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City of Manchester Level 1 Strategic Flood Risk Assessment

Final Report

Prepared for
Manchester City Council

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This report describes work commissioned by Manchester City Council by an instruction dated 13 February 2026. The Client's representative for the contract was Duncan McCorquodale of Manchester City Council. Kira Khangura and Laura Thompson-Jones of JBA Consulting carried out this work.

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The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by JBA has not been independently verified by JBA, unless otherwise stated in the Report.

Acknowledgements

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Contents

List of Figures

List of Tables

Abbreviations

ACDP	Area with Critical Drainage Problems
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
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
FAA	Flood Alert Area
FCERM	Flood and Coastal Erosion Risk Management
FFL	Finished Floor Level
FMfP	Flood Map for Planning
FRA	Flood Risk Assessment
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
LFRMS	Local Flood Risk Management Strategy
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
LNRS	Local Nature Recovery Strategy
LPA	Local planning Authority
NFM	Natural Flood Management

NPPF	National Planning Policy Framework
NVZ	Nitrate Vulnerable Zone
PPG	Planning Practice Guidance
RMA	Risk Management Authority
SFRA	Strategic Flood Risk Assessment
SHELAA	Strategic Housing and Economic Land Availability Assessment
SoP	Standard of Protection
SuDS	Sustainable Drainage System
SWMP	Surface Water Management Plan

Definitions

1D model: One-dimensional hydraulic model.

1D-2D model: Linked one and two 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), 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 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: A parcel of land that is currently undeveloped and has not been developed previously.

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 (RMA): The EA; a 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 (SuDS): 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 planning authority's local plan.

Executive Summary

This report provides a comprehensive and robust evidence base on flood risk issues to support the review and update of the planning policies for the City of Manchester. This report uses the best available information, including input from key stakeholders. The SFRA applies the 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. At the time of publication of this SFRA, the NPPF 2025 version is used to inform the SFRA.
- 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, last updated in August 2025.
- The Association of Directors of Environment, Economy, Planning & Transport (ADEPT) 'Strategic flood risk assessment good practice guidance' (adeptnet.org.uk).

Introduction

To support the new local plan for Manchester City Council (referred to hereafter as the Council), the key objectives of the assessment are:

- To review the most recent policy and legislation in the NPPF and Flood Risk and Coastal Change Planning Practice Guidance;
- To collate and analyse the latest available information (both nationally and locally) and data for current and future flood risk from all sources in combination and how these may be mitigated;
- To inform decisions in the emerging Manchester Local Plan, including the consideration of potential flood risk impacts on the proposed development locations and allocations in the draft plan and planning policies;
- To provide evidence to support the application of the Sequential Test where appropriate for any proposed development locations and allocations within the draft local plan; and
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used in the local plan evidence base.

Summary of Manchester and flood risk

The City of Manchester is located within Greater Manchester in the north of England. The city is one of the 10 constituent councils of the Greater Manchester Combined Authority (GMCA). Over 551,943 people live in the area, according to the 2021 Census. The authority area covers approximately 116km² of land, including the communities of Cheetham Hill, Blackley, Moston, Openshaw, Rusholme, Levenshulme, Chorlton-Cum-Hardy, Didsbury, Northenden and Wythenshawe, as well as the city centre.

Flood risk from all sources has been assessed in this SFRA. This study has shown that the most significant sources of flood risk across the City of Manchester are fluvial and surface water. The points below summarise the findings:

Fluvial: The majority of fluvial flood risk comes from the River Mersey, the River Medlock and the River Irk as well as various ordinary watercourses including Corn Brook. Platt Brook and Chorlton Brook. Fluvial flood risk is discussed in Section 4.3.6 and shown on the SFRA mapping in Appendix H.

Surface Water: The EA's Flood Map for Planning - Surface Water Spatial Planning Extents dataset highlights the many areas to be at risk of surface water flooding. Modelled high risk areas are prevalent across the city, highlighting the densely urban nature of the city. Surface water flood risk is discussed in Section 4.5 and shown on the SFRA mapping in Appendix H.

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 and surface water flood risk. The approach to climate change is discussed in Section 5.

Sewer: United Utilities provide water and sewerage services across the region and have provided details of historic sewer flooding across the City of Manchester. Sewer flood risk is discussed in Section 4.6.

Groundwater: The risk of groundwater emergence within the City of Manchester is varied. There are several areas shown in the JBA Groundwater Emergence Map where groundwater levels are either at or very near the ground surface, as detailed in Section 4.7 and shown on the SFRA mapping in Appendix H.
There is no national risk-based groundwater flood dataset of a suitable resolution 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.

Canals: Rochdale Canal, Ashton Canal and Bridgewater Canal run through the City of Manchester. Canal flood risk is discussed in Section 4.8.1.

Reservoirs: There are six reservoirs located within the City of Manchester, and 72 located outside, which present a potential risk of flooding to the city. 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 flood risk assessments (FRA) (where relevant) in accordance with the PPG: Flood risk and coastal change. Reservoir flood risk is discussed in Section 4.8.2 and shown on the SFRA mapping in Appendix H.

Defences: The EA Asset Information Management System (AIMS) dataset provides information on flood defence assets across the city. The majority of flood defences within the City of Manchester are present along the River Mersey, as flood embankments and walls. Further information on defences is available in Section 6 and shown on the SFRA mapping in Appendix H.

How to use this report

The SFRA provides recommendations regarding all sources of flood risk across the City of Manchester, which can be used to inform policy on flood risk within the emerging local plan. This includes how the cumulative impact of 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 B) and provides guidance on how to apply the Exception Test.

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

The 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 city 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 city are outlined in Section 6.5 and Section 8 discusses mitigations, resistance and resilience measures which can be applied to alleviate flood risk to an area.

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

SFRA mapping

The interactive SFRA mapping in Appendix H highlights on a strategic scale flood risk from rivers, surface water and reservoirs, and where groundwater emergence may occur. The potential impacts from climate change are also shown for risk from rivers, where data is available, and from surface water. The maps are 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.

The mapping data should always be supplemented by direct consultation with the relevant wastewater company to ascertain if there is any site-specific risk from a public sewer. This is because sewer flood risk information is not publicly available and would need to be considered on a site-specific basis.

1 Introduction

1.1 Purpose of a Strategic Flood Risk Assessment (SFRA)

Manchester City 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.

As set out in the National Planning Policy Framework (NPPF), 2025 (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

1.2 Relevance of the SFRA

The 'How to prepare a Strategic Flood Risk Assessment guidance', 2025 (gov.uk) 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 and included in the Level 1 SFRA. Over time, new and updated information will become available to inform planning decisions:

- The Environment Agency (EA) regularly reviews and updates its hydrology, hydraulic modelling, and flood risk mapping.
- The EA published the National Flood Risk Assessment 2 mapping (NaFRA2) and 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 other Risk Management Authorities (RMAs).

Weblinks have been provided for relevant guidance documents and policies published by RMAs such as Manchester City Council, in its role as LPA and LLFA, and the EA. When considering this Level 1 SFRA to help prepare site-specific flood risk assessments (FRA), it is important to check with the source organisation (the Council) 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 site allocations are not at major flood risk and where development pressures are low, a Level 1 assessment may be sufficient, without the LPA needing 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 flood risk areas cannot appropriately accommodate all necessary development, creating the need to apply the NPPF's Exception Test if relevant, or if the 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, and inform on whether a proposed development could be safe for its lifetime.

This report and associated appendices fulfil the requirements of a Level 1 SFRA.

1.4 Local plan area

The City of Manchester is located within the conurbation of Greater Manchester in the northwest of England. The City of Manchester is one of the ten members of the Greater Manchester Combined Authority (GMCA). Over 551,943 people live in the city according to the 2021 Census, the greatest out of the 10 GMCA councils. The City of Manchester authority area covers approximately 116 km^2 of land and is predominantly urbanised. Key communities outside of the city centre include Cheetham Hill, Blackley, Moston and Openshaw to its north, and Rusholme, Levenshulme, Chorlton-Cum-Hardy, Didsbury, Northenden and Wythenshawe to its south. Manchester Airport is located within the south of the authority area.

The City of Manchester is bordered by the Metropolitan Boroughs of Stockport, Tameside, Rochdale, Oldham, Bury, Salford and Trafford. It is also bordered by Cheshire East to the south, as shown in Figure 1-1. United Utilities is the water company covering water supply and sewerage services.

The EA main rivers Medlock and Irk run through the city. The Medlock rises east of Oldham and runs east to west to join the River Irwell in the city centre. The River Irk rises to the east of Royton and runs southwest, also joining the River Irwell in the city centre. The River Irwell flows along the border between the Manchester and Salford authority areas, west of the city centre. The River Mersey flows westwards through the south of the city before draining into the Irish Sea. Other EA main rivers flow through the south of the city, including Chorlton, Platt and Gore Brook. Notable ordinary watercourses include Corn Borok and Fallowfield Brook.

