canals have the potential to interact with other watercourses in the borough. These have the potential to become flow paths if these canals were overtopped or breached. Any development proposed adjacent to a canal should include a detailed assessment of how a canal breach may impact the site, as part of a site-specific FRA. Guidance on development near canals is available from the Canal and River Trust (canalrivertrust.org.uk).

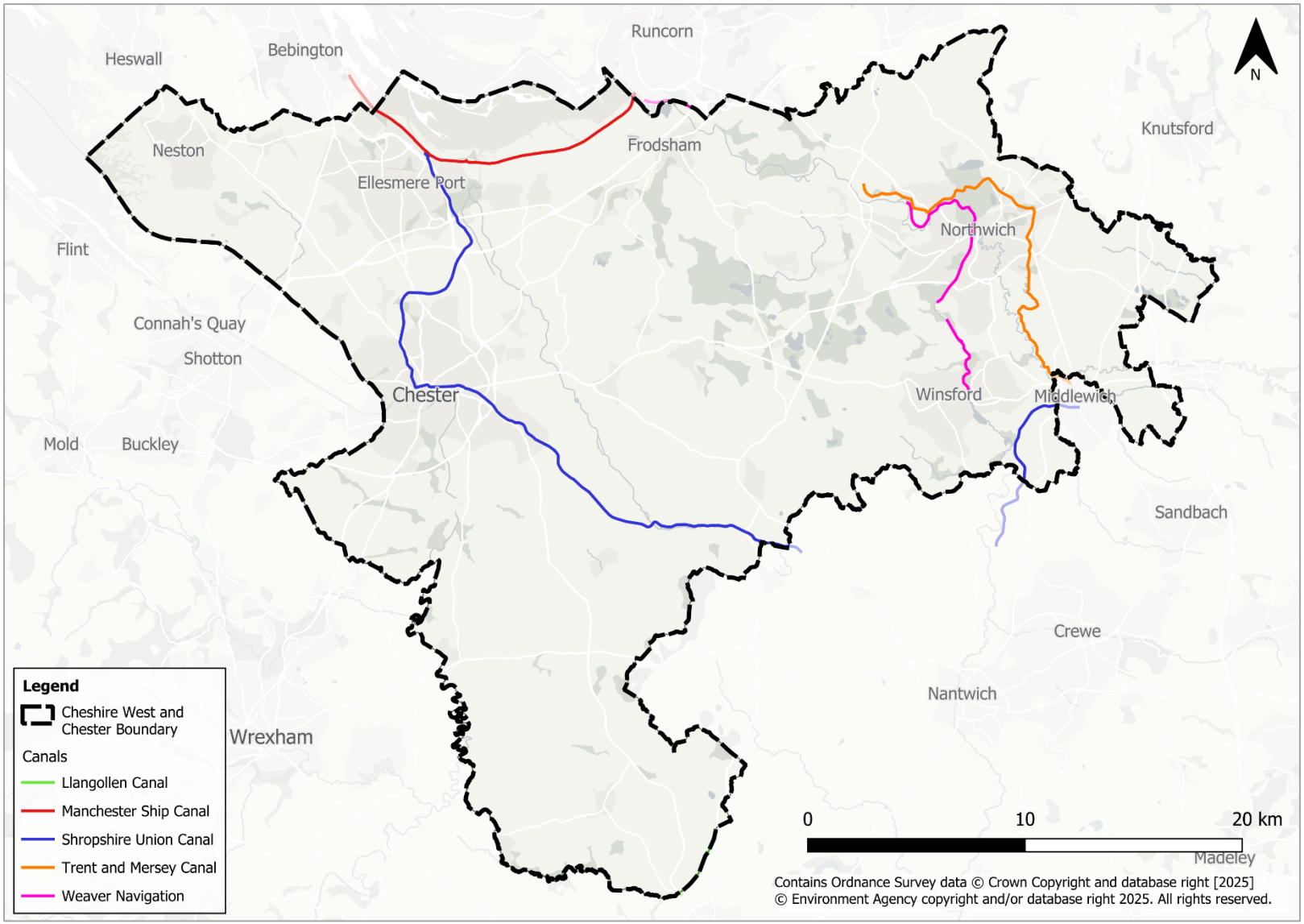


Figure 4-9: Location of the canals in the borough

4.14.2 Reservoir flood risk

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoirs Act 1975 (gov.uk) and are on a register held by the EA. The level and standard of inspection and maintenance required by a Supervising Panel of Engineers under the Act means that the risk of flooding from reservoirs is very low.

Reservoirs have a designated "risk category" set by the potential damage and loss of life in circumstances where there is a breach or an extreme flood event. Reservoirs designated as high risk are subject to increased inspection and maintenance requirements. However, this designation does not mean they are at a high risk of flooding. Allocation of new development downstream of an existing reservoir could potentially change the reservoir's risk category and result in a legal requirement to improve the structural and hydraulic capacity of the dam. As the cost of implementing such works can be substantial, consideration should be given to whether it would be more appropriate to place development in alternative locations not associated with such risk.

Flooding from reservoirs occurs following partial or complete failure of the control structure designed to retain water in the artificial storage area. Reservoir flooding is very different from other forms of flooding; it may happen with little, or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate but is extremely low compared to flooding from other sources. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure.

The EA's Reservoir Flood Map (RFM) shows the potential consequences of reservoir failure. Developers and planners should check the Long-Term Risk of Flooding (gov.uk) before using the reservoir data shown in this SFRA to make sure they are using the most up to date mapping.

4.14.2.1 Reservoir Flood Map

The EA provide two flooding scenarios for the reservoir flood maps: a ‘dry-day’ and a ‘wet-day’. The ‘dry day’ scenario shows the predicted flooding which would occur if the dam or reservoir fails when rivers are at normal levels. The ‘wet day’ scenario shows the predicted worsening of the flooding which would be expected if a river is already experiencing an extreme natural flood. It should be noted that these datasets give no indication of the likelihood or probability of reservoir flooding. The EA maps represent a credible worst-case scenario. In these circumstances it is the time to inundation, the depth of inundation, the duration of flooding and the velocity of flood flows that will be most influential.

The EA also provides the 'fluvial contribution' extent which shows the extent of river flooding added to the reservoir model to determine the impacts of failure on a wet-day. This can be compared with the Flood Map for Planning to gauge the impact a flood from a reservoir may have.

The current mapping shows that there are 11 reservoirs located within the borough and a further 18 reservoirs located outside the borough which may pose a risk within the borough (detailed in Table 4-4). The reservoir RFM is shown in Figure 4-10.

The RFM is shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

In addition to the risk of inundation, those considering development in areas affected by breach events should also assess the potential hydraulic forces imposed by the rapid flood event and check that that the proposed infrastructure fabric can withstand the loads imposed on the structures by a breach event.

Table 4-4: Reservoirs with flood extents that impact the borough.

Reservoir	Easting and Northing	Reservoir owner	Risk Category	Local Authority	Does reservoir impact borough in 'dry day' scenario?
Alwen Reservoir	295521, 352871	Conwy	Contact NRW	Conwy	Yes
Belgrave Farm (ID 195)	339654, 361170	Moore Newsum	Not high-risk	Cheshire West and Chester	Yes
Bosley	392200, 365900	Canal & River Trust	High-risk	Cheshire East	Yes
Boughton Treatment Works - East	342100, 366612	Severn Trent Water	High-risk	Cheshire West and Chester	Yes
Boughton Treatment Works - North and Mid	342100, 366612	Severn Trent Water	High-risk	Cheshire West and Chester	Yes
Boughton Treatment Works - South	342085, 366525	Severn Trent Water	High-risk	Cheshire West and Chester	Yes
Cae-Llwyd	327030, 348013	Wrexham	Contact NRW	Wrexham	Yes
Capesthorne Middle Lake	384100, 372600	Sir William Bromley-Davenport	Not high-risk	Cheshire East	No
Finchett's Gutter	339000, 367500	Environment Agency	High-risk	Cheshire West and Chester	Yes
Freshwater and Wellwater A	331077, 372449	Flintshire	Contact NRW	Flintshire	Yes
Knoll's Bridge	339600, 369300	Environment Agency	High-risk	Cheshire West and Chester	Yes

Reservoir	Easting and Northing	Reservoir owner	Risk Category	Local Authority	Does reservoir impact borough in 'dry day' scenario?
Llyn Brenig	297597, 354115	Welsh Water	Contact NRW	Conwy	Yes
Llyn Celyn	287853, 340035	Welsh Water	Contact NRW	Gwynedd	Yes
Llyn Tegid (Bala Lake) Breach 1	292426, 335532	Snowdonia National Park Authority	Contact NRW	Gwynedd	Yes
Llyn Tegid (Bala Lake) Breach 2	293083, 335229	Snowdonia National Park Authority	Contact NRW	Gwynedd	Yes
Manley Mere	348700, 372300	Mr and Mrs MJ Houlbrooke	High-risk	Cheshire West and Chester	Yes
Manor Pool (ID 355)	358293, 371014	Delamere Manor Events Limited	High-risk	Cheshire West and Chester	Yes
Marchweil	334657, 348534	Welsh Water	Contact NRW	Wrexham	Yes
Redesmere	384800, 371700	Mr Nicholas Bromley Davenport	High-risk	Cheshire East	Yes
Rhodeswood	404400, 398200	United Utilities PLC	High-risk	High Peak	No
Rode Pool	381500, 357500	Mr Randle Baker Wilbraham	High-risk	Cheshire East	No
Sharkerley Mere	373275, 371150	Cheshire West & Chester Council	High-risk	Cheshire West and Chester	Yes
Simmonds Hill	351616, 372773	United Utilities PLC	High-risk	Cheshire West and Chester	Yes

Reservoir	Easting and Northing	Reservoir owner	Risk Category	Local Authority	Does reservoir impact borough in 'dry day' scenario?
Sutton	391800, 370100	Canal & River Trust	High-risk	Cheshire East	Yes
Sutton Hall	337000, 375600	United Utilities PLC	High-risk	Cheshire West and Chester	Yes
Tabley Mere	372300, 376800	The Crown Estate	High-risk	Cheshire East	Yes
Torside	405600, 398300	United Utilities PLC	High-risk	High Peak	No
Ty-mawr	327647, 348108	Hafren Dyfrdwy	Contact NRW	Wrexham	Yes
Woodhead	408200, 399400	United Utilities PLC	High-risk	High Peak	No

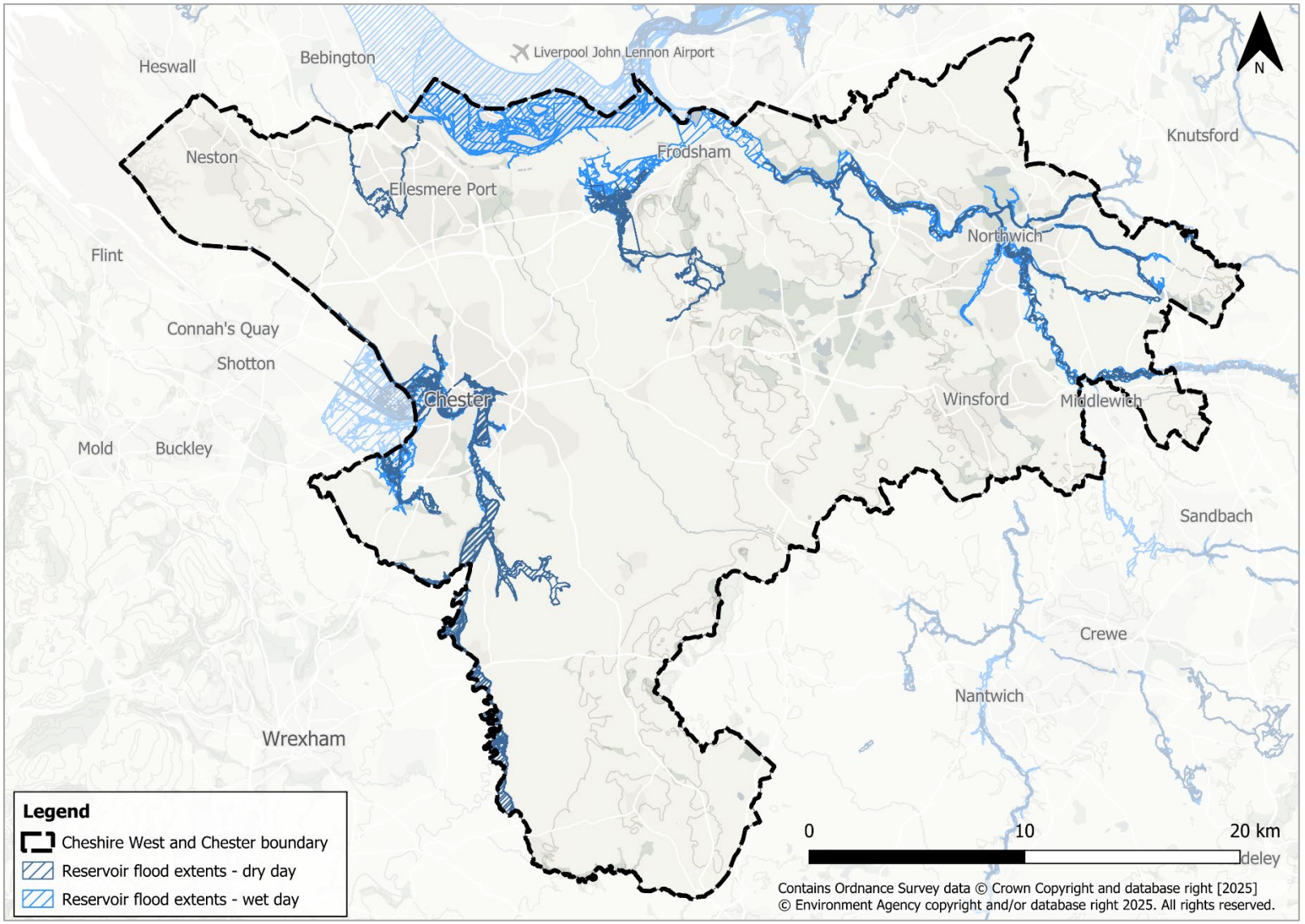


Figure 4-10: EA Reservoir Flood Map within the borough

4.15 Combined sources of flood risk

- In coastal locations, such as Neston, Parkgate and Ellesmere Port, the combined effect of increased runoff volumes to outfalls during a rainfall / fluvial event where there is tide locking can increase flood risk due to the discharge of outflows being prevented.
- In urban areas, surface water drainage networks and sewer systems are closely linked, with their interaction significantly influencing flood risk. Traditional urban drainage relies on impermeable surfaces directing rainwater into pipes and culverts, which often connect to combined sewers carrying both wastewater and stormwater. During heavy rainfall, these systems can become overwhelmed, leading to overflows that discharge untreated sewage into watercourses, exacerbating flooding and pollution.