The City of Manchester is highly urbanised, many of its main rivers and ordinary watercourses are culverted for large sections as they flow through the city.

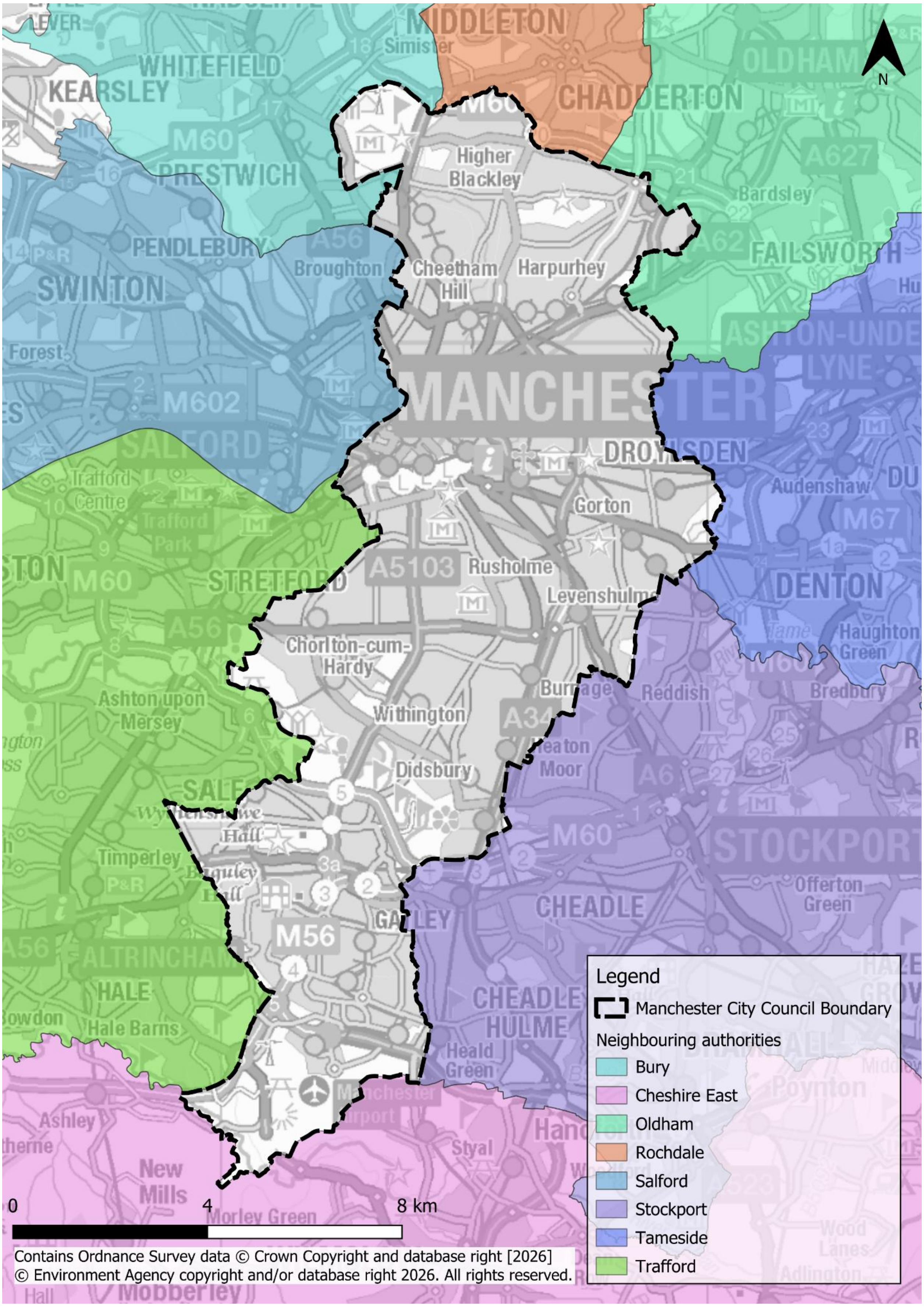


Figure 1-1: City of Manchester and its neighbouring authorities

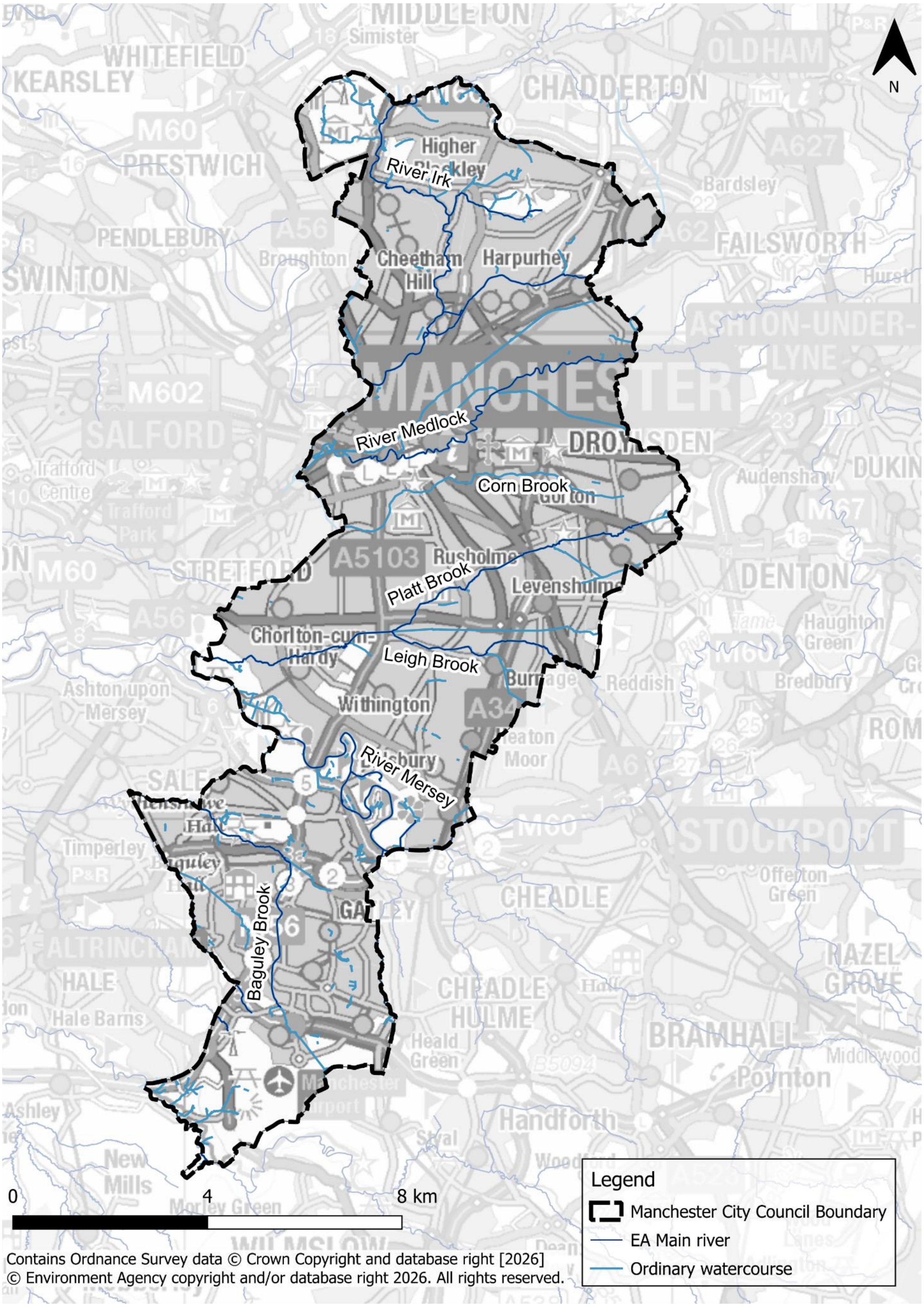


Figure 1-2: Main rivers and ordinary watercourses across the City of Manchester

1.5 Consultation

SFRAs should be prepared in consultation with other RMAs. In addition to the LPA the following parties have been consulted during the preparation of the Level 1 SFRA through data requests and draft report reviews:

- Environment Agency
- Lead Local Flood Authority (Manchester City Council)
- United Utilities
- Canal & River Trust
- Tameside Metropolitan Borough Council
- Trafford Metropolitan Borough Council
- Salford Metropolitan Borough Council
- Rochdale Metropolitan Borough Council
- Bury Metropolitan Borough Council
- Oldham Metropolitan Borough Council
- Stockport Metropolitan Borough Council
- Cheshire East 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 (National Highways and Manchester City Council)
- Catchment partnerships (Section 12.1)
- Regional flood and coastal committees (North West Regional Flood and Coastal Committee)

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 neighbourhood planners.	Users should refer to this section for a summary of the Level 1 findings and recommendations.
1. Introduction	This section provides a background and context to the study 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, as well as Appendix C, 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 local characteristics of flooding affecting Manchester 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 Manchester 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, as well as mitigation options.
8. Principles for site design and master planning	This section contains guidance for developers on principles of managing flood risk in developments through site design and master planning.	Developers should use this section to understand what should be considered within the site design and master planning stages of a development.
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.	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.

Section	Contents	How to use
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 potential cumulative impacts of development
12. Strategic flood risk solutions	This section sets out wider strategic solutions that may offer potential to reduce flood risk across the city, including natural flood management. It also details current partnership working opportunities within the city.	Planners should use this section to help develop policy recommendations for strategic flood risk solutions to reduce flood risk across the city, with a particular emphasis on natural flood management and nature-based solutions. Developers should use this section to consider options for strategic solutions and natural flood management techniques and nature-based solutions.
13.Recommendations and next steps	This section outlines planning policy recommendations. It also sets out the recommended next steps and potential future work.	Developers and planners should consider the recommendations made in this section. 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 recommended methodology for carrying out the Sequential Test, including how each source of flood risk should be considered.	Planners and developers should consider this appendix to inform the application of the Sequential Test.
Appendix C	Provides a background to the flood risk policy documents that are relevant to the authority area.	Planners and developers should use this appendix, in conjunction with Section 2 of this report, to understand the relevant flood and water management policy and guidance for

Section	Contents	How to use
		development.
Appendix D	Technical note explaining the methodology behind the delineation of the functional floodplain (Flood Zone 3b) and future functional floodplain for this Level 1 SFRA.	Planners and developers should use this appendix to understand the datasets used to inform the functional floodplain extents.
Appendix E	Excel spreadsheet containing an assessment of flood risk to the potential development allocations based on all available sources of flood risk including for climate change where available. Each potential allocation is assigned a strategic recommendation based on risk and vulnerability.	Planners should use this appendix to understand the level of risk to each potential allocation and associated recommendations for development. Planners should use this appendix to assist in the application of the Sequential Test for local plan preparation.
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. Planners should use this appendix to assist in the application of the Sequential Test for local plan preparation.
Appendix G	Details the methodology and results for the cumulative impact assessment.	Planners should use this appendix, in conjunction with Section 11 of this report, to help develop policy recommendations for the cumulative impacts of development.
Appendix H .	Interactive GeoPDF mapping displaying all flood risk information used within the SFRA.	Planners and developers should use the flood risk data within the mapping to scope out the issues they need to consider in greater detail in a site-specific FRA to support a planning application.

2 Policy and strategy for flood risk management

This section, along with Appendix C which contains greater detail, 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 City of Manchester 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 provides 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, flood forecasts and warnings and general supervision	Main River (e.g., River Mersey, River Medlock and River Irk) and reservoirs (Flood Risk Activity Permits, enforcement, and works), flood warning	Statutory consultee for certain development in Flood Zones 2 and 3 and all works within 20 metres of a main river.
Manchester City 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
Manchester City Council as LPA	Applying the sequential and exception tests at the plan-making stage. Allocating land at least flood risk. Safeguarding land for flood risk	Ensuring maintenance arrangements for drainage of developments are in place. Encouraging the use of SuDS through	Producing the local plan and assessing planning applications. Ensuring the SFRA is kept up to date

Risk Management Authority	Strategic level	Operational level	Planning role
	management functions	local plan policy or supplementary planning guidance.	
United Utilities	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 Manchester City 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 Council 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 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 Exception Tests for both planners and developers.

3.1 National Planning Policy Framework and Guidance

The NPPF (February 2025) (gov.uk) sets out 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:

"*Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing of future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere*" (paragraph 170).

The Sequential and Exception Tests help to guide this process.

The Flood Risk and Coastal Change PPG, 2025 (gov.uk) 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. At the time of publication of this SFRA, the NPPF 2025 version is used to inform the SFRA.

3.2 The Sequential Test for plan preparation

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 for the potential inclusion in the local plan. 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 4.3.6 for information on the FMfP;
- In Flood Zone 3b and your development is not incompatible;

- Within the 'Flood Zones plus climate change' of the FMfP, showing it is at increased risk of flooding from rivers 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

The requirements for developers are set out in the FRA Standing Advice (gov.uk).

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).

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.

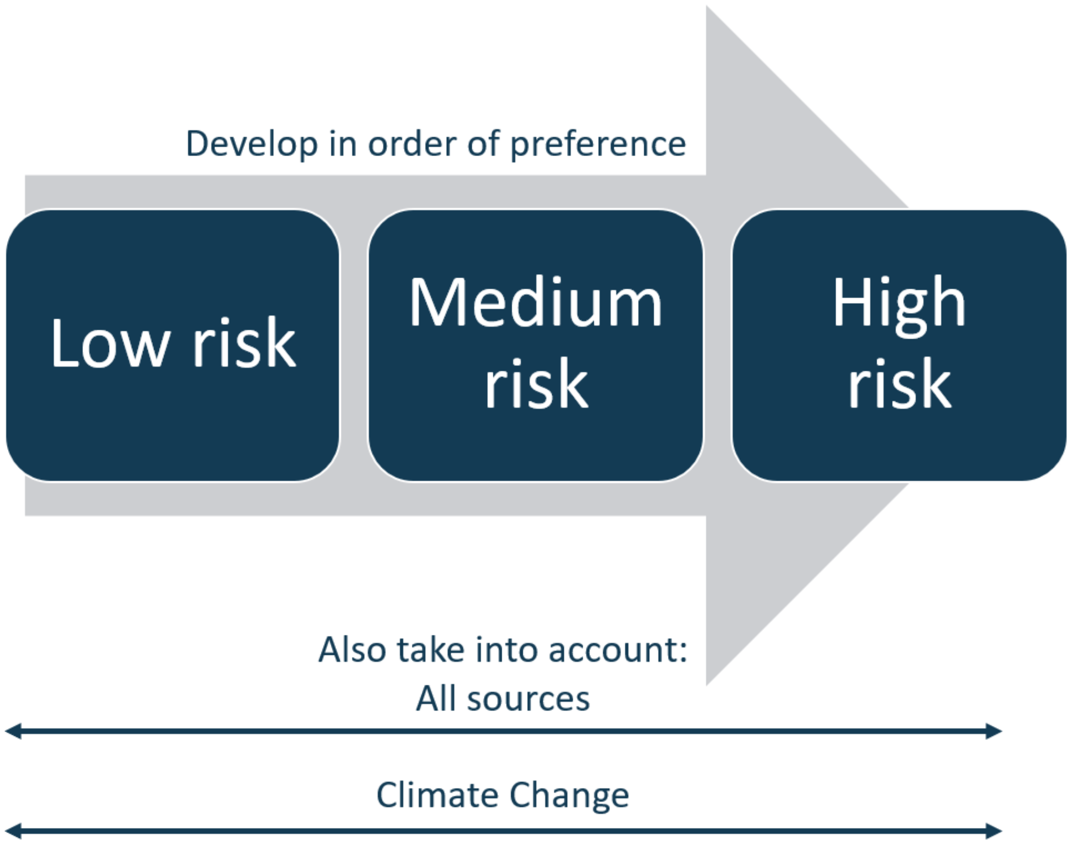
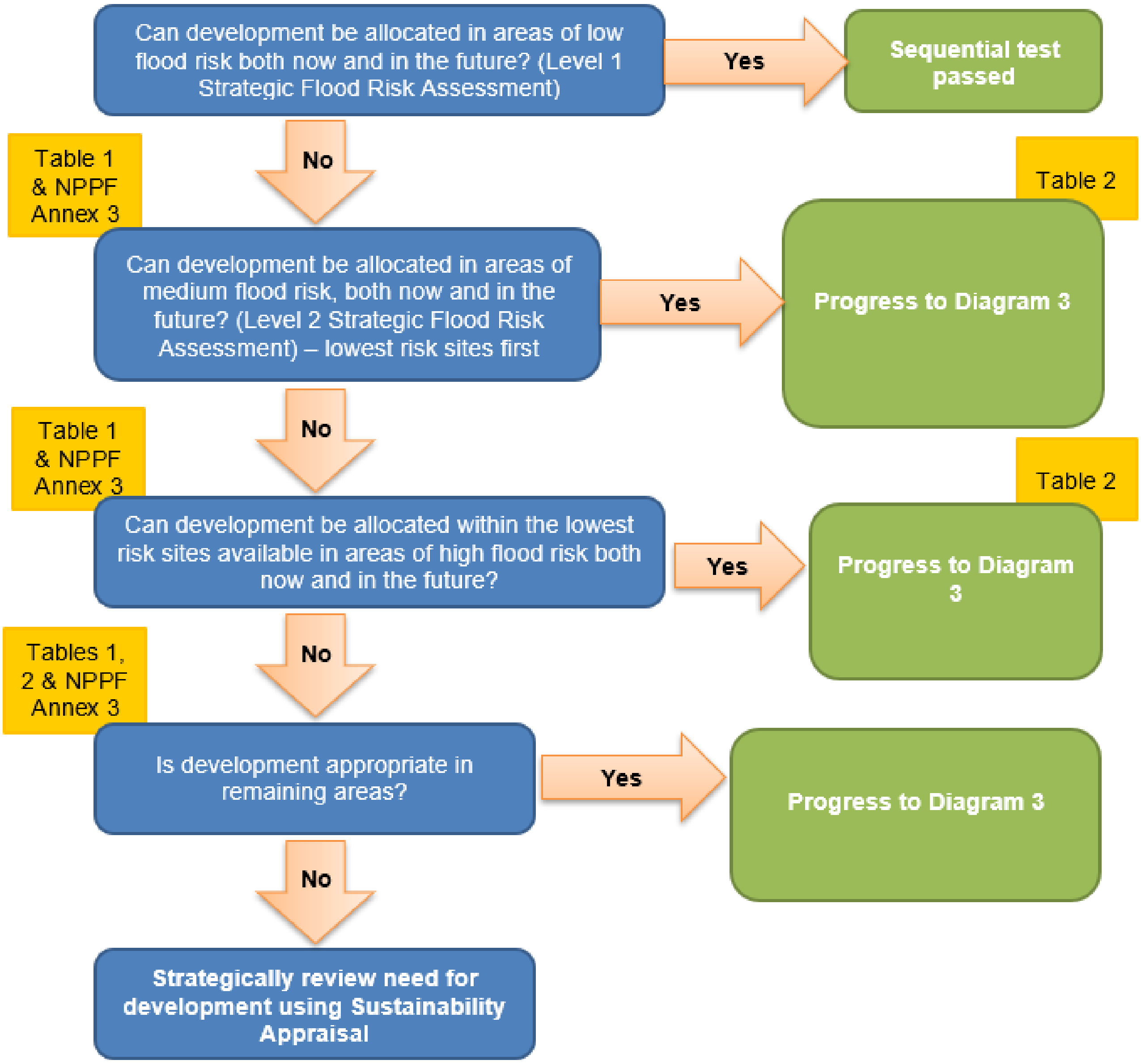