4.16 Summary of flood risk in the borough

A table summarising all sources of flood risk to the potential growth areas within the borough can be found in Appendix C. These are potential growth areas identified in the Local Plan Regulation 18 Issues and Options document, as areas or broad locations for development if not enough land can be identified within settlements to meet development needs. The potential growth areas are grouped around 17 locations, as listed below:

For this summary, the borough has been divided into broad growth areas, based on 92 areas provided by the Council, aggregated into 17 larger areas. The broad growth areas are listed below:

- Chester
- Northwich
- Winsford
- Cuddington and Sandiway
- Farndon
- Frodsham
- Helsby, Ince and Elton
- Kelsall and Tarvin
- Malpas
- Neston and Parkgate
- Tarporley
- Tattenhall
- Acton Bridge
- Capenhurst
- Delamere
- Hooton and Little Sutton
- Mouldsworth

5 Impact of climate change

The NPPF sets out that flood risk should be managed over the lifetime of a development, taking climate change into account. This section sets out how the impact of climate change should be considered.

5.1 Climate change guidance

The Climate Change Act 2008 (legislation.gov.uk) creates a legal requirement for the UK to put in place measures to adapt to climate change and to reduce carbon emissions by at least 80% below 1990 levels by 2050. This was updated in June 2019 under the Climate Change Act 2008 (2050 Target Amendment) Order (legislation.gov.uk) to a 100% reduction (or net zero) by 2050.

In 2018, the Met Office published new UK Climate Projections (UKCP18) (gov.uk). The EA used these projections to update their guidance on climate change allowances for new developments for peak river flows (July 2021) and peak rainfall intensities (May 2022). This includes information on how these allowances should be included in both SFRAs and FRAs. The guidance adopts a risk-based approach considering the vulnerability of the development and considers risk allowances on a management catchment level, rather than a river basin level. The management catchments for the borough are shown in Figure 5-1. The North West and Dee transitional and coastal (TraC) catchments refer to estuarine and coastal catchments which do not have associate peak river flow allowances. For these areas, refer to the sea level rise allowances in Section 5.4.

Developers should check Flood risk assessments: climate change allowances (gov.uk) for the most recent guidance before undertaking a detailed FRA.

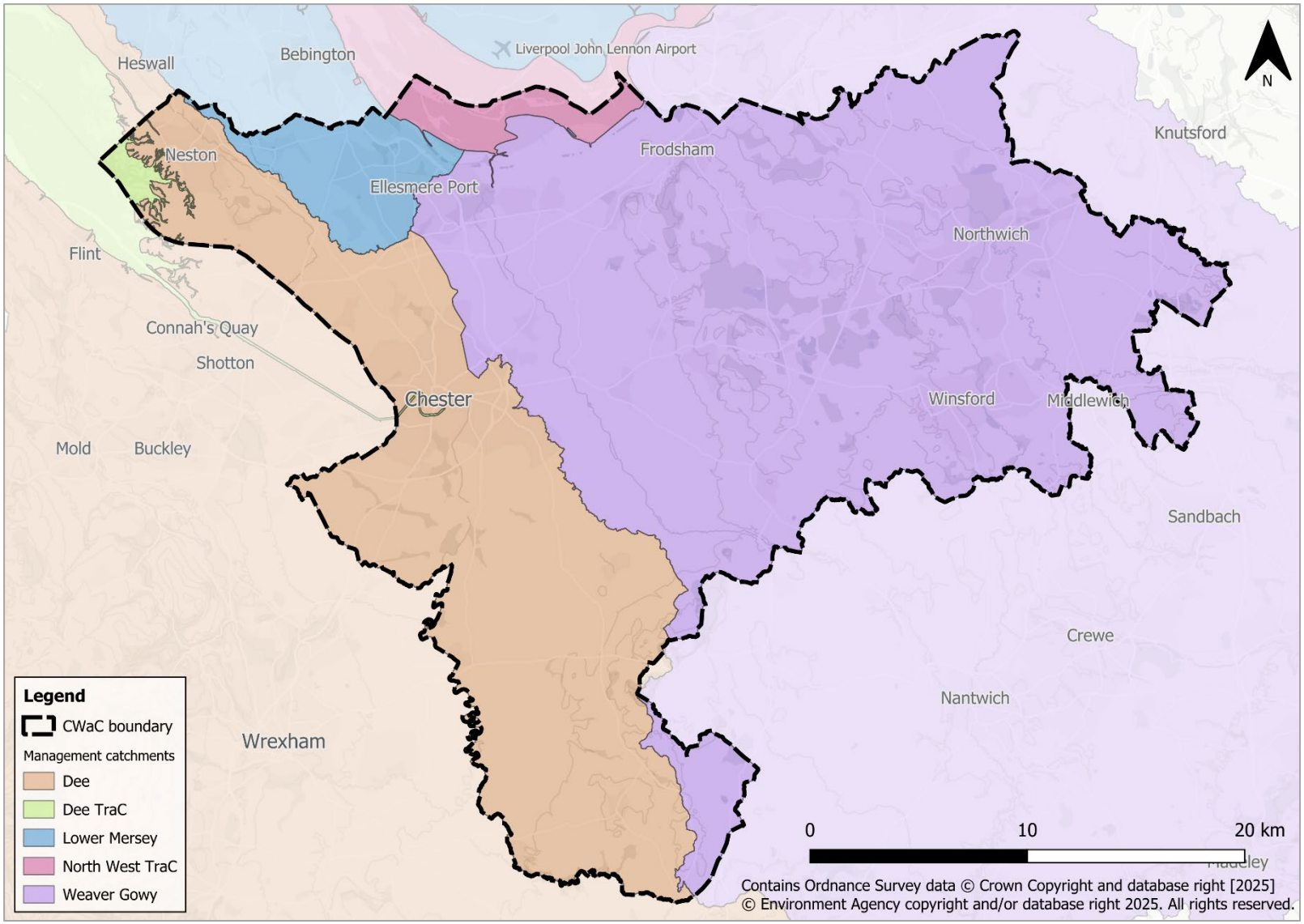


Figure 5-1: Management catchments (assigned by the EA) across the borough

5.2 Peak river flows

Climate change is expected to increase the frequency, extent and impact of flooding, reflected in peak river flows. Wetter winters and more intense rainfall may increase fluvial flooding and surface water runoff and there may be increased storm intensity in summers. Rising river levels may also increase flood risk.

The peak river flow allowances (gov.uk) provided in the guidance shows the anticipated changes to peak flows for the management catchment within which the subject watercourse is located. The range of allowances are based on percentiles which describe the proportion of possible scenarios that fall below an allowance level:

- The central allowance is based on the 50th percentile (exceeded by 50% of the projections in the range).
- The higher central allowance is based on the 70th percentile (exceeded by 30% of the projections in the range).
- The upper end allowance is based on the 95th percentile (exceeded by 5% of the projections in the range).

These allowances (increases) are provided in the form of figures for the total potential change anticipated, for three climate change periods or epochs:

- The '2020s' (2015 to 2039).
- The '2050s' (2040 to 2069).
- The '2080s' (2070 to 2125).

The time period used in the assessment depends upon the expected lifetime of the proposed development. Residential development should be considered for a minimum of 100 years, whilst the lifetime of a non-residential development depends upon the characteristics of that development but a period of at least 75 years is likely to form a starting point for assessment. Further information on what is considered to be the lifetime of development is provided in the PPG (gov.uk).

5.2.1 Peak river flow allowances

The borough is located within the Dee, Weaver Gowy and Lower Mersey management catchments for peak river flow allowances. The tables below display the peak river flow allowances that apply to the borough.

Table 5-1: Peak river flow allowances for the Dee Management Catchment.

Allowance category	Total potential change (%) anticipated for '2020s' (2015 to 2039)	Total potential change (%) anticipated for '2050s' (2040 to 2069)	Total potential change (%) anticipated for '2080s' (2070 to 2125)
Upper end	26	32	50
Higher Central	16	19	30
Central	12	14	22

Table 5-2: Peak river flow allowances for the Weaver Gowy Management Catchment.

Allowance category	Total potential change (%) anticipated for '2020s' (2015 to 2039)	Total potential change (%) anticipated for '2050s' (2040 to 2069)	Total potential change (%) anticipated for '2080s' (2070 to 2125)
Upper end	36	34	106
Higher Central	24	40	67
Central	19	30	52

Table 5-3: Peak river flow allowances for the Lower Mersey Management Catchment.

Allowance category	Total potential change (%) anticipated for '2020s' (2015 to 2039)	Total potential change (%) anticipated for '2050s' (2040 to 2069)	Total potential change (%) anticipated for '2080s' (2070 to 2125)
Upper end	32	55	90
Higher Central	22	35	57
Central	18	27	44

5.2.2 Which peak river flow allowance to use?

The EA guidance states that both the central and higher central allowances should be assessed in SFRAs. However, the higher central allowance is only required to be assessed where there is planned 'essential infrastructure'.

The Flood Zone and flood risk vulnerability classification (gov.uk) should be considered when deciding which allowances apply to the development or the plan. Specific guidance for which climate change allowance estimates should be applied can be found in the EA climate change guidance (gov.uk).

5.2.3 Representation of fluvial climate change within the Level 1 SFRA

The Flood Map for Planning now includes for the Flood Zones plus Climate Change dataset. This shows how the combined extent of Flood Zones 2 and 3 could increase with climate change, ignoring the presence of defences. This dataset uses the Central allowance for the 2080s epoch for the risk of flooding from rivers.

The fluvial climate change mapping is shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

5.3 Peak rainfall intensities

Climate change is predicted to result in wetter winters and increased summer storm intensities in the future. This increased rainfall intensity will likely negatively impact land and urban drainage systems, resulting in surface water flooding, due to the increased volume of

water entering the systems. The EA have developed a peak rainfall allowances map (gov.uk) which shows anticipated changes in peak rainfall intensity which can be used for site-scale applications (like urban drainage design) and surface water flood mapping in small catchments (<5km^2).

The guidance suggests that direct rainfall modelling may not be suited to larger (>5km^2) catchments with rural land use. In these instances, the guidance states that the fluvial flood risk affected by climate change should be assessed using uplifts from peak river flow allowances (Section 5.2).

5.3.1 Peak rainfall intensity allowances for the borough

The borough is located within the Dee, Weaver Gowy and Lower Mersey management catchments for peak rainfall allowances. The tables below show the peak rainfall allowances that apply to the borough.

Table 5-4: Peak rainfall intensity allowances for small and urban catchments for Dee Management Catchment.

Allowance category	Total potential change (%) anticipated for '2050s' (2022 to 2060) 3.3% AEP	Total potential change (%) anticipated for '2050s' (2022 to 2060) 1% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 3.3% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 1% AEP
Upper end	35	40	40	45
Central	20	25	30	30

Table 5-5: Peak rainfall intensity allowances for small and urban catchments for Weaver Gowy Management Catchment.

Allowance category	Total potential change (%) anticipated for '2050s' (2022 to 2060) 3.3% AEP	Total potential change (%) anticipated for '2050s' (2022 to 2060) 1% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 3.3% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 1% AEP
Upper end	35	40	40	45
Central	20	25	25	30

Table 5-6: Peak rainfall intensity allowances for small and urban catchments for Lower Mersey Management Catchment.

Allowance category	Total potential change (%) anticipated for '2050s' (2022 to 2060) 3.3% AEP	Total potential change (%) anticipated for '2050s' (2022 to 2060) 1% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 3.3% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 1% AEP
Upper end	35	40	40	45
Central	20	25	30	30

5.3.2 Which peak rainfall intensity allowance to use?

Rainfall intensity climate change uplifts should be applied to both the 3.3% and 1% AEP events. The recommended epoch and use of either the central or upper end allowances should be based on the design lifetime of the proposed development. Further details are provided within the EA climate change guidance (gov.uk). For FRAs and SFRAs the upper end allowance should be used. The EA guidance recommends that the upper end allowance is considered for both the 3.3% and 1% AEPs for the 2070's epoch (2061 to 2125), unless the allowance for the 2050's epoch (2022 to 2060) is higher, in which case this should be used. This is appropriate for development with a lifetime beyond 2100. For development with a shorter lifetime the central allowance can be used.

5.3.3 Representation of surface water climate change within the Level 1 SFRA

The NaFRA2 RoFSW mapping received a significant update and was published January 2025. It now includes one modelled climate change scenario, the 2050s central allowance for the 3.3%, 1% and 0.1% AEP events. However, as stated above, the upper end allowance on peak rainfall for the 2070s should be assessed in SFRAs. Therefore, at the time of writing, the available national surface water climate change mapping, is unsuitable for consideration in development planning.

For this Level 1 SFRA, the low risk RoFSW extent is considered as a conservative proxy for the medium risk plus climate change extent. The proxy surface water climate change mapping is shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

5.4 Sea level rise

Increasing global temperatures are leading to ocean warming. This is resulting in sea level rise from two different mechanisms: as the oceans warm seawater expands and the melting of ice over land is resulting in further water adding to the ocean.

5.4.1 Sea level rise allowances for the borough

The borough is located within the North West river basin district (RBD) and Dee RBD. EA climate change guidance states that parts of the Dee RBD that are within England, should

use the North West sea level rise allowances. Table 5-7 shows the sea level rise allowances that apply to the borough.

Table 5-7: Sea level allowances for the North West RBD for each epoch in mm for each year (based on a 1981 to 2000 baseline). The total sea level rise for each epoch is in brackets.

Allowance category	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
Upper end	5.7 (200)	9.9 (297)	14.2 (426)	16.3 (489)	1.41
Higher central	4.5 (158)	7.3 (219)	10 (300)	11.2 (336)	1.01

5.4.2 Which sea level rise allowance to use?

FRAs and SFRAs should assess both the higher central and upper end allowances. The H++ climate change allowance (gov.uk) should be applied where it is appropriate to apply a credible maximum scenario (gov.uk). Further details are provided within the EA climate change guidance (gov.uk).

5.4.3 Representation of sea level rise climate change within the Level 1 SFRA

The Flood Map for Planning now includes for the Flood Zones plus Climate Change dataset. This shows how the combined extent of Flood Zones 2 and 3 could increase with climate change, ignoring the presence of defences. This dataset uses the Upper End allowance for risk of flooding from the sea, accounting for cumulative sea level rise to 2125.

The tidal climate change mapping is shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

5.5 Groundwater

The effect of climate change on groundwater flooding, and those watercourses where groundwater has a large influence on winter flood flows, is much more uncertain than other types of flooding. Milder wetter winters may increase the frequency of groundwater flooding incidents in areas that are already susceptible, but warmer drier summers may counteract this effect by drawing down groundwater levels to a greater extent during the summer months. The effect of climate change on groundwater levels for sites in areas where groundwater is known to be an issue, as informed by the JBA Groundwater Emergence map (Section 4.13), should be considered at the planning application stage.

5.6 Adapting to climate change

PPG: Climate Change (gov.uk) Paragraph 003 (Reference ID: 6-003-20140612) contains information and guidance for how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. Paragraph 005 (Reference ID: 6-005-20140306) also provides considerations for the LPA on dealing with the

uncertainty of climate risks and accounting for climate change in a realistic way within developments.

6 Flood risk infrastructure

This section provides a summary of existing flood alleviation schemes and assets in the borough. Planners should note the areas that are protected by defences where further work to understand the undefended and residual flood risk through a Level 2 SFRA may be beneficial. Developers should consider the benefit they provide over the lifetime of a development in a site-specific FRA.

6.1 Asset management

RMAs hold databases of flood risk management and drainage assets according to their jurisdiction as follows:

- The EA holds a national asset database that is updated by local teams.
- The LLFA is compiling a register of significant local flood risk assets, required under Section 21 of the FWMA (2010).
- Highways authorities hold databases of highways drainage assets, such as gullies and connecting pipes.
- Water companies hold records of public surface water, foul and combined sewers, the records may also include information on culverted watercourses.

The databases include assets RMAs directly maintain and third-party assets. The drainage network is extensive and will have been modified over time. It is unlikely that any RMA contains full information on the location, condition, and ownership of all the assets in their area. RMAs generally take a prioritised approach to collecting asset information, which will continue to refine the understanding of flood risk over time.

6.2 Standards of Protection

Flood defences are designed to give a specific Standard of Protection (SoP), reducing the risk of flooding to people and property in flood prone areas. For example, a flood defence with a 1% AEP SoP means that the flood risk in the defended area is reduced to at least a 1% chance of flooding in any given year.

Over time the actual SoP provided by the defence may decrease, for example due to deterioration in condition, lack of maintenance, or increases in flood risk due to climate change. The understanding of SoP may also change over time as RMAs undertake more detailed surveys and flood modelling studies.

It should be noted that the EA's ongoing hydraulic modelling programme may revise flood risk datasets and, therefore, the SoP offered by flood defences in the area may differ from those discussed in this report.

6.3 Maintenance

Different authorities have responsibilities relating to maintenance of flood risk assets, set out in Table 6-1. It is important that the authorities work in partnership to maintain flood risk assets and manage flood risk across the borough.

Table 6-1: Flood risk asset maintenance responsibilities based on the FWMA (2010).

Authority	Asset maintenance responsibilities
EA	Permissive powers to maintain and improve main rivers, ultimate responsibility for maintaining watercourses rests with the landowner.
Local authorities	Permissive powers to maintain and improve ordinary watercourses, ultimate responsibility for maintaining watercourses rests with the landowner.
LLFA	Permissive powers, limited resources are prioritised and targeted to where they can have the greatest effect.
Highways authorities	Duty to maintain public roads, making sure they are safe, passable, and the impacts of severe weather have been considered. Responsible for maintaining sections of watercourses where they are crossed by highways.
Water companies	Duty to effectually drain their area. What this means in practise is that assets are maintained to common standards and improvements are prioritised for the parts of the network that do not meet this standard e.g., where there is frequent sewer flooding.
Riparian owners	Responsible for the protection of their properties from flooding as well as other management activities, for example by maintaining riverbeds/banks, controlling invasive species, and allowing the flow of water to pass without obstruction.

There is potential for the risk of flooding to increase in areas where flood alleviation measures are not maintained regularly. Breaches in raised flood defences are most likely to occur where the condition of a flood defence has degraded over time. Drainage networks can frequently become blocked with debris. Blockages of culverts and bridge openings can also occur.

Developers should not assume that any defence, asset, or watercourse is being or will continue to be maintained throughout the lifetime of a development. They should contact the relevant RMA about current and likely future maintenance arrangements and make future users of the development aware of their obligations to maintain watercourses.

Formal structural defences are given a rating based on a grading system for their condition. A summary of the grading system used by the EA for condition is provided in Table 6-2.

Table 6-2: Grading system used by the EA to assess flood defence condition.

Grade	Rating	Description
1	Very good	Cosmetic defects that will have no effect on performance.
2	Good	Minor defects that will not reduce the overall performance of the asset.
3	Fair	Defects that could reduce the performance of the asset.
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation required.
5	Very poor	Severe defects resulting in complete performance failure.

Source: Condition Assessment Manual – EA 2006

6.4 Major flood risk management assets in the borough

The EA retired the Flood Map for Planning 'Areas Benefiting from Defences' (ABD) dataset in December 2022. Developers can now enter an address into the EA Flood Map for Planning (gov.uk) to get information about their specific site and request FRA data for planning (also known as Product 4). The EA's Asset Information Management System (AIMS) dataset can also indicate areas of raised flood defences that may benefit a specific site.

The main areas of the borough where there is likely to be a reduced flood risk due to defences include:

- Chester, particularly the racecourse and Sealand Road / Greyhound retail park areas;
- Stanlow Refinery;
- Land north of the M56 near Frodsham and Helsby; and
- Northwich town centre.

This corresponds with the locations of flood defences within the borough, as shown in the EA's AIMS dataset. The AIMS flood defence dataset gives further information on flood defence assets within the borough. Table 6-3 details the locations which benefit from formal flood defences within the AIMS dataset. Developers should refer to the AIMS Spatial Flood Defences dataset (gov.uk) for further information on specific flood defences. The AIMS dataset is shown on the Council's online interactive mapping service and SFRA mapping in Appendix J.

Table 6-3: Locations included in the EA 'AIMS' data set.

Watercourse /Coastline	Location	Type	Design SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Ownership
Aldford Brook / Coddington Brook	Aldford	Embankment (7)	20% AEP (6) 1% AEP (1)	Unknown (6) 3 (1)	Unknown (6) 3 (1)	Private individual, company or charity (6), EA (1)
River Dee	Aldford	Embankment (5)	10% (2) Unknown (3)	Unknown (5)	Unknown (5)	Private individual, company or charity (5)
River Dee, Balderton Brook, Yew Tree Drain, Bache Brook, Backford Brook, Finchett's Gutter / Sealand Main Drain	Chester	Demountable defence (1), Spillway (2), Wall (20), Embankment (27)	Unknown (20), 1% AEP (20), 0.5% AEP (6), 5% AEP (4)	4 (1), 3 (5), Unknown (44)	3 (4), 2 (2), Unknown (44)	EA (31), private individual, company or charity (12), Unknown (1), Local authority (6)
River Gowy/ Stanlow Pool, Mill Brook, Thornton Brook	Mickle Trafford to Stanlow Oil Refinery	Wall (4), Embankment (89)	1% AEP (60), 20% AEP (28), Unknown (5)	3 (88), 4 (1), Unknown (4)	2 (1), 3 (84), 4 (4), Unknown (4)	EA (89), private individual, company or charity (4)
River Gowy	Stamford Mill	Embankment (4)	20% AEP (3), Unknown (1)	3 (3)	3 (3)	EA (3), private

Watercourse /Coastline	Location	Type	Design SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Ownership
						individual, company or charity (1)
Carden Brook	Stretton Water Mill	Embankment (2), Spillway (1)	Unknown (3)	Unknown (3)	Unknown (3)	Local authority (2), private individual, company or charity (1)
Mill Brook	Tattenhall	Embankment (2)	Unknown (2)	Unknown (2)	Unknown (2)	Private individual, company or charity (2)
Weaver Navigation	North of Meadowbank	Embankment (5)	Unknown (5)	Unknown (5)	Unknown (5)	Private individual, company or charity (5)
River Weaver / Weaver Navigation	Hartford Bridge to Weaver Viaduct	Embankment (9)	Unknown (9)	Unknown (9)	Unknown (9)	Private individual, company or charity (9)

Watercourse /Coastline	Location	Type	Design SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Ownership
Weaver Navigation, River Dane, Wade Brook	Northwich	Demountable defence (6), Embankment (12), Flood Gate (13), Wall (44)	5% AEP (4), 1% AEP (64), Unknown (7)	3 (73) Unknown (2)	1 (20), 2 (49), 3 (4), Unknown (2)	EA (73), private individual, company or charity (2)
Weaver Navigation / River Weaver	Wallerscote Landfill and Salters Ford	Embankment (7)	Unknown (7)	Unknown (7)	Unknown (7)	Private individual, company or charity (7)
Crowton Brook, Small Brook	Crowton	Embankment (2)	Unknown (2)	Unknown (2)	Unknown (2)	Private individual, company or charity (2)
River Weaver / Weaver Navigation	Bartington to Frodsham	Embankment (32)	1% AEP (3), 20% AEP (1)	3 (4), Unknown (28)	3 (2), 4 (2), Unknown (28)	EA (4), private individual, company or charity (28)

6.5 Existing and future flood alleviation schemes

6.5.1 Northwich Flood Risk Management Scheme

Completed in June 2018, Northwich Flood Risk Management Scheme consists of 1.7km of raised defences throughout Northwich town centre, as well as an embankment upstream at Whalley playing fields. The combination of flood walls, embankments, flood gates and demountable defences better protect over 400 homes and businesses from flooding from the rivers Weaver and Dane.

During Storm Christoph in 2021, there was extensive sewer flooding in the town. Pumps are currently in situ in the town to provide protection from future flooding.

6.5.2 Tattenhall Natural Flood Management Project

Completed in 2021, the Tattenhall Natural Flood Management project has introduced water storage areas, using earth bunds, and habitat creation to slow floodwaters upstream of Tattenhall village. The bunds will temporarily hold back water in existing fields which will reduce the amount of water that travels downstream during periods of heavy rainfall.

7 Flood risk management requirements for developers

This section provides guidance on site-specific FRAs and other principles for managing flood risk in new development.

7.1 Early consultation with statutory and non-statutory consultees

Developers should consult with the EA, the LLFA, Canal & River Trust (Peel Ports for the Manchester Ship Canal) and the relevant sewerage undertaker at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling and foul and surface water drainage assessment and design. It should be noted that some of these consultees may need to charge for data and/or advice requested by developers or landowners.

7.2 Site-specific FRAs

7.2.1 What is a site-specific FRA?

A site-specific FRA is carried out by (or on behalf of) a developer to assess the flood risk to and from a development site and should accompany a planning application where required (see Section 7.2.2). It is recommended that the assessment is undertaken by a suitably qualified person or company. The assessment should demonstrate how flood risk will be managed now and over the development's lifetime, taking both climate change and the vulnerability of users into account.

The developer should check with the LPA whether they are required to apply the Sequential Test prior to commencing with a site-specific FRA.

The objectives of a site-specific FRA are to establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source.
- Whether a proposed development will increase flood risk elsewhere.
- Whether the measures proposed to deal with these effects and risks are adequate and appropriate.
- The nature of residual risk and whether this can be safely managed.
- The evidence, if necessary, to apply the Sequential Test.
- The evidence, if applicable, to show whether the development will be safe and pass the Exception Test.

7.2.2 When is an FRA required?

As set out in Flood risk assessments: applying for planning permission (gov.uk), a site-specific FRA is required for all development (including minor development and changes of use):

- In Flood Zones 2, 3, or 3b.
- Within Flood Zone 1 with a site area of 1 hectare or more.
- In areas with critical drainage problems as identified by the EA or LLFA.
- Within Flood Zone 1 where the LPA's SFRA shows it will be at increased risk of flooding during its lifetime.
- Where the vulnerability classification is increased and may be subject to sources of flooding other than rivers or sea.