Figure 3-1: The Sequential Test

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 proposed 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 sites 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 preferred approach.

3.3 The Exception Test for plan preparation

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)

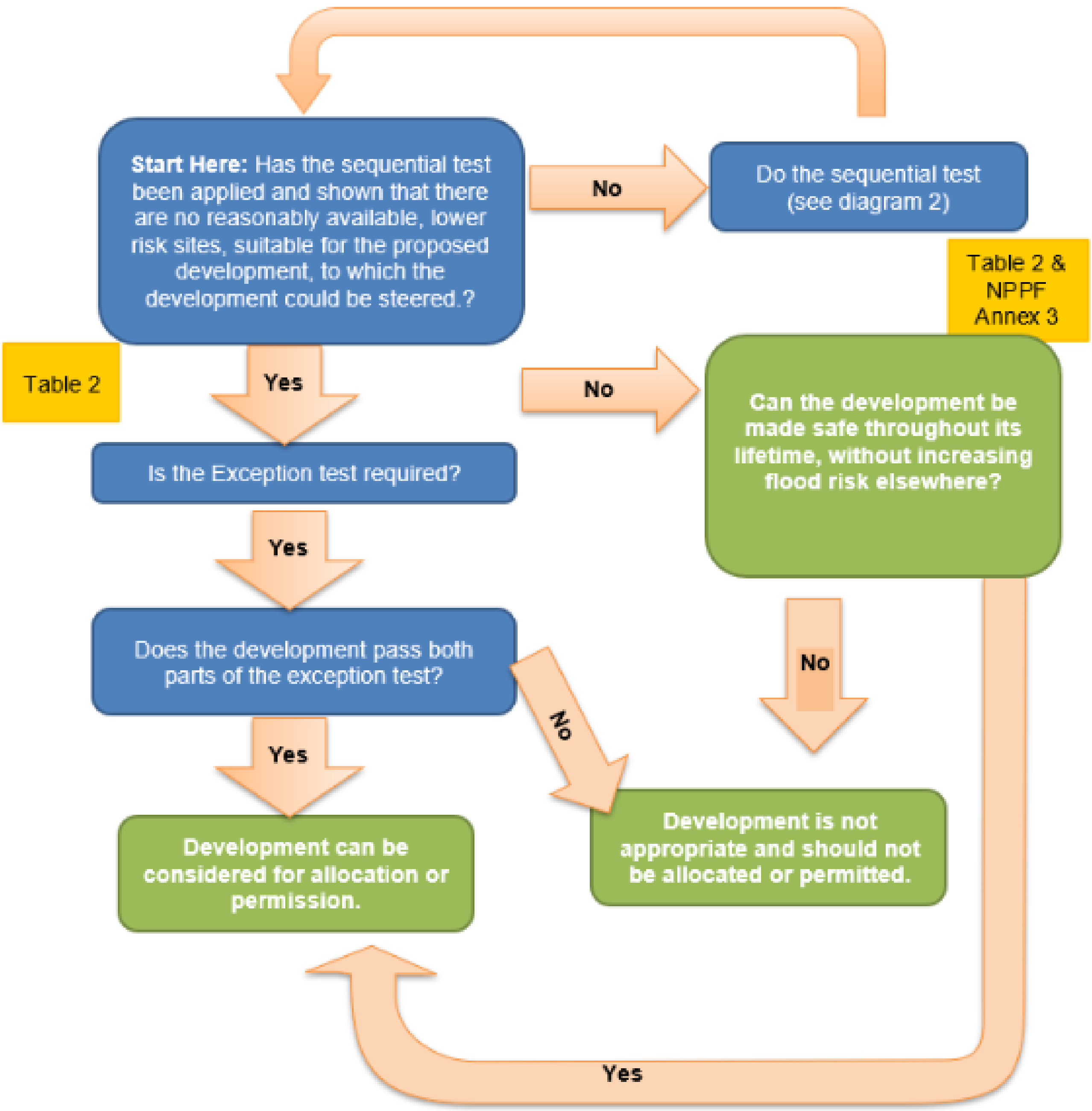
(Paragraph: 033 Reference ID: 7-033-20220825) summarises the Exception Test (Figure 3-3).

Table 2 of the PPG (gov.uk) sets out when the Exception Test is required 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 3.4.2 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 planning permission should be refused.

Wider sustainability objectives should be considered, such as those set out in local plan Sustainability Appraisals. These generally consider matters such as 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.

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. 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 fluvial Flood Zone 1 unless there are other flooding issues in the area of the development (i.e. surface water, groundwater, reservoir, sewer flooding).

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

The SFRA contains information on all sources of flooding and takes into account 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. Following the September 2025 update to the PPG a proportionate approach should be taken in applying the Sequential Test in areas of surface water flood risk. 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 (therefore addressing the risks identified e.g. by the EA flood risk mapping), without increasing flood risk elsewhere, then the Sequential Test need not be applied.

Local circumstances must be used to define geographical scope of the Sequential Test (within which it is appropriate to identify reasonably available alternatives). To determine the appropriate search area criteria, include 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.
- 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.

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 in itself is not acceptable as a reason not to consider alternatives.

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 City of Manchester, and the factors that affect flooding including topography, soils, and geology.

This is a strategic summary of risk in the City of Manchester to inform the application of the Sequential and Exceptions Tests, if required. Developers should use this section of the SFRA, together with the SFRA flood risk data, 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 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 (annual exceedance probability) 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.

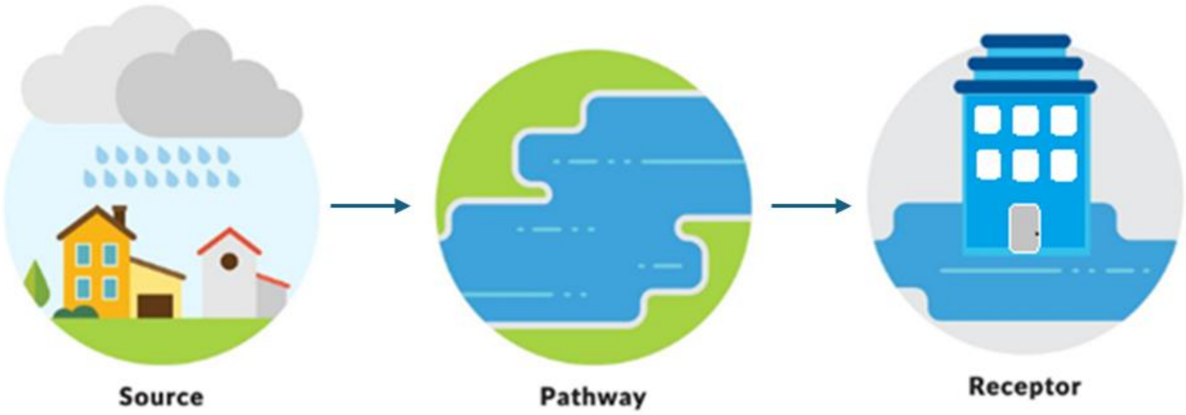


Figure 4-2: Source-Pathway-Receptor model.