7.2.3 What level of detail is needed in a site-specific FRA?

Site-specific FRAs should be proportionate to the degree of flood risk and the scale, nature, and location of the development. The SFRA can be used by developers as a starting point to identify the initial flood risk to a site however a pre-application consultation is key to define the scope of the FRA and identify data requirements, making sure that latest available datasets are used.

7.2.4 Guidance for FRAs

FRAs should follow the approach recommended by the NPPF (and associated planning practice guidance), and guidance provided by the EA and the LLFA. Guidance and advice for developers on the preparation of site-specific FRAs is available from the following websites with hyperlinks provided:

- Standing Advice on Flood Risk (gov.uk)
- Flood Risk Assessment for Planning Applications (gov.uk); and
- Site-specific Flood Risk Assessment: Checklist (gov.uk)

Guidance should be sought from the EA and the Council at the earliest possible stage, and opportunities should be taken to incorporate environmental enhancements and reduce flooding from all sources both to and from the site through development proposals. Developers should seek to go beyond managing the flood risk and support opportunities to reduce the causes and impacts of flooding, whilst enhancing and conserving the natural environment. PPG: Flood risk and coastal change (gov.uk) Paragraphs 062 - 067 provide further information. Potential strategic solutions to consider are detailed in Section 11 of this report.

7.3 Emergency planning

Safe access and escape routes from the site should always be available from developments. The developer should seek to incorporate an emergency plan and ensure safe refuge points are available if the development site has been identified to be at risk of flooding. The local authority and emergency services should be consulted when designing an emergency plan. For further details on emergency planning, see Section 10 of this report.

8 Principles for site design and master planning

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development. This section sets out the principles for site design through ground level modifications and consideration of the impact of defence infrastructure on planning.

The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land uses away from high-risk areas to higher ground and lower flood risk areas, while more flood-compatible development (e.g., recreational spaces) can be located in higher risk areas. Higher risk areas can also be retained and enhanced as natural green space. Whether parking in floodplains is appropriate will be based on the likely flood depths and hazard, evacuation procedures and availability of flood warning. Car parks are considered as 'less vulnerable' development according to the NPPF. The nature of risk to water quality also needs to be considered and mitigated to ensure that accumulated hydrocarbons and other vehicle related pollutants are not released to the aquatic environment.

Waterside areas, or areas along known flow routes, can be included in development layouts as blue green infrastructure, being used for recreation, amenity, and environmental purposes, allowing the preservation of flow routes and flood storage, whilst at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Appropriate landscaping should provide safe access to higher ground from these areas and avoid the creation of isolated 'dry islands' as water levels rise.

8.1 Modification of ground levels

Modifying ground levels to raise the land above the design flood level is an effective way of reducing flood risk to a particular site in circumstances where the land does not act as conveyance for floodwaters. However, care must be taken as raising land above the flood level could reduce conveyance or flood storage in the floodplain and could adversely impact flood risk downstream or on neighbouring land. Raising ground levels can also deflect flood flows, so analysis should be performed to demonstrate that there are no adverse effects on third party land or property.

Compensatory flood storage should be provided, and would normally be on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain (for it to fill and drain by gravity). It should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated). Appendix A3 of the CIRIA Publication C624 (ciria.org) provides guidance on how to address floodplain compensation.

Raising levels can also create areas where surface water might pond during significant rainfall events. Any proposals to raise ground levels should be modelled and fully tested to check that it would not cause increased ponding or build-up of surface runoff on third party land.

Any proposal for modification of ground levels within areas of flood risk will need to be discussed at an early stage with the EA and its impacts assessed as part of a detailed FRA.

8.2 Raised floor levels

If raised floor levels are proposed, these should be agreed with the Council and the EA. The minimum Finished Floor Level (FFL) may change dependent upon the vulnerability and flood risk to the development.

Developers should refer to the Preparing a flood risk assessment: standing advice (gov.uk) for the latest guidance on FFLs but generally the EA advises the minimum finished floor levels should be set 600mm above the 1% AEP fluvial / 0.5% AEP tidal plus climate change peak flood level, where the appropriate climate change allowances have been used. An additional allowance may be required because of risks relating to blockages to the channel, culvert or bridge and should be considered as part of an FRA. Lowering existing FFLs below the existing levels within the 1% AEP / 0.5% AEP plus climate change floodplain would not be acceptable and should be discouraged. New development offers opportunities to improve the resilience of buildings to flooding.

Building design and raised floor levels are the only way to fully reduce groundwater flood risk, through ensuring FFLs are raised above predicted groundwater levels considering known groundwater issues.

Allocating the ground floor of a building for less vulnerable, non-residential, or non-habitable residential use is an effective way of raising living space above flood levels. Single storey buildings such as ground floor flats or bungalows are especially vulnerable to rapid rise of water (such as that experienced during a breach of flood defences). This risk can be reduced by use of multiple storey construction and raised areas that provide a point of refuge. However, access and escape routes may still be an issue, particularly when flood duration covers many days.

Similarly, the use of basements should be avoided in areas of flood risk. Habitable uses of basements within Flood Zone 3 and areas at high risk of surface water flooding should not be permitted, whilst basement dwellings (classed as 'highly vulnerable') in Flood Zone 2 will be required to pass the Exception Test.

Where the ground level of a site is below the ground level at the point where the drainage connects to the public sewer, care must be taken to ensure that the proposed development is not at an increased risk of sewer surcharge. It is good practice for the finished floor levels and manhole cover levels (including those that serve private drainage runs) to be higher than the manhole cover level at the point of connection to the receiving sewer. Alternatively, mitigation measures may need to be incorporated into the proposals to protect against sewer surcharge.

8.3 Development and raised defences

8.3.1 Undefended and residual risk

Construction of localised raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will remain. Compensatory storage must be provided where raised defences remove storage from the floodplain. This is because raised defences prevent floodwater from spreading naturally across the floodplain, which can increase flood levels elsewhere.

Where development is located behind, or in an area that benefits from defences, both the undefended risk and the residual risk of flooding from defence breaching or overtopping must be considered by the developer, and it must be demonstrated that they can be safely managed. The assessment of the risk should consider:

- Improvements required to the level of protection afforded by existing defences for future development.
- The future commitment and funding to maintain the current standard of protection of any existing defences.
- Any disparities between the proposed level of commitment to maintain the current standard of protection and the level of protection required to support future development.
- The effects of climate change on the future SoP afforded by the defences and the associated maintenance and upgrade commitments required.
- Any land required to be safeguarded for affordable future flood risk management measures.

8.3.2 Breach assessment

The assessment of the residual risk from a breach event should consider an assessment of the hazards that might occur from subsequent flood flows, considering depth and flow velocities, so that the safety of people and structural stability of properties and infrastructure can be appropriately considered.

Considerations should include the location of a breach, when it would occur and for how long, the depth of the breach (toe level), the loadings on the defence, and the potential for multiple breaches.

There are various ways of assessing breaches using hydraulic modelling. EA LIT56413 Breach of Defences Guidance (2021) provides some guidance for breach assessment. It is recommended that the EA is consulted if a development site is located near to a flood defence, to understand the level of assessment required and to agree the approach for the breach assessment.

8.3.3 Overtopping assessment

The assessment of the residual risk from overtopping of defences should consider the potential flood hazard to people, based on factors such as the height of floodwaters above

the crest of the defence, the proximity and elevation of receptors relative to the defence and the likely depth and velocity of floodwaters in the event of overtopping. The Defra and EA Flood Risks to People guidance document (gov.uk) provides standard flood hazard ratings based on the distance from the defence and the level of overtopping. Overtopping modelling or assessments should be undertaken for any sites located next to defences or perched ponds/reservoirs, accounting for climate change.

8.3.4 Developer contributions

In some cases, and following application of the Sequential Test, it may be appropriate for the developer to contribute to the improvement of flood defence provision that would benefit both proposed new development and the existing local community. Developer contributions can also be made to maintenance and provision of flood risk management assets, flood warning and the reduction of surface water flooding (i.e. SuDS). LPAs can choose to impose a community infrastructure levy (CIL) on development in their area.

8.4 Buffer strips

The provision of a buffer strip alongside a watercourse allows additional capacity to accommodate climate change and means access to the watercourse, and any structures or defences, is retained for future maintenance purposes. It also helps to avoid the disturbing of riverbanks which may adversely impact local ecology, and the need to have to construct engineered riverbank protection. A buffer strip of 8m is recommended for any non-tidal main river and 16m for tidal main rivers. Where flood defences are present, these distances should be taken from the landward toe of the defence.

Building adjacent to riverbanks may cause issues with the structural integrity of the riverbanks and subsequently the building itself, making future maintenance of the river much more difficult. Flood Risk Activity Permits (gov.uk) from the EA are likely to be required for development in these areas alongside any planning permission. There should be no built development within these distances from main rivers/ordinary watercourses/flood defences (where present).

8.5 Property Flood Resilience

Property Flood Resilience (PFR) includes a range of measures that can be installed around the perimeter of a building to reduce the risk of internal flooding. PFR can also be used within a building, to minimise the damage done if internal flooding stills occurs. PFR aims to help households and businesses reduce the damage caused by flooding, helping to speed up recovery and reoccupation.

PFR encompasses two main elements:

- Resistance - Resistance measures are installed around the perimeter of a building. These measures aim to reduce or resist the amount of water entering the building, thus reducing the damage caused internally. Examples include flood doors/barriers, anti-flood airbricks, and non-return valves.

- Resilient adaptation (recoverability) - Adaptations made within a property, which aim to reduce the damage caused if internal flooding occurs.

The consideration of resistance measures and resilient adaptation should not be used to justify development in inappropriate locations. However, having applied planning policy there may be some instances where development is permitted in high or medium flood risk areas where application of resistance and resilience measures may be required.

There may also be opportunities for 'change of use' developments to be used to improve the flood resistance and resilience of existing development, which may not have been informed by a site-specific FRA when first constructed.

Further information and guidance on best practice can be found online in the following locations:

- Department for Communities and Local Government Improving the Flood Performance of New Buildings: Flood Resilient Construction (gov.uk)
- CIRIA Property Flood Resilience Code of Practice (ciria.org)
- EA Flood resilience construction of new buildings (gov.uk)

9 Surface water management and SuDS

This section provides an overview of SuDS, including signposting to relevant guidance, as well as guidance for developers on surface water drainage strategies, considering any specific local standards and guidance for SuDS from the LLFA.

9.1 Sustainable Drainage Systems

Sustainable Drainage Systems (SuDS) are management practices which enable surface water to be drained in a more sustainable manner and to mimic the local natural drainage. The inclusion of SuDS within developments is also an opportunity to enhance ecological and amenity value, and promote blue green infrastructure, incorporating above ground features into the development landscape strategy.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the pre-application or master planning stage. To further inform development proposals at the master planning stage, pre-application submissions are accepted by the Council. This assists with the delivery of well designed, appropriate, and effective SuDS. Applicants are also encouraged to engage with United Utilities or Dŵr Cymru Welsh Water to discuss their surface water proposals, especially where adoption is proposed.

9.2 Sources of SuDS guidance

9.2.1 National standards for SuDS

Previously, SuDS guidance was developed to sit alongside the PPG and provide non-statutory standards as to the expected design and performance for SuDS.

As of June 2025, the Defra National standards for sustainable drainage systems (SuDS) (gov.uk) were brought in to comply with principles laid out in Section 9.4. Whilst remaining as a non-statutory specification, these now form a material consideration for LPAs when assessing planning applications. These standards aim to reflect and reinforce good practice and use of SuDS as detailed in Section 9.4.1, reflecting the four pillars of SuDS design.

The national standards contain two sets of standards. The first type (Standard 1) is known as the hierarchy standard and gives criteria for the prioritisation of final runoff destinations. The other standards (Standards 2-7) detail the minimum requirements of design criteria that surface water drainage systems should satisfy alongside how they are to be appropriately built, maintained, and operated.

9.2.2 C753 CIRIA SuDS Manual (2015)

The C753 CIRIA SuDS Manual (2015) (ciria.sharefile.com) provides guidance on planning, design, construction, and maintenance of SuDS. The manual is divided into five sections

ranging from a high-level overview of SuDS, progressing to more detailed guidance with progression through the document.

9.2.3 Design and Construction Guidance (DCG)

The Design and Construction Guidance (DCG) (water.org.uk) contains Codes for Adoption, covering the adoption of new water and wastewater infrastructure by water companies, and contains details on the water sector's approach to the adoption of SuDS.

9.2.4 Local SuDS guidance

The Cheshire West and Chester Council SuDS Guidance contains design and technical guidance, as well as council-specific guidance. The Council have also produced a submission application and approval checklist, runoff calculator and suitability matrix to assist in the design of SuDS.

At the time of writing, the Cheshire West and Chester Borough Wide Design Code is currently being finalised. The Code sets out design principles for the borough and will be a material consideration in the determination of planning applications. The Design Code will include a section relating to water and drainage and will identify a series of codes relating to the design of SuDS.

9.3 Roles of the LLFA and LPA

The LLFA are a statutory planning consultee. They provide technical advice on surface water drainage strategies and designs put forward for major development proposals, to confirm that onsite drainage systems are designed in accordance with the current legislation and guidance.

When considering planning applications, the LLFA drainage/flood risk engineering team will provide advice to the LPA on the management of surface water. The LPA should satisfy themselves that the development's proposed minimum standards of operation are appropriate and, using planning conditions or planning obligations, to ensure there are clear arrangements for ongoing maintenance over the lifetime of the development.

In their roles as LLFA and LPA, the Council should:

- Promote the use of SuDS for the management of runoff;
- Ensure their policies and decisions on applications support and compliment the building regulations on sustainable rainwater drainage, giving priority to infiltration over discharges into watercourses, and then sewer conveyance;
- Incorporate favourable policies within development plans;
- Adopt policies for incorporating SuDS requirements into the Local Plan; and
- Encourage developers to utilise SuDS whenever practical, if necessary, through the use of appropriate planning conditions.

9.3.1 Schedule 3 of the Flood and Water Management Act (2010)

At the time of writing, the implementation of SuDS is driven through planning policy. Schedule 3 of the FWMA 2010 aims to provide a framework for the approval and adoption of drainage systems, to designate SuDS Approving Bodies (SAB) within unitary and county councils, and to ensure national standards on the design, construction, operation, and maintenance of SuDS for the lifetime of the development are followed. Timescales for the enactment of Schedule 3 by the Government are unknown.

9.4 Considerations for SuDS design

9.4.1 Four pillars of SuDS design

SuDS are designed to maximise the opportunities and benefits that can be secured from surface water management practices. SuDS design should consider the four pillars of SuDS (Figure 9-1): water quantity, water quality, amenity, and biodiversity.

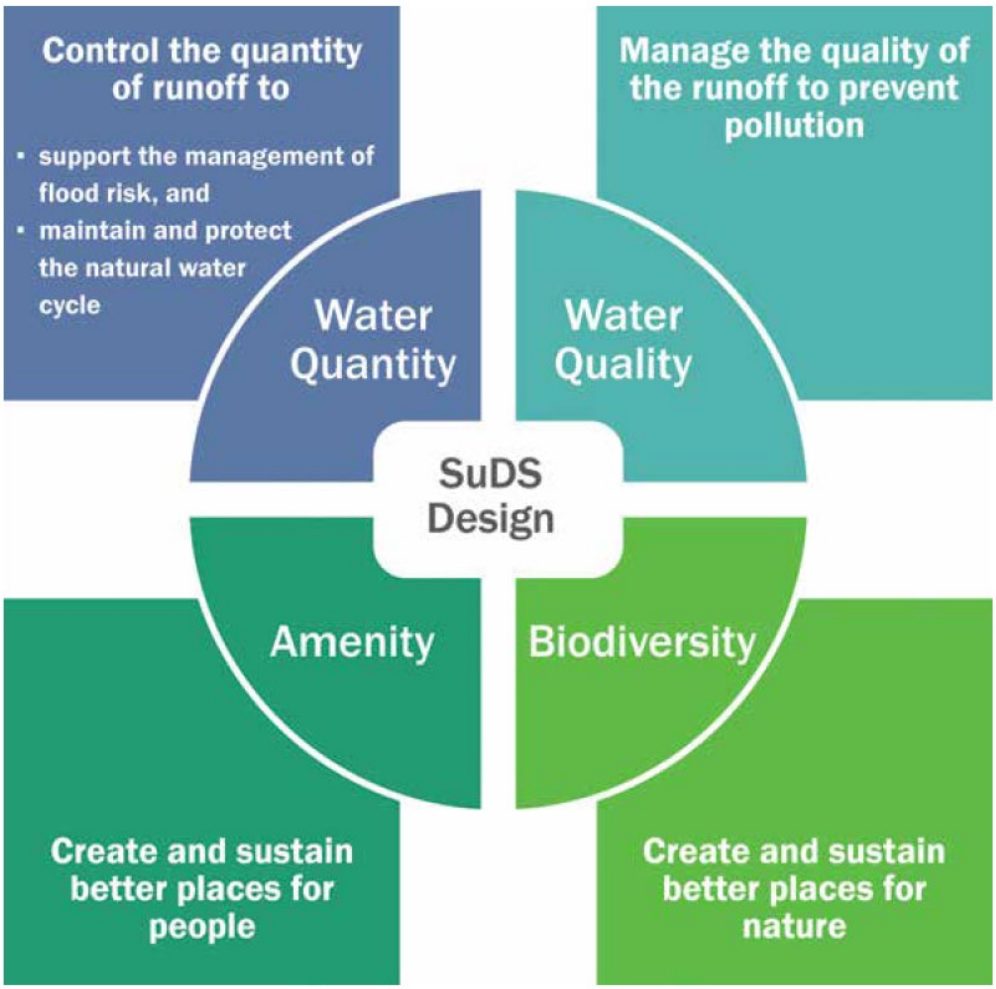


Figure 9-1: Four pillars of SuDS design (The SuDS Manual C753, 2015).

Given the flexible nature of SuDS, they can be used in most situations within new developments as well as being retrofitted into existing developments. SuDS can also be designed to fit into most spaces, for example, permeable paving could be used in parking spaces or rainwater gardens as part of traffic calming measures.

It is a requirement that *'applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity'* (NPPF Paragraph 182).

It is important that SuDS are maintained for the lifetime for the development so that features can continue to function as designed. Consideration should be given to enhancing SuDS to achieve biodiversity net gain.

9.4.2 Types of SuDS

There are many different SuDS techniques that can be implemented in attempts to mimic pre-development drainage conditions. Techniques can include soakaways, infiltration trenches, permeable pavements, grassed swales, green roofs, ponds, and wetlands. Many of which do not necessarily need to take up a lot of space. The suitability of the techniques will be dictated in part by the development proposal and site conditions. Advice on best practice is available from the EA and the Construction Industry Research and Information Association (CIRIA) e.g. the CIRIA SuDS Manual C753 (2015).

9.4.3 SuDS management train

SuDS should not be used individually but as a series of features in an interconnected system designed to capture water at source and convey it to a discharge location. Collectively this concept is described as a SuDS Management Train (see Figure 9-2).

The number of treatment stages required within the Management Train depends primarily on the source of the runoff and the sensitivity of the receiving waterbody or groundwater.

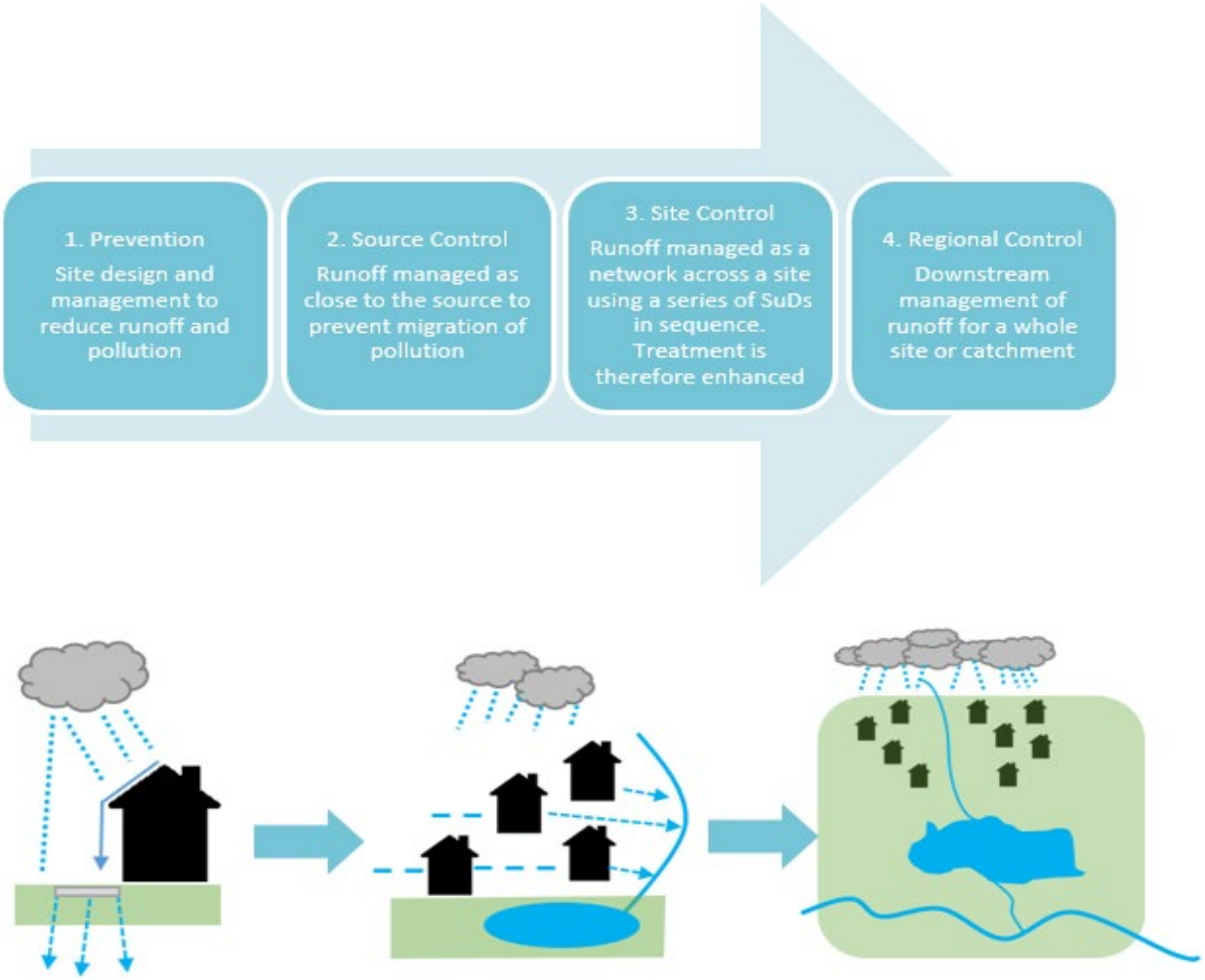


Figure 9-2: SuDS Management Train.

9.4.4 SuDS considerations

The design of appropriate SuDS will be influenced by a number of physical and policy constraints. These should be taken into account and reflected upon during the conceptual, outline, and detailed stages of SuDS design. Table 9-1 details some possible constraints and how they may be overcome.

Drainage from new development sites or redeveloped sites should be designed in line with the drainage hierarchy (PPG: Flood Risk and Coastal Change Paragraph: 056 Reference ID: 7-056-20220825) which initially promotes the use of infiltration prior to considering alternative drainage. For SuDS techniques that are designed to encourage infiltration, it is imperative that the water table is low enough to receive surface runoff waters. Most types of SuDS will be suitable in areas with permeable bedrock including features such as soakaways and infiltration basins. In areas with more impermeable geology, offsite discharge in accordance with the drainage hierarchy may be required to discharge surface water runoff from the site. In some cases, above-ground features such as attenuation

ponds may be practical with a managed outlet or discharge point. Infiltration SuDS should be considered with caution within areas of possible subsidence or sinkholes.

Site-specific infiltration testing will need to be conducted early on as part of the design of the development in order to determine the impact of groundwater levels on the effectiveness of any drainage system. Groundwater monitoring is also encouraged and may be required in some locations.

Where sites lie within or close to Groundwater Source Protection Zones (GSPZs) (Section 9.5.2) or aquifers (Section 4.2.2), further restrictions may be applicable, and guidance should be sought from the LLFA and the EA.

Table 9-1: Example SuDS design constraints and possible solutions

Constraints	Solution
Land availability	SuDS can be designed to fit into small areas by utilising different systems. For example, features such as permeable paving and green roofs can be used in urban areas where space may be limited.
Contaminated soil or groundwater below site	SuDS can be placed and designed to overcome issues with contaminated groundwater or soil. Shallow surface SuDS can be used to minimise disturbance to the underlying soil. The use of infiltration SuDS should also be investigated as it may be possible in some locations within the site. If infiltration is not possible, impermeable linings can be used within features to prevent infiltration.
High groundwater levels	Non-infiltrating features can be used. Features can be lined with an impermeable lining or clay to prevent the egress of water into the feature. Additionally, shallow features can be utilised which are above the groundwater table.
Steep slopes	Check dams can be used to slow flows. Additionally, features can form a terraced system with additional SuDS components such as ponds used to slow flows.
Shallow slopes	Use of shallow surface features to allow a sufficient gradient. If the gradient is still too shallow, pumped systems can be considered as a last resort.
Ground instability	Geotechnical site investigation should be done to determine the extent of unstable soil and dictate whether infiltration would be suitable or not.
Sites with deep backfill	Infiltration should be avoided unless the soil can be demonstrated to be sufficiently compacted. Some features such as swales are more adaptable to potential surface settlement.

Constraints	Solution
Open space in floodplain zones	Design decisions should consider the likely high groundwater table and possible high flows and water levels. Features should also seek to not reduce the capacity of the floodplain and take into consideration the influence that a watercourse may have on a system. Instances such as siltation after a flood event should also be taken into account during the design phase.
Future adoption and maintenance	The LPA should ensure development proposals, through the use of planning conditions or planning obligations, have clear arrangements for ongoing maintenance over the development's lifetime.

9.5 Other surface water considerations

9.5.1 Groundwater Vulnerability Zones

The 2015 EA published groundwater vulnerability maps provide a separate assessment of the vulnerability of groundwater in overlying superficial rocks and those that comprise of the underlying bedrock. The map shows the vulnerability of groundwater at a location based on the hydrological, hydro-ecological, and soil properties within a one-kilometre grid square.

The groundwater vulnerability maps should be considered when designing SuDS. Depending on the height of the water table at the location of the proposed development site, restrictions may be placed on the types of SuDS appropriate to certain areas. Groundwater vulnerability maps can be found on Defra's interactive mapping (defra.gov.uk).