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 EA's National LIDAR Programme (gov.uk) provides elevation data at 1 metre spatial resolution for all of England.

The topography of the City of Manchester generally falls from east to west, with higher-lying ground in areas such as Cheetham Hill, Blackley, Openshaw and Levenshulme, moving towards The Pennines. There are also areas of higher elevation in the south of the city in Wythenshawe towards the Cheshire Plains. Lower-lying ground can be seen in the Floodplains of the River Medlock, Mersey and Irk, through the city centre and areas just south of it, including Withington, Chorlton and Didsbury. The topography of the City of Manchester is shown in Figure 4-3.

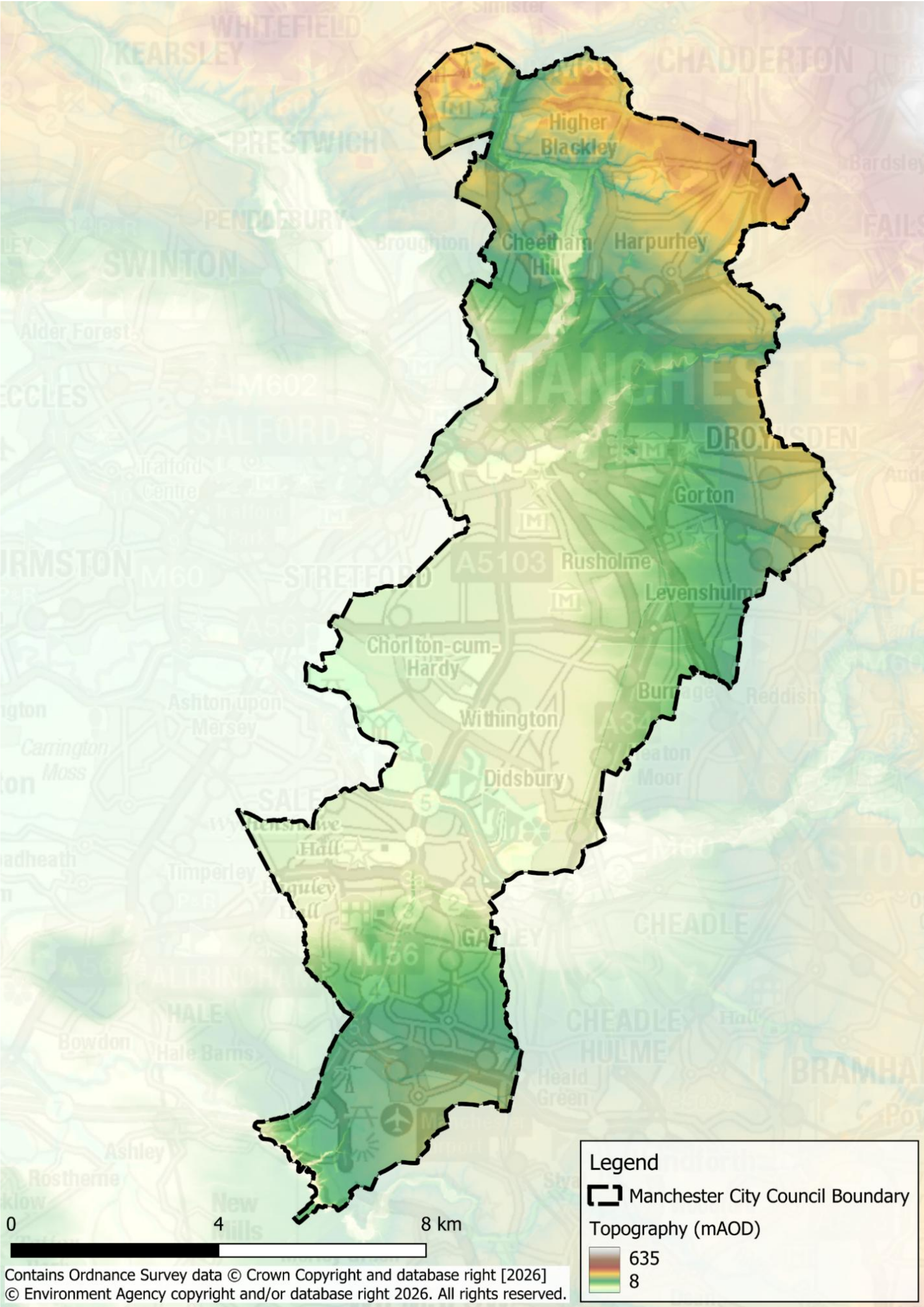


Figure 4-3: EA 1m LiDAR data showing the topography across the City of Manchester

4.2.2 Geology

Across the City of Manchester, bedrock geology is generally a mixture of mudstone, siltstone and sandstone. These sedimentary rock types have varying permeabilities. Sandstone and siltstone are more permeable whereas mudstone is finer-grained and clayey making it more impermeable. Coal, ironstone and ferricrete are present beneath Moston, Levenshulme and areas east of the city centre. These rock types are relatively less permeable. Within the centre of the authority area, conglomerate and interbedded geology is present. Conglomerate tends to be more permeable than other sedimentary rocks given its coarse-grained nature.

Superficial geology across the City of Manchester is largely till. Till has a relatively low permeability. There are some smaller areas of peat and glacial sand and gravel, as shown in Figure 4-4. Glacial sand and gravel tend to be highly permeable whereas the permeability of peat is variable. River terrace deposits are present along the River Mersey and its floodplain.

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

The EA also provides mapping 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. A secondary aquifer is a permeable layer which can support local water supplies and provide a source of base flow to rivers

The bedrock geology beneath the majority of the City of Manchester is categorised as principal aquifer. The bedrock geology beneath the southwest of the authority area, surrounding Sharston and Baguley, is categorised as Secondary Aquifer. The superficial deposits beneath the entire of the authority area are classified as Secondary Aquifer.

A map extent detailing the aquifer designations present across the city can be viewed on DEFRA's Interactive Mapping.

4.2.3 Soils

Soilscapes are a classification of soils in England and Wales, conveying a summary of the regional differences in the soil landscapes. Soils across a large part of the City of Manchester are classified as Soilscape 17 (slowly permeable seasonally wet acid loamy and clayey soils). The soils have impeded drainage. Along areas in the west of the authority area Soilscape 15 (Naturally wet very acid sandy and loamy soils) is present. This soil type is naturally wet and has a high water table which could impede drainage. Along the River Mersey floodplain, Soilscape 20 (Loamy and clayey floodplain soils with naturally high groundwater) is present. These soils are naturally wet and have a high water table which could impeded drainage.

The British Geological Survey website (bgs.ac.uk) provides data on soils across Manchester.

The Mining Remediation Authority mapping shows large areas in the north of the authority area where mining activity has occurred. The mapping can be used to identify possible ground instability and potential mining hazards.