9.5.2 Groundwater Source Protection Zones (GSPZ)

The EA also defines Groundwater Source Protection Zones (GSPZs) near groundwater abstraction points. These protect areas of groundwater used for drinking water. The GSPZ requires attenuated storage of runoff to prevent infiltration and contamination. GSPZs can be viewed on Defra's interactive mapping (defra.gov.uk). Three main zones are defined as follows:

- Inner protection zone (Zone 1) - areas from where pollution can travel to the groundwater source within 50 days or is at least a 50m radius.
- Outer protection zone (Zone 2) - areas from where pollution can travel to the groundwater source within 400 days or lies within the nearest 25% of the total catchment area (whichever is largest).
- Total catchment (Zone 3) - the total area needed to support removal/discharge of water from the groundwater source.

Figure 9-3 shows there are currently seven GSPZs which lie, fully or partially within the borough. These are located largely within the west and centre of the borough.

Where a site is located in a GSPZ used for public water supply, applicants should engage with the Council to understand any concerns and any necessary mitigation measures to manage the risk of development to public water supply.

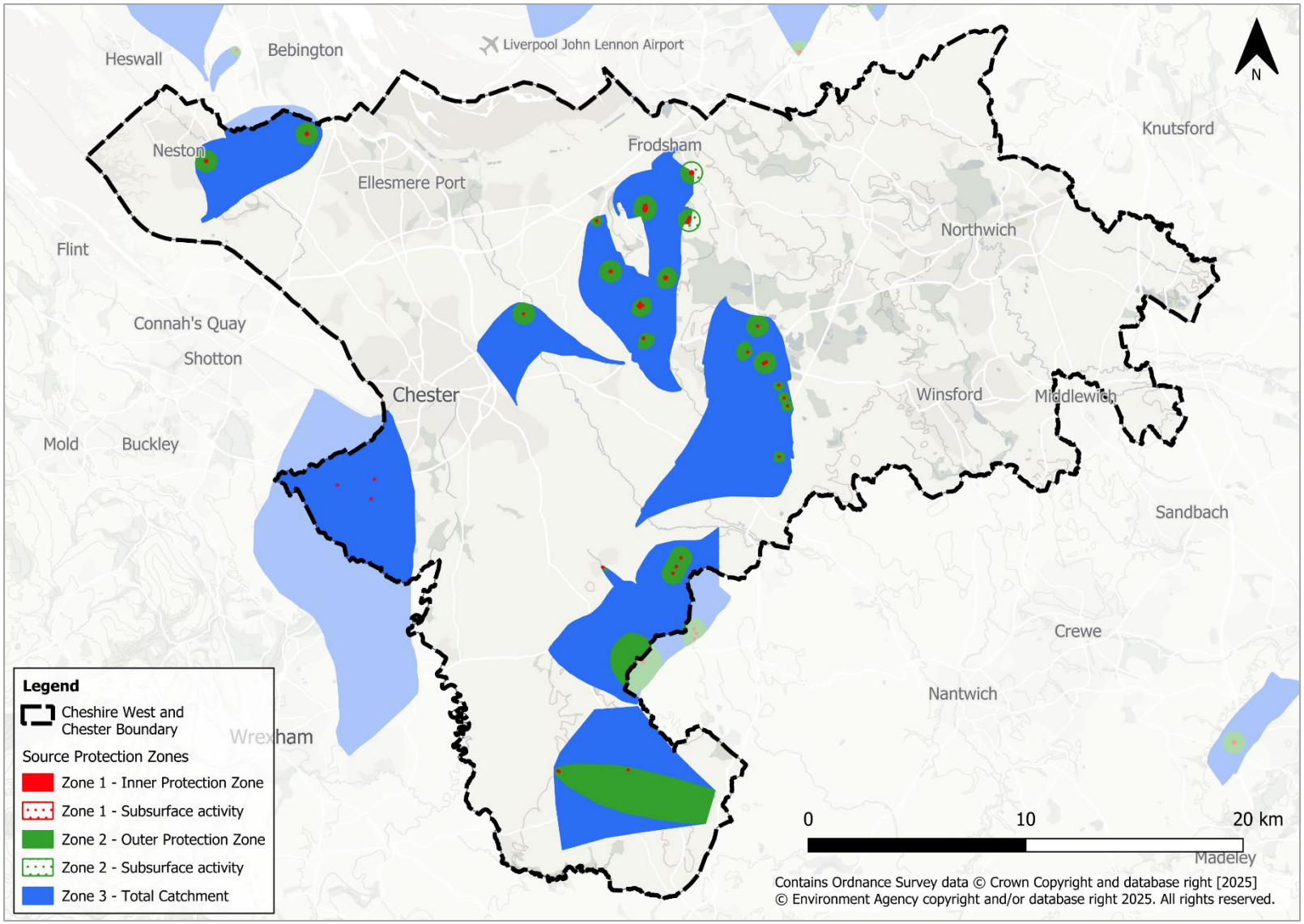


Figure 9-3: Groundwater Source Protection Zones across the borough

9.5.3 Nitrate Vulnerable Zones

Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. Nitrate levels in waterbodies are affected by surface water runoff from surrounding agricultural land entering receiving waterbodies. The level of nitrate contamination will potentially influence the choice of SuDS and should be assessed as part of the design process. 2025 - 2028 NVZs can be viewed on the EA's interactive mapping (data.gov.uk).

Much of the borough is located within a NVZ. The exceptions include: most of Chester, much of Ellesmere Port, Ince, and villages to the south and north of Chester.

Landowners can appeal an NVZ designation once notified if their land (or part of it):

- Does not drain into water that has been identified as polluted.
- Drains into water that should not be identified as polluted.

9.5.4 Nutrient Neutrality Catchments

Natural England (NE) have produced a dataset which shows surface water catchments constituting Nutrient Neutrality catchments. These catchments define areas where additional nutrients from any source could reach and impact a sensitive site, and where the requirements for Nutrient Neutrality therefore apply.

There are two designated Nutrient Neutrality catchments within the authority area, namely Oak Mere Special Area of Conservation (SAC) and West Midland Mosses SAC (Abbotts Moss). In these areas, any new development must demonstrate that there is no net increase in nutrient loading to the protected site.

9.5.5 Critical Drainage Areas

Local authorities can choose to designate Critical Drainage Areas (CDAs) within their authority area; however, there are no CDAs currently designated within the borough.

10 Flood warning and emergency planning

This section provides an overview of the requirements for emergency plans, include any local emergency planning arrangements, and an overview of the available flood alerts and warnings.

10.1 NPPF requirements

The NPPF Flood Risk Vulnerability and Flood Zone "incompatibility" table seeks to avoid inappropriate development in areas at risk from all sources of flooding. It is essential that any development which will be required to remain operational during a flood event is located in the lowest flood risk zones to ensure that, in an emergency, operations are not impacted upon by floodwater, or that such infrastructure is resistant to the effects of flooding such that it remains serviceable/operational during 'upper end' events, as defined in the Environment Agency's Climate Change allowances.

The outputs of this Level 1 SFRA should be compared and reviewed against any emergency plans and continuity arrangements. This includes the nominated rest and reception centres (and prospective ones), so that evacuees are outside of the high-risk Flood Zones and will be safe during a flood event.

10.2 Emergency planning

The Civil Contingencies Act 2004 lists local authorities, the EA and emergency services as Category 1 responders, responsible for reducing, controlling, and mitigating the effects of emergencies in both response and recovery phases.

The NPPF (Paragraph 181) requires site-level FRAs to demonstrate that "*any residual risk can be safely managed; and safe access and escape routes are included where appropriate, as part of an agreed emergency plan*."

In accordance with the NPPF, SFRAs, PFRAs and SWMPs can be used in the preparation and execution of a flood emergency plan as they can indicate areas that may be at risk of flooding. These can be provided as part of an FRA or as a separate document. Decisions regarding whether an emergency plan is required sits with the LPA, with advice from their emergency planning teams, the EA, and the LLFA.

According to the PPG flood risk and coastal change guidance, an emergency plan is needed wherever emergency flood response is an important component of making a development safe; this includes the free movement of people during a 'design flood' and potential evacuation during an extreme flood.

Emergency plans are essential for any site with transient occupancy in areas at risk of flooding, such as holiday accommodation, hotels, caravan, and camping sites (PPG: Flood risk and coastal change paragraph 043).

Emergency plans should consider:

- The type of flood risk present, and the extent to which advance warning can be given in a flood event.
- The number of people that would require evacuation from the area potentially at risk.
- The vulnerability of site occupants.
- The impact of the flooding on essential services e.g., electricity, gas, telecommunications, water supply and sewerage.
- Safe access and escape routes for users and emergency services (Section 10.2.1).

Further information is available from the following documents/websites with hyperlinks provided:

- The National Planning Policy Guidance (gov.uk)
- 2004 Civil Contingencies Act (legislation.gov.uk)
- Defra (2014) National Flood Emergency Framework for England (gov.uk)
- FloodRe (floodre.co.uk)
- The EA and Defra's Standing Advice for FRAs (gov.uk)
- EA's 'How to plan ahead for flooding' (gov.uk)
- Sign up for Flood Warnings with the EA (gov.uk)
- The National Flood Forum (nationalfloodforum.org.uk)
- 'Prepare for flooding' (gov.uk)
- ADEPT Flood Risk Plans for new development (adeptnet.org.uk)
- Environment Agency (2012) Flooding – minimising the risk, flood plan guidance for communities and groups
- Environment Agency Personal flood plans (2017)

10.2.1 Safe access and escape routes

Safe access and escape routes will need to be available during the design flood event. Access requirements are set out in the PPG: Flood Risk and Coastal Change (gov.uk) Paragraph: 047 Reference ID: 7-047-20220825.

As part of an FRA, the developer should review the acceptability of the proposed access in consultation with the LLFA, the EA, and emergency planners. Site and plot specific velocity and depth of flows should be assessed against standard hazard criteria to ensure safe access and escape routes can be achieved.

10.3 Local arrangements for managing flood risk

10.3.1 Cheshire Resilience Forum

Cheshire Resilience Forum (CRF) works to prepare for, respond to and recover from any emergency, including flooding. The CRF brings together local authorities, emergency services, the NHS and other RMAs.

CRF published a Multi-Agency Emergency Response Manual in November 2022. This document sets out the coordinated response of agencies across Cheshire in the event of an emergency.

10.4 Flood alerts and flood warnings

The EA is the lead organisation for providing warnings of river and sea flooding. Flood warnings are supplied via the Flood Warning System (FWS) service, to homes and business within Flood Zones 2 and 3. The EA Sign up for Flood Warnings (gov.uk) webpage provides information on how to sign up for these warnings.

There are currently eight Flood Alert Areas (FAA) and 19 Flood Warning Areas (FWAs) covering the borough.

Flood alerts are issued when there is water out of bank for the first time anywhere in the catchment, signalling that 'flooding is possible', and therefore FAAs usually cover the majority of main river reaches.

Flood warnings are issued to designated FWAs (i.e., properties within the extreme flood extent which are at risk of flooding), when the river level hits a certain threshold; this is correlated between the FWA and the gauge, with a lead time to warn that 'flooding is expected'.

11 Cumulative Impact Assessment

This section details the cumulative impact assessment, which identifies which catchments are most likely to be sensitive to increased flood risk as a result of future development.

11.1 Introduction

The cumulative impact of development should be considered at both the local plan making stage and the planning application and development design stages.

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume from any source, as well as the impact of increased flows on flood risk downstream. Whilst the loss of storage for individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe. Similarly, the effect of the loss of surface water flow paths/exceedance paths from sewers, surface water ponding and infiltration can also give rise to cumulative effects and potentially exacerbate flood risk. There are also risks of development causing modified flow regimes from sites creating an alignment in peak flows in downstream watercourses and resulting in greater flood risk as a result of the development.

All developments are required to comply with the NPPF and demonstrate they will not increase flood risk elsewhere. Therefore, providing development proposals comply with the latest guidance and legislation (relating to flood risk and sustainable drainage, and appropriate consideration is given to flow paths and storage), development proposals should normally not increase flood risk downstream.

Local planning policies can also be used to identify areas where the potential for development to increase flood risk is highest and identify opportunities for such new development to positively contribute to decreases in flood risk downstream.

11.2 Cumulative Impacts Assessment (CIA)

There is currently no national guidance available for assessing the cumulative impacts of development. A bespoke catchment-level assessment has been completed as part of this SFRA to understand the impact of future development on flood risk in Cheshire West and Chester. The river catchments covering Cheshire West and Chester have been ranked from high to low sensitivity. Note that the CIA provides a relative assessment of the catchments within Cheshire West and Chester and are not comparable across other boroughs/districts.

11.2.1 Results

The CIA has identified the following catchments as being at high sensitivity to the cumulative impacts of development:

- Dane (Wheelock to Weaver)
- Balderton drain

- Finchett's Gutter
- Stanney Mill Brook
- Rivacre Brook
- Weaver (Dane to Frodsham)
- Dane (Cow Brook to Wheelock)
- Keckwick Brook
- Weaver (Marbury Brook to Dane)

Specific recommendations for catchments identified as high risk, alongside broadscale recommendations applicable across the whole borough, are set out in Section 11.2.2. The full CIA methodology can be found in Appendix G.

11.2.2 Recommendations from the CIA

All developments in the borough should consider the following in relation to the cumulative impact of development on flood risk:

- Developments must seek betterment of existing flood risks both within the site and in surrounding areas. As a minimum, developments must meet national and local standards for Flood Risk Assessments and Surface Water Drainage Strategies. By looking at flood risks beyond the site boundary, developers should be encouraged to implement sustainable solutions which manage flood risk.
- Major developments[1] must be accompanied by an overall Surface Water Drainage Strategy. This should cover:
    - How the cumulative impacts of potential peak rates and volumes of surface water runoff from development sites would impact on the peak flows, duration of flooding and timing of flood peaks on receiving watercourses. This should be used to develop and implement appropriate drainage sub-catchments for the management of surface water, as well as specific runoff rate and volume requirements for each phase of the development.
    - The risk of flooding from all sources, including for rainfall events greater than the design standard of the surface water drainage system should be taken into account. This is to ensure there is no flood risk to new properties and that exceedance flows in extreme events are safely routed around those properties.
    - The consideration of how SuDS, natural flood management techniques, green infrastructure and green-blue corridors can be designed into the development master plan to facilitate drainage flood risk management. As well as managing the quantity of water, they should also ensure the wider benefits of biodiversity, amenity, water quality and recreation are realised.

1 As defined in the NPPF as residential developments comprising 10 or more homes, or greater than 0.5 hectares in area, and for non-residential developments, additional floorspace of 1,000m^2 or more, or a site of 1 hectare or more, or as otherwise provided in the Town and Country Planning (Development Management Procedure) (England) Order 2015.

    - Based on the above, a drainage phasing plan aligned with the SuDS train method should be developed. Firstly, it should consider how water can be infiltrated / stored at a plot level, then conveyed through the site. It should also identify any regional storage needs at a settlement level.
    - The provision of drainage shall be based on the drainage phasing plan, to ensure adequate drainage is provided implemented throughout the lifetime of the development. This includes provision of adequate drainage during the construction phase, to manage the risk of flooding, erosion and pollution during construction.
    - Cheshire West and Chester Council (as LPA and LLFA) and the Environment Agency should be consulted during the development of the Surface Water Drainage Strategy.
- In upland and rural areas of the catchments, Natural Flood Management (NFM) techniques, such as woodland planting and earth bunds, can be used to slow down and store flood waters upstream of settlements.
- In urban and suburban locations, SuDS must be integrated into the site design, to manage the existing surface water flow paths on the site and to help mitigate the flood risks to downstream communities.
- Successive minor developments have the potential to significantly impact on existing surface water and flood risk issues, particularly as the LLFA is not currently consulted on these applications. Therefore, planning policy for minor developments must support existing LPA guidance on the reduction of existing runoff rates, through the use of SuDS.
- Any development within the fluvial or tidal floodplain (i.e. Flood Zones 3b, 3a and 2) must provide suitable flood compensation storage, in consultation with the Environment Agency, to avoid a net loss in floodplain storage.
- The LLFA and other Risk Management Authorities (RMAs) should use the information in the SFRA to inform a long term pipeline of flood alleviation studies and schemes to determine where further developer contributions on / off site would be beneficial.

Planning considerations for medium and higher sensitivity catchments are provided in Appendix G.

12 Strategic flood risk solutions

This section sets out wider strategic solutions that may offer potential to reduce flood risk across the borough, including natural flood management. It also details current partnership working opportunities within the borough.

Section 11 considers the cumulative impacts of development across the borough and the catchments which are most sensitive to these impacts, and as such where strategic flood risk solutions may be most beneficial.

Where possible, developments should seek to help reduce flood risk in the wider area. The following sections outline different options which could be considered for strategic flood risk solutions. Any strategic solutions should ensure they are consistent with wider catchment policy and the local policies.

It is important that the ability to deliver strategic solutions in the future is not compromised by the location of proposed development. When assessing the extent and location of proposed development, consideration should be given to the requirement to secure land for flood risk management measures that provide wider benefits.

12.1 Partnership working

Flood risk to an area or development can often be attributed to multiple different sources, including fluvial, tidal, surface water and/or groundwater, which can become intertwined. Where complex flood risk issues are highlighted, it is important that all stakeholders are actively encouraged to work together to identify issues and provide suitable solutions.

12.1.1 Catchment Based Approach

The Catchment Based Approach (CaBA) (catchmentbasedapproach.org) was introduced by the Government to establish catchment partnerships throughout England to jointly deliver improved water quality and reduce flood risk, directly supporting the achievement of many of the targets set out within the Government's 25-year Environment Plan. CaBA partnerships are actively working in all 100+ river catchments across England and cross-border with Wales.

The CaBA partnerships working within Cheshire West and Chester include:

- Tidal Dee Catchment Partnership
- Middle Dee Catchment Partnership
- Weaver Gowy Catchment Partnership
- Lower Mersey Catchment Partnership

12.2 Biodiversity Net Gain

Biodiversity Net Gain (BNG) is a strategy to develop land and contribute to the recovery of nature. It is making sure the habitat for wildlife is in a better state than it was before

development. BNG has been applicable since February 2024 for major developments in the Town and Country Planning Act 1990, unless exempt, and has been applicable to small sites since April 2024. Exempt developments include planning applications received before these dates, below threshold development and householder applications. The full list of exemptions can be found on the Biodiversity net gain: exempt developments web page (gov.uk). Further information is available on the Government BNG webpage (gov.uk). Strategic flood risk solutions can help developments achieve BNG requirements.

12.3 Natural Flood Management

12.3.1 Introduction

Development can provide opportunities to work with natural processes to help reduce flood and erosion risk, benefit the natural environment and reduce costs of schemes. This is known as Natural Flood Management (NFM), a process whereby action is taken to mitigate flood risk by protecting, restoring and emulating natural processes. This approach aims to reduce flow volumes and delay the arrival of peak flood flow downstream.

Techniques and measures, which could be applied in the borough include:

- Creation of offline storage areas, which store diverted water from the channel in a separate storage area situated on the floodplain.
- Re-meandering streams (creation of new meandering courses or reconnecting cut-off meanders to slow the flow of the river).
- Targeted woodland planting (as indicated in the EA's Working with Natural Processes dataset).
- Reconnection and restoration of functional floodplains (Section 12.4).
- Restoration of rivers and removal of redundant structures, i.e. weirs and sluices no longer used or needed (Section 12.5).
- Installation or retainment of large woody material in river channels.
- Improvements in management of soil and land use.
- Creation of rural and urban SuDS.

To maximise the benefits of NFM, it is important that land which is likely to be needed for NFM is protected by safeguarding land for future flood risk management infrastructure. This is particularly important for infrastructure that reduces the risk of flooding to large amounts of existing development, or where options for managing risk in other ways are limited to achieve multiple benefits for flood risk and the environment.

It is important to recognise the value of maintenance or restoration of natural riparian zones, such as grasslands, which protect the soils from erosion and ‘natural’ meadows which can tolerate flood inundation. The use of blue green infrastructure throughout river corridors can also play a vital role in enhancing the river environment as well as safeguarding land from future development, protecting people and buildings from flooding and reducing flood risk downstream.

12.3.2 Working with natural processes

The EA published an evidence base (gov.uk) for working with natural processes (WwNP) to reduce flood risk to support the implementation of NFM, with maps showing locations with the potential for NFM measures. These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measure that may work in a catchment and the best places in which to locate them.

The Welsh Government have published a dataset called 'NFM Prioritisation for Larger Flood Risk Catchments with weighting for ecosystem service provision'. This dataset ranks catchments to be prioritised, based on the percentage area of NFM potential as identified in the WwNP potential area maps and the System Cynorthwyo Cunllunio Adnoddau Naturiol (SCCAN) maps, with a weighting towards ecosystem service provision. The maps help identify catchments where NFM may be a suitable means of reducing flood risk and may also provide additional environmental benefits.

As shown in Figure 12-1, the Shotwick Brook, Finchett's Gutter, Balderton Drain, Dee - Chester Weir to Ceiriog, Pulford Brook and Worthenbury Brook - lower catchments are located across the border between the borough and Wales. All six of these catchments have a percentage of catchment area covered by NFM opportunity (including environmental weighting) of over 80%.

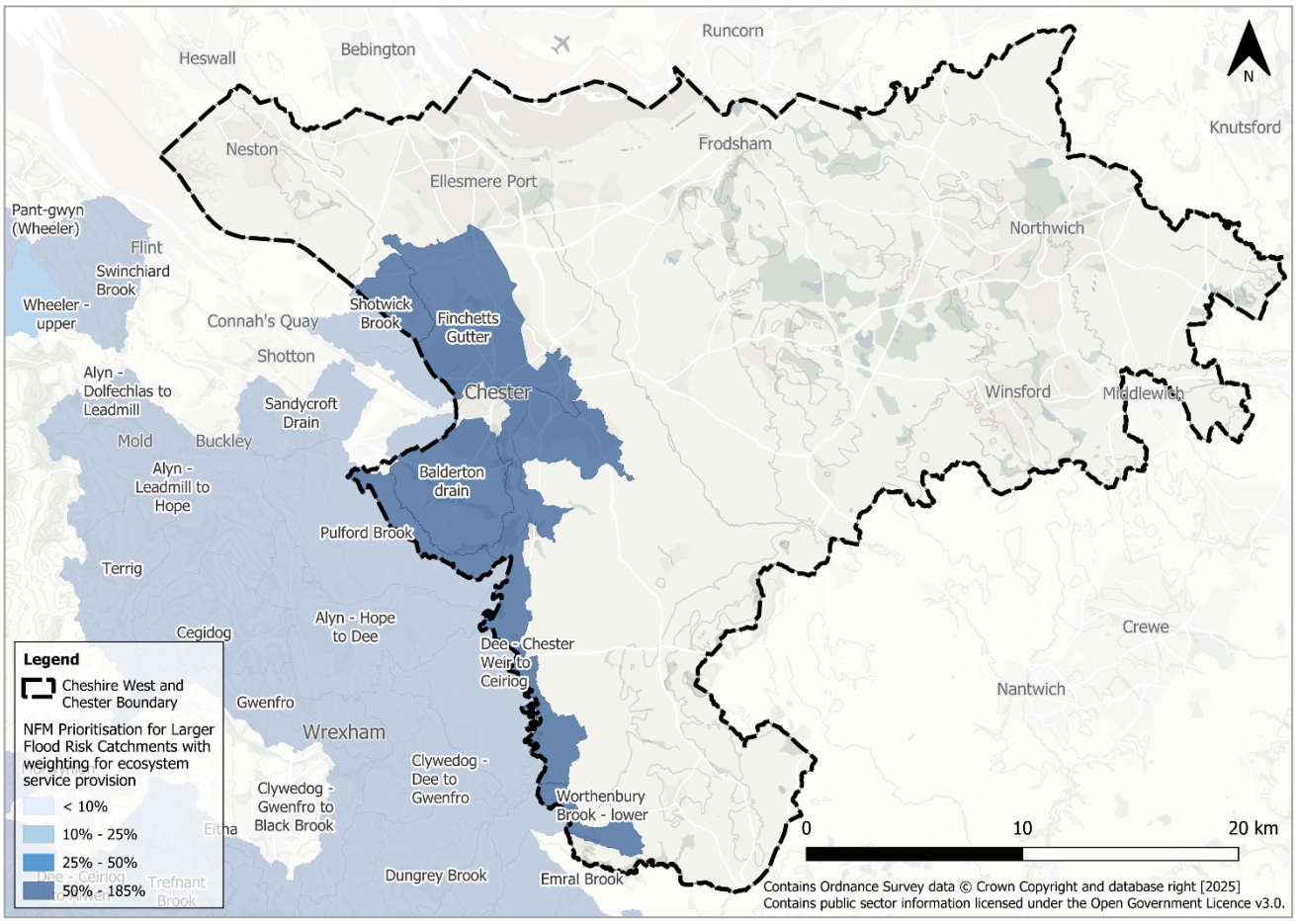


Figure 12-1: Welsh Government NFM mapping

12.3.3 Ongoing NFM schemes

The draft Cheshire and Warrington Local Nature Recovery Strategy (LNRS) has recently gone out for consultation. Among the key opportunities and actions for improving biodiversity are to:

- Reconnect rivers to their floodplains so they function more naturally, reducing flood risk downstream
- Restore and increase hedgerows and areas of riparian tree planting, which can help to reduce runoff and improve water quality in rivers and streams
- Revert rye grass pastures to lowland meadows to increase soil infiltration and lowering sedimentation rates, contributing to a reduction in flood risk

The LNRS can provide developers with additional concepts for NFM, SuDS, or green-blue infrastructure initiatives. By collaborating with members of the Local Nature Partnership (LNP), the LNRS can help ensure that the appropriate techniques are employed for the proposed area.

The Chester Wetland Project aims to restore floodplain meadow habitat in the Countess of Chester park with benefits to water quality, carbon sequestration, floodplain connectivity, ecological connectivity and function and improved community blue / green space access.

In Hatchmere Nature Reserve, Cheshire Wildlife Trust have reintroduced beavers. Beavers can create wetlands by digging canals and damming watercourses. This can help reduce downstream flooding as the channels, dams and wetlands can hold back water and release it more slowly after heavy rainfall.

Websites that provide further information about ongoing NFM schemes and community works include The Flood Hub (thefloodhub.co.uk) and the Rivers Trust NFM National Map (theriverstrust.hub.arcgis.com).

12.4 Catchment and floodplain restoration

Floodplain restoration represents the most sustainable form of strategic flood risk solution, by allowing watercourses to return to a more naturalised state, and by creating space for naturally functioning floodplains working with natural processes.

Although the restoration of floodplain is difficult in previously developed areas where development cannot be rolled back, the following measures should be adopted:

- Promoting existing and future brownfield sites that are adjacent to watercourses to naturalise banks as much as possible. Buffering areas around watercourses to provide an opportunity to restore parts of the floodplain.
- Removing redundant structures to reconnect the river and the floodplain.
- Applying the sequential approach to avoid new development within the floodplain.