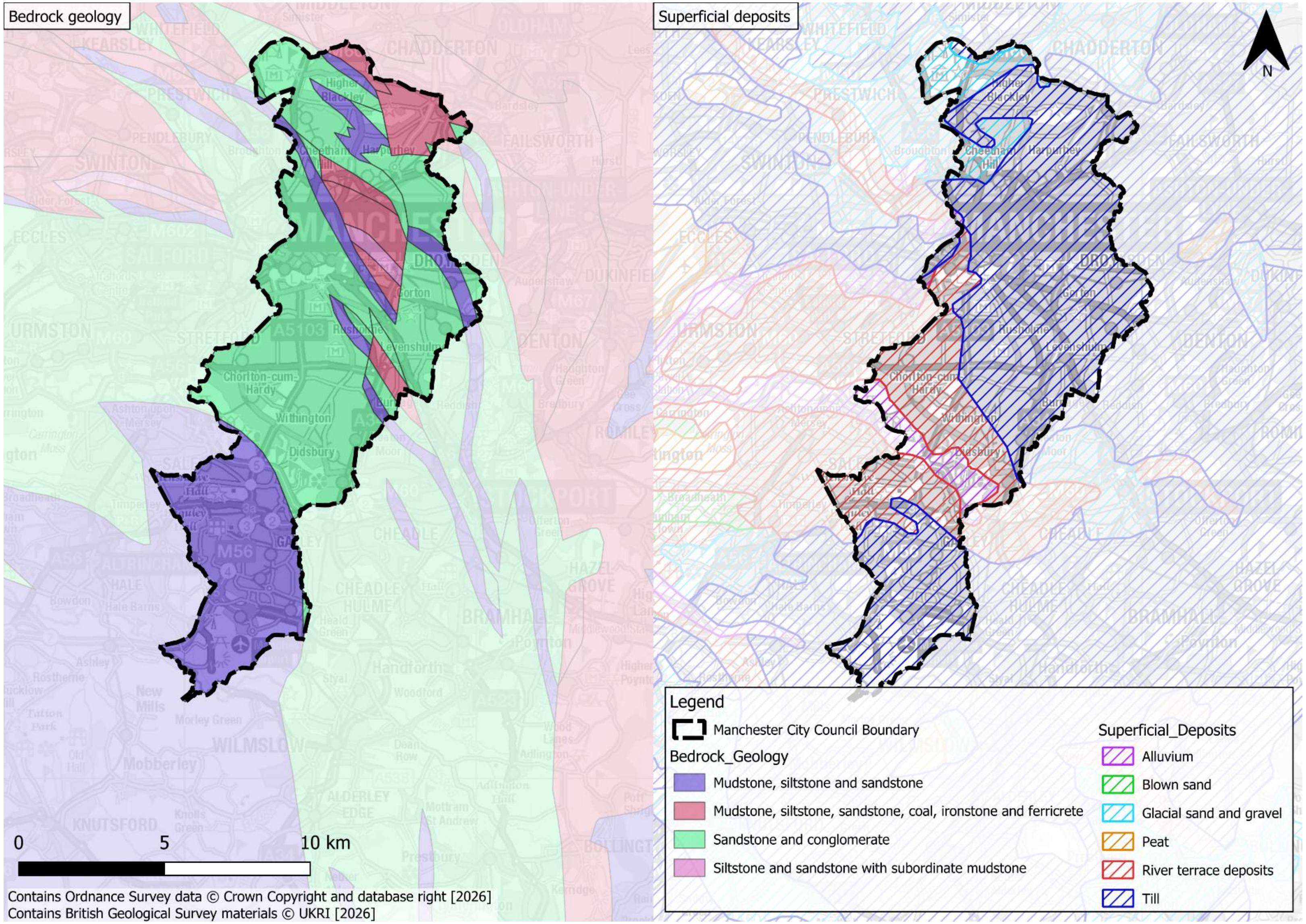


Figure 4-4: Bedrock geology across the City of Manchester

4.3 Historic 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

LLFAs are required, under the FWMA (2010), to maintain and update a 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 recorded in a digital database and / or Section 19 reports which can be found on Manchester City Council's website. Manchester City Council produced a Section 19 report detailing the events of the New Year 2025 floods in Manchester.

4.3.1.1 Section 19 investigations: New Year 2025

This Section 19 report details the extensive flooding that took place in various areas of the City of Manchester on and around New Years Eve 2024 and New Years Day 2025. High levels of rainfall in December 2024 meant that rain over the New Year fell on already saturated catchments. The report identifies an annual exceedance probability (AEP) of the event between 1%-2%. Internal flooding was reported at 60 residential properties and 29 commercial properties in total.

The source of flooding was primarily from main rivers, in particular the River Mersey in Didsbury and Northenden, the River Irk in Harpurhey and Crumpsall, the River Medlock in Deansgate, and Baguley Brook in Brooklands. Flooding was also reported in these areas from ordinary watercourses.

Table 4-1 documents the main areas impacted by the flooding. In addition to these areas, flooding was reported along highways, motorways and transport services across the city.

Table 4-1: Areas impacted by New Years flooding 2025

Location	Source of flooding	Impacts
East and West Didsbury	• Fluvial, from the River Mersey and surrounding, culverted ordinary watercourses • The Didsbury Flood Storage Reservoir was operated as water levels in the River Mersey rose. • Embankment breaches along the River Mersey resulted in uncontrolled flows into the reservoir • In East Didsbury, the River Mersey overtopped its embankment along Wilmslow Road, behind Broad Oak Lane and overtopped the flood gate at Stenner Lane. • The capacity of the Fog Lane Brook was exceeded, causing out of channel flooding into Fog Lane Park. Drainage in the park was also overwhelmed, contributing to surface water flooding.	• Internal property flooding of businesses within the Didsbury flood storage reservoir • Internal property flooding at 27 residential properties in the Palatine Road area • Damage to facilities due to internal flooding at Didsbury Sports Ground • 3 residential properties and 1 business flooded internally at Stenner Lane • 4 properties reported external flooding at Parrs Wood • Internal flooding reported at 3 residential properties surrounding Fog Lane Park • Internal property flooding reported at one property surrounding Ball Brook • Groundwater flooding was reported along the culverted Ball Brook route

Location	Source of flooding	Impacts
Northenden	• Fluvial, primarily from the River Mersey and surrounding, culverted watercourses. • Operation of Didsbury Flood Storage Reservoir flooded Northenden Golf Club • The Orchard Road drain, an ordinary watercourse in Northenden, exceeded its capacity • Surcharging gullies and manholes were observed • Brownley Brook, an ordinary watercourse flowing through the south of Northenden, was exceeded in several sections	• Flooding of rear gardens of several properties in the Monaco Drive and Orchard Road West area due to the Orchard Road Drain exceeding capacity. One property reported internal flooding • Two properties reported internal flooding from the River Mersey at Riverside Residential Park • Internal flooding reported at 7 residential properties surrounding Brownley Brook •
Harpurhey and Crumpsall	• Fluvial, from the River Irk • A retaining wall along the River Irk reportedly collapsed, directing floodwater towards Hendham Vale and Vale Park Industrial Estate • Highway drainage and sewer systems were likely overwhelmed due to steep topography surrounding the industrial estate and heavy rainfall, resulting in surface water flooding	• Internal flooding reported at up to 10 industrial units.
Brooklands	• Fluvial, from Baguley Brook • Baguley Brook exceeded capacity due to heavy rainfall • Residents reported that the trash screen on the inlet to the culvert beneath Bordley Walk was blocked with debris.	• Floodwater flowed towards properties near Garthorp Road and Bordley Walk • Internal flooding reported at four properties

Location	Source of flooding	Impacts
Deansgate, City Centre	• Fluvial, from the River Medlock • Capacity of the River Medlock was exceeded due to heavy rainfall • Flooding of the River Medlock was exacerbated by the constraints of various culverts and structures built as early as the late 18th century with reduced capacities. • High flows in the River Medlock resulted in overflow into the Bridgewater Canal at Castlefield Basin. Insufficient capacity meant the Bridgewater canal overflowed	• Internal flooding reported at two nightclubs, two pubs and a restaurant on Charles Street and Princess Street • Two reports of internal flooding caused by surcharging foul drainage systems • Internal flooding of a hotel on York Street. Manhole covers reportedly lifted within the building. • Internal flooding of a residential block on Cambridge Street, Lower Catham Street • Internal flooding reported at two businesses at Castlefield Basin.

4.3.1.2 LLFA historic flood incident reports

Manchester City Council, as LLFA, have provided a number of historic flood incident reports for consideration within this SFRA. These flood reports document smaller flood events that do not meet the threshold for a full Section 19 investigation. Figure 4-5 shows the location of these events, aggregated by ward.

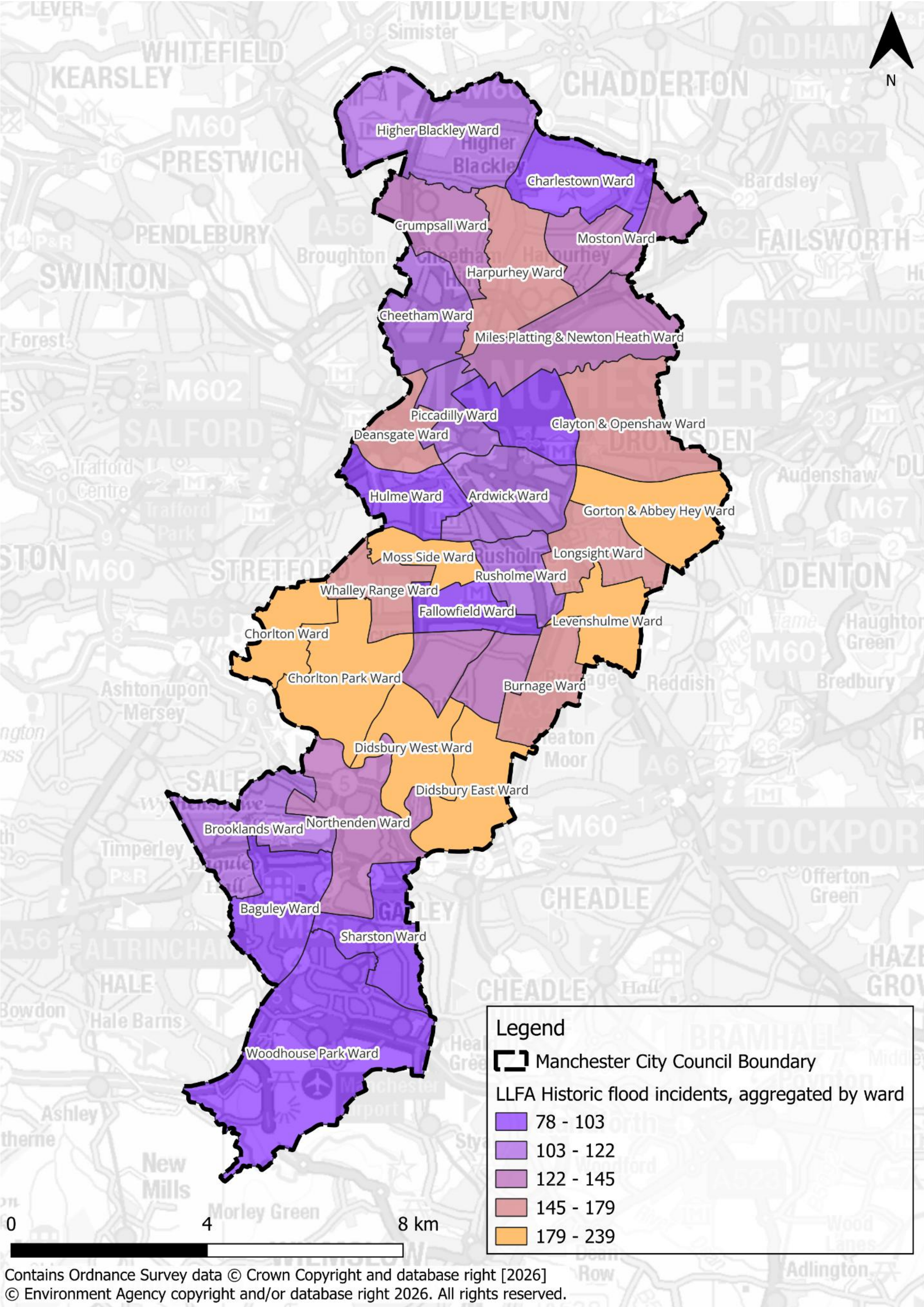


Figure 4-5: LLFA Historic flood incidents aggregated by ward

4.3.2 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 Recorded Flood Outlines (RFO) dataset 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.

The EA's HFM dataset contains 24 records of flooding within the city. The locations of these incidents are shown in Figure 4-6. Details of these incidents are provided in Table 4-2. The majority of historic incidents have been caused by an exceeding of channel capacity. Two incidents have been caused by obstructions / blockages of channels or culverts. Two further incidents have been caused by an overtopping of defences.

The EA's historic flood map is included in the SFRA mapping in Appendix H.

Table 4-2: EA Historic Flood Map recorded incidents in the City of Manchester

Start date	End date	Flood cause	Flood source
20/09/1946	21/09/1946	Main river	Channel capacity exceeded (no raised defences)
21/01/1954	22/01/1954	Main river	Channel capacity exceeded (no raised defences)
21/01/1954	22/01/1954	Main river	Channel capacity exceeded (no raised defences)
01/01/1964	02/01/1964	Unknown	Unknown
16/07/1973	17/07/1973	Unknown	Channel capacity exceeded (no raised defences)
05/10/1973	06/10/1973	Unknown	Operational failure/breach of defence
27/12/1978	28/12/1978	Unknown	Channel capacity exceeded (no raised defences)
27/10/1980	27/10/1980	Main river	Channel capacity exceeded (no raised defences)
21/12/1991	22/12/1991	Other	Other
28/01/1995	29/01/1995	Unknown	Channel capacity exceeded (no raised defences)
03/03/1998	04/03/1998	Unknown	Other
23/10/1998	24/10/1998	Unknown	Other
23/10/1998	24/10/1998	Unknown	Obstruction/blockage - channel
16/11/2000	17/11/2000	Unknown	Channel capacity exceeded (no raised defences)
26/10/2001	27/10/2001	Main river	Obstruction/blockage - channel
08/02/2002	09/02/2002	Unknown	Channel capacity exceeded (no raised defences)
21/01/2008	22/01/2008	Main river	Unknown
26/12/2015	26/12/2015	Main river	Overtopping of defences

Start date	End date	Flood cause	Flood source
16/03/2019	16/03/2019	Main river	Channel capacity exceeded (no raised defences)
20/01/2021	20/01/2021	Main river	Other
01/01/2025	01/01/2025	Main river	Unknown
01/01/2025	01/01/2025	Main river	Other
01/01/2025	01/01/2025	Main river	Overtopping of defences
01/01/2025	01/01/2025	Ordinary watercourse	Unknown

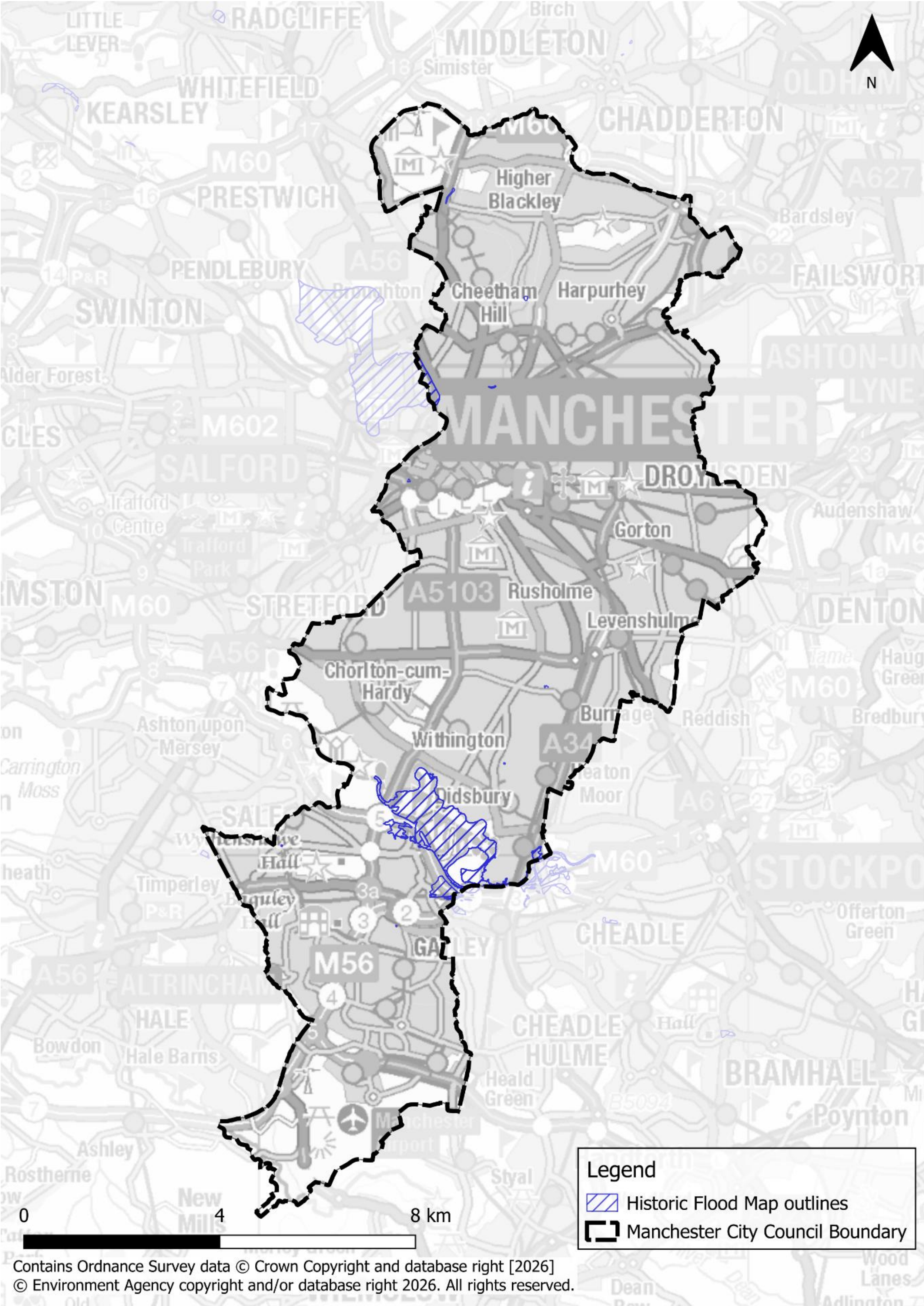


Figure 4-6: EA Historic Flood Map

4.3.3 Historic fluvial flooding

The Manchester City Council Preliminary Flood Risk Assessment (PFRA) identifies the following historic fluvial flood events to impact the city:

- 2004: Chorlton Brook - Flooded halls of residence at the University of Manchester, Fallowfield
- 2001: River Medlock / Bridgwater Canal - Overtopping of canal at Castlefield hotel area
- 1981: Chorlton, Baguley, Sinderland and Timperley Brook - flooding to properties in Fallowfield and Withington, as well as Gorton, Sale and Altrincham outside of the authority area.
- 1872: River Mersey, River Medlock, River Irk - Extensive flooding to properties in low lying areas, affecting Northenden, Didsbury, and the city centre.