12.5 Structure removal and/or modification (e.g. weirs)

Structures, both within watercourses and adjacent to them can have significant impacts upon a river's regime, including alterations to the geomorphology and hydraulics of the

channel through water impoundment and altering the sediment transfer regime, which over time can significantly impact the channel profile including bed and bank levels, alterations to flow regime and interruption of biological connectivity, including the passage of fish and invertebrates.

Many artificial in-channel structures (such as weirs and culverts) can sometimes be redundant and/or serve little purpose. Opportunities for the removal of such structures should be investigated where feasible. The need to do this is heightened by climate change, for which restoring natural river processes, habitats and connectivity are vital adaptation measures. However, it also must be recognised that some artificial structures may have important functions or historical/cultural associations, which need to be considered carefully when planning and designing restoration work.

In the case of weirs, whilst weir removal should be investigated in the first instance, in some cases it may be necessary to modify a weir rather than remove it. For example, by lowering the weir crest level or adding a fish pass. This will allow more natural water level variations upstream of the weir and remove a barrier to fish migration.

Developers should investigate the 'opening up' or 'daylighting' of existing culverts where possible and should not construct new culverts on site except for short lengths to allow essential infrastructure crossings.

12.6 Riverbank stabilisation

Any practice that may cause riverbank erosion should be avoided. Landowners should be encouraged to avoid using machinery and vehicles close to or within the watercourse unless in the circumstances where machinery and vehicles are required for watercourse maintenance such as desilting, grass cutting, or removal of vegetation. Care should be taken not to destabilise the banks.

There are several techniques that can be employed to restrict the erosion of riverbanks. In an area where bankside erosion is particularly bad and/or vegetation is unable to properly establish, ecologically sensitive bank stabilisation techniques, such as willow spiling, can be particularly effective. Live willow stakes thrive in the moist environment and protect the soils from further erosion allowing other vegetation to establish and protect the soils. Other approaches include the planting of brash or small trees, large wood, large trees and root wads.

12.7 Green infrastructure

Green infrastructure (GI) is a planned and managed network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and rural fringe and consist of:

- Open spaces – parks, woodland, nature reserves, lakes.
- Linkages – river corridors and canals, and pathways, cycle routes and greenways.

- Networks of “urban green” – private gardens, street trees, verges and green roofs.

The identification and planning of GI is critical to achieving sustainable growth. It merits forward planning and investment as much as other socio-economic priorities such as health, transport, education and economic development. GI is also central to climate change action and is a recurring theme in planning policy. With regards to flood risk, green spaces can be used to manage storm flows and free up water storage capacity in existing infrastructure to reduce risk of damage to urban property, particularly in urban centres and vulnerable urban regeneration areas. GI can also improve accessibility to waterways, improve water quality, support regeneration, and improve opportunities for leisure, economic activity, and biodiversity.

13 Recommendations and next steps

13.1 Requirements for a Level 2 SFRA

Following the application of the Sequential Test, where sites cannot be appropriately accommodated in low-risk areas, the Council may need to show that allocated sites can be safe for their lifetime. Some sites may also require application of the Exception Test. In these circumstances, a Level 2 SFRA is required, to assess in more detail the nature and implications of the flood characteristics in order for the LPA to allocate such sites in the new Local Plan. However, a Level 2 SFRA does not negate the need for a site-specific FRA at the application stage.

As part of this Level 1 SFRA, an initial site screening exercise using the Council's Land Availability Assessment (Stage 1) (LAA) potential development allocation boundaries and the latest flood risk data has been undertaken to help inform the application of the Sequential Test and the subsequent potential requirement for a Level 2 SFRA prior to a site's allocation within the Local Plan.

Appendix F provides a strategic assessment of the suitability, relative to flood risk, of the sites that could be the location of potential allocations in Council's new Local Plan, summarising the outcomes of the screening assessment spreadsheet in Appendix E.

SFRA strategic recommendation B[2] applies to sites where a Level 2 SFRA will be required in order to allocate a site. Of 1,896 potential development sites screened as part of this Level 1 SFRA, as identified through the Council's Stage 1 LAA, strategic recommendation B applies to 1,325 sites.

13.2 Recommendations from SFRA findings

The following overarching SFRA recommendations have been developed to guide future development and inform planning decisions across the borough in relation to flood risk. These recommendations should be read alongside national and local policies and are intended to support the allocation of sites and planning applications, ensuring that flood risk is appropriately considered at all stages of the planning process.

- New development should be directed to areas with the lowest probability of flooding (Flood Zone 1). Development within Flood Zones 2 and 3 should only be

2 Applies to any site where the following criteria is true: any part of a site is within Flood Zone 3a (high risk), any part of a site is within Flood Zone 2 (medium risk), any part of a site is within the high or medium risk surface water flood zones, any part of a site is within the medium risk plus climate change extent (using the low risk surface water extent as a conservative proxy) or any part of a site is within the EA Flood Map for Planning Climate Change Extents.

considered if no reasonably alternative sites exist. Development should also be directed away from the climate change flood risk zones.

- There should be no residential development within Flood Zone 3a or the climate change flood zone. More vulnerable development is required to be subject to and to pass the Exception Test if it is proposed within Flood Zone 3a.
- Where development is proposed within Flood Zone 2, and whilst accounting for climate change, consideration should be given to locating dwellings above ground floor level. Ground floor areas should be limited to less vulnerable uses, such as retail, restaurants, office space, or car parking, where compatible with local policy.
- There should be no development within Flood Zone 3b (functional floodplain). Areas of functional floodplain would ideally remain as or be converted to open greenspace, providing multifunctional ecology, social and amenity benefits.
- A site-specific flood risk assessment should accompany planning applications where development is proposed within Flood Zones 2 and 3a, at risk from climate change, or within Flood Zone 1 and the site area is 1 hectare or greater.
- Built development within 8m of the bank top of a main river, culvert or flood defence should be discouraged. Focus should be for the preservation of the watercourse corridor, wildlife habitat, flood flow conveyance and future watercourse maintenance or improvement.
- For all new development situated within flood risk areas, planning applications should be accompanied by an emergency plan that is proportionate to the risk. This should set out clear procedures for safe evacuation, identify safe access and escape routes and account for the vulnerability of site users during a flood event.
- Space should be provided for the inclusion of SuDS on all allocated sites, outline proposals and full planning applications. SuDS design should demonstrate how constraints have been considered and how the design provides multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure, and the enhancement of historical features.
- Where development is located behind a flood defence or within a defended area, consideration should be given to the potential safety of the development, FFLs and for safe access and escape routes in the event of rapid inundation of water due to a defence breach with little warning.

13.3 Recommendations for further work

The SFRA process has developed into more than just a planning tool. Sitting alongside the Sustainability Appraisal and Local Flood Risk Management Strategy, it can be used to provide a much broader and inclusive vehicle for integrated, strategic and local flood risk management and delivery.

There are several studies listed in Table 13-1 that may be of benefit to the LPA, in developing the flood risk evidence base to support the delivery of the Local Plan, or to the

LLFA to help fill critical gaps in flood risk information that have become apparent through the preparation of this Level 1 SFRA.

Table 13-1: Potential further works and assessments

Type	Study	Reason	Timeframe
Understanding of local flood risk	Level 1 SFRA update	When there are changes to: the predicted impacts of climate change on flood risk; national flood modelling; detailed flood modelling - such as from the EA or LLFA; the Local Plan, spatial development strategy or relevant local development documents; local flood management schemes; flood risk management plans; local flood risk management strategies; national planning policy or guidance (2025 reforms of the PPG); or after a significant flood event.	As required
	Level 2 SFRA	Reviewing of EA flood zones in those areas not covered by existing detailed hydraulic models (i.e., the Flood Map for Planning does not cover every watercourse such as those <3km^2 in catchment area or ordinary watercourses). If a watercourse or drain is present on OS mapping but is not covered by the Flood Map for Planning, this does not mean there is no potential flood risk. A model or further investigation may therefore be required to ascertain the flood risk, if any, to any nearby sites.	Short term
	Level 2 SFRA	Further, more detailed assessment of flood risk to high and medium risk sites both now and in the future as notified by this Level 1 SFRA.	Short term

Type	Study	Reason	Timeframe
Residual risk	Level 2 SFRA	Residual risk from flooding as a result of defence breaches and asset blockages should continue be mitigated through Sequential Testing to steer development to lower risk areas and identifying opportunities for property flood resilience measures for properties at residual risk.	Short term
Flood storage and attenuation	Working with Natural Processes	Further assessment of WwNP options in upper catchments to gauge possible areas for Natural Flood Management. Promote creation of floodplain and riparian woodland, floodplain reconnection and runoff attenuation features where the research indicates that it would be beneficial to the borough.	Short term
Water resources	Water Cycle Study	To ensure sufficient provision of infrastructure for water supply and wastewater for new development. Particularly relevant to intensification of urban development or the development of large strategic sites.	Short term
Partnership	United Utilities and Welsh Water	Cheshire West and Chester Council should continue to collaborate with water companies on sewer and surface water projects to ensure their assets can remain operational and resilient at all times across the catchment and that capacity for new development is appropriate.	Ongoing
	EA	Cheshire West and Chester Council should continue to work with the EA on fluvial and tidal flood risk management projects. Potential opportunities for joint schemes to tackle flooding from all sources should be identified.	Ongoing

Type	Study	Reason	Timeframe
	Community	Continued involvement with the community through existing flood risk partnerships.	Ongoing

Appendices

A Data Sources used in this SFRA

B Guide for using available flood risk data in applying the Sequential Test

C Growth Area Overviews

D Functional floodplain delineation methodology

E Site screening assessment spreadsheet

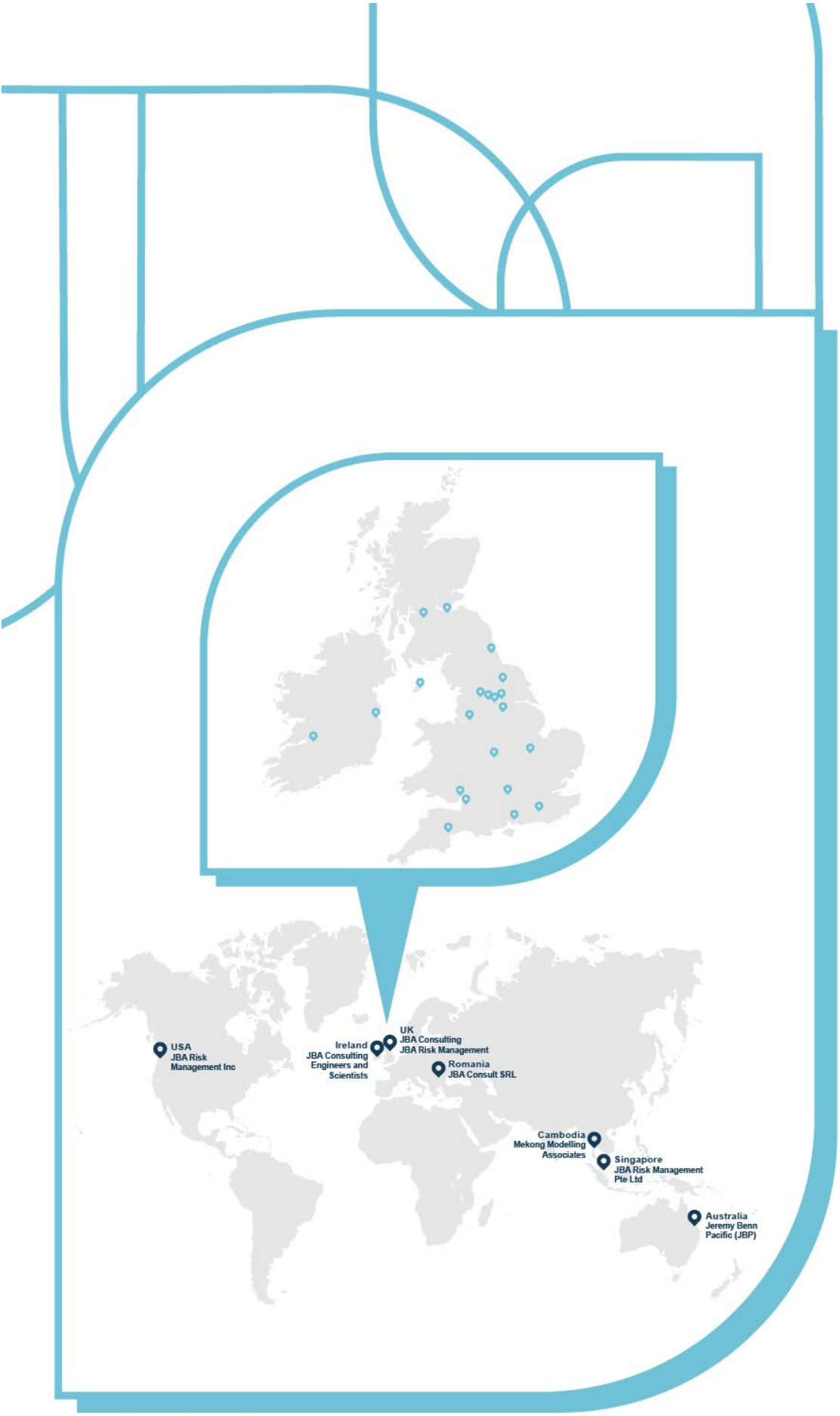
F Local Plan Sites Assessment Summary

G Catchment-level assessment of Cumulative Impacts of Development on Flood Risk

H Legislation and Policy Summary for Flood and Water Management

I GIS data

J SFRA GeoPDF Mapping



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