As discussed in Section 4.3.1.1, widespread flooding impacted the city around New Years 2025. The River Mersey, Medlock, Irwell and several ordinary watercourses exceeded channel capacity leading to flooding.

4.3.4 Historic surface water flooding

As discussed in Section 4.3.1, surface water flooding has been reported during the New Years 2025 event in areas of Didsbury, Northenden, Harpurhey and Crumpsall following heavy rainfall and exacerbated by overwhelmed drainage systems. Surface water flooding was also reported on highways due to heavy rainfall contained within the highway.

The Greater Manchester Surface Water Management Plan (2013) (see Appendix C for further detail) identified the following historic surface water flood events:

- August 1911: Moss Side, Withington, Fallowfield - Flooded sewage works
- July 1947: Wilbraham - Flooded rail station and line
- June 1958: Ardwick, Wilbraham and Fallowfield - Flooded rail station
- December 1965: Northenden and Didsbury - Flooded property and evacuations, sewers burst
- August 2004: Manchester university and Fallowfield - Flooded halls of residence and homes in Fallowfield

4.3.5 Historic sewer flooding

United Utilities have provided their recorded historic flood incident database. These have been aggregated to ward boundaries. The area with the highest number of recorded historic sewer flooding incidents is Chorlton Ward in the west of the authority area. It should be noted that the absence of a recorded historic flood incident does not mean sewer flooding has not occurred in a location, only that it hasn't been recorded.

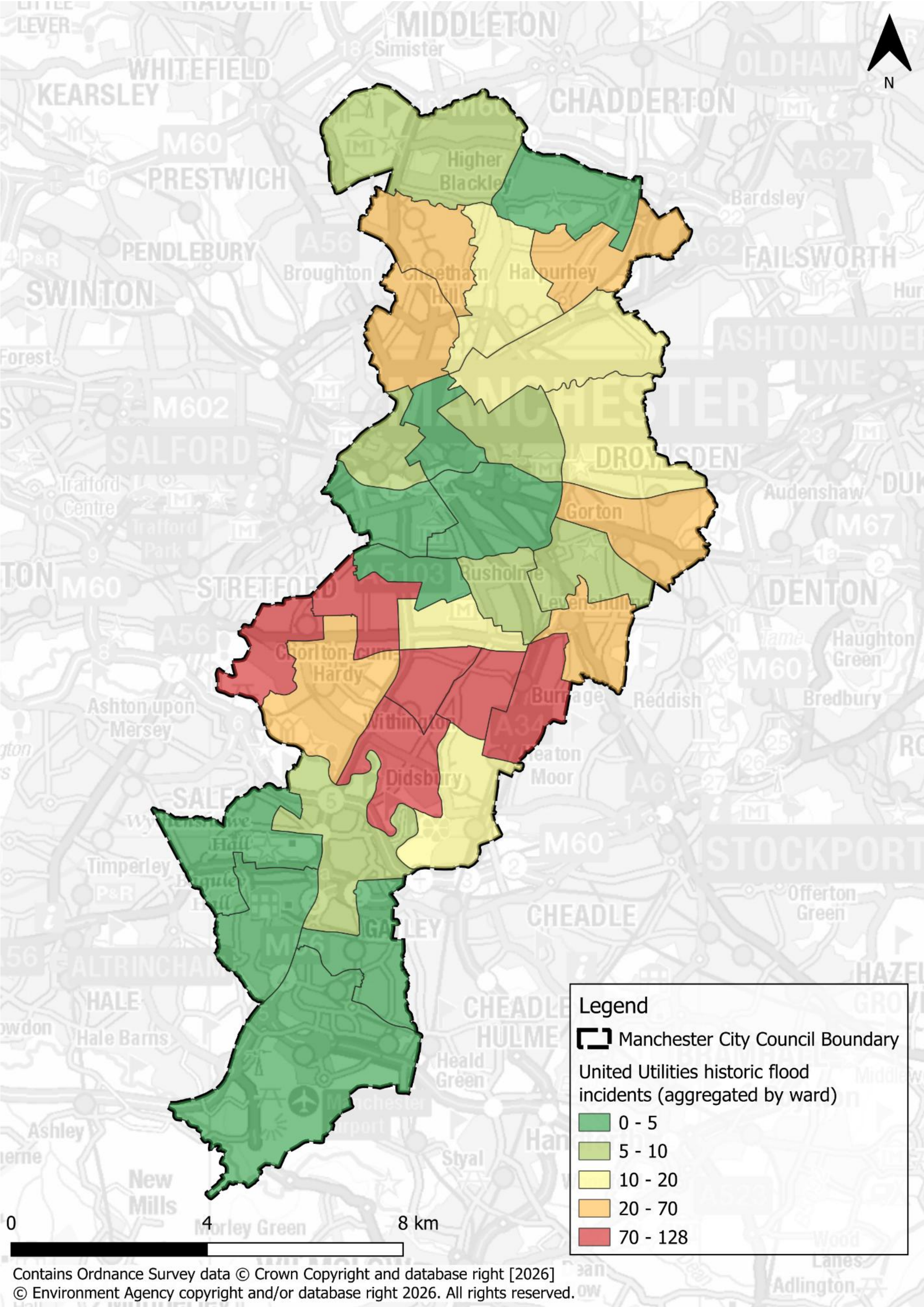


Figure 4-7: United Utilities recorded historic flood incidents (aggregated to ward boundaries)

4.3.6 Historic canal flooding

Within the authority area, the Canal & River Trust holds records of one canal breach and 24 overtopping incidents. Details of these incidents are documented in Table 4-3 and shown in Figure 4-8.

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

Year	Canal	Location	Incident type	Details
2013	Rochdale Canal	Newton Heath	Overtopping	Vandalism to upstream locks
2018	Rochdale Canal	Miles Platting	Breach	Misuse
2018	Rochdale Canal	Miles Platting	Breach	N/A
2018	Rochdale Canal	Miles Platting	Breach	Both offside and towpath side overtopped.
2010	Rochdale Canal	Miles Platting	Breach	Lockside at Lock 81 and towpath overtopped
2012	Rochdale Canal	Miles Platting	Overtopping	Overtopping due to inclement conditions / high flows in the canal
2012	Rochdale Canal	Miles Platting	Overtopping	Misuse of lock lead to overtopping
2018	Rochdale Canal	Miles Platting	Overtopping	Vandalism
2012	Rochdale Canal	Miles Platting	Overtopping	Vandalism
2017	Rochdale Canal	Ancoats	Overtopping	Lock 82 Great Ancoats overtopped
2012	Rochdale Canal	Picadilly	Overtopping	Multiple locations of overtopping below lock 82
2017	Rochdale Canal	Picadilly	Overtopping	Gates at Rochdale lock 84 overtopped
2009	Rochdale Canal	Picadilly	Overtopping	Excessive water coming off the Rochdale & Ashton canals causing overtopping
2019	Rochdale Canal	Princess Street	Overtopping	Vandals or boaters leaving paddles up on locks causing flooding
2010	Rochdale Canal	Deansgate	Overtopping	Overtopping onto towpath and offside.
2010	Rochdale Canal	Deansgate	Overtopping	Overtopping onto towpath and offside

Year	Canal	Location	Incident type	Details
2009	Rochdale Canal	Deansgate	Overtopping	Overtopping onto towpath
2018	Rochdale Canal	Deansgate	Overtopping	Overtopping onto towpath
2017	Ashton Canal	New Islington	Overtopping	Overtopping onto towpath
2014	Ashton Canal	New Islington	Overtopping	Overtopping onto road
2013	Ashton Canal	New Islington	Overtopping	Overtopping onto towpath
2009	Ashton Canal	Bradford	Overtopping	Overtopping onto towpath
2009	Ashton Canal	Bradford	Overtopping	Overtopping of canal, flowing into the River Medlock
2009	Ashton Canal	Bradford	Overtopping	Vandalism
2005	Bridgewater Canal	Castlefield Basin	Breach	Sluice failure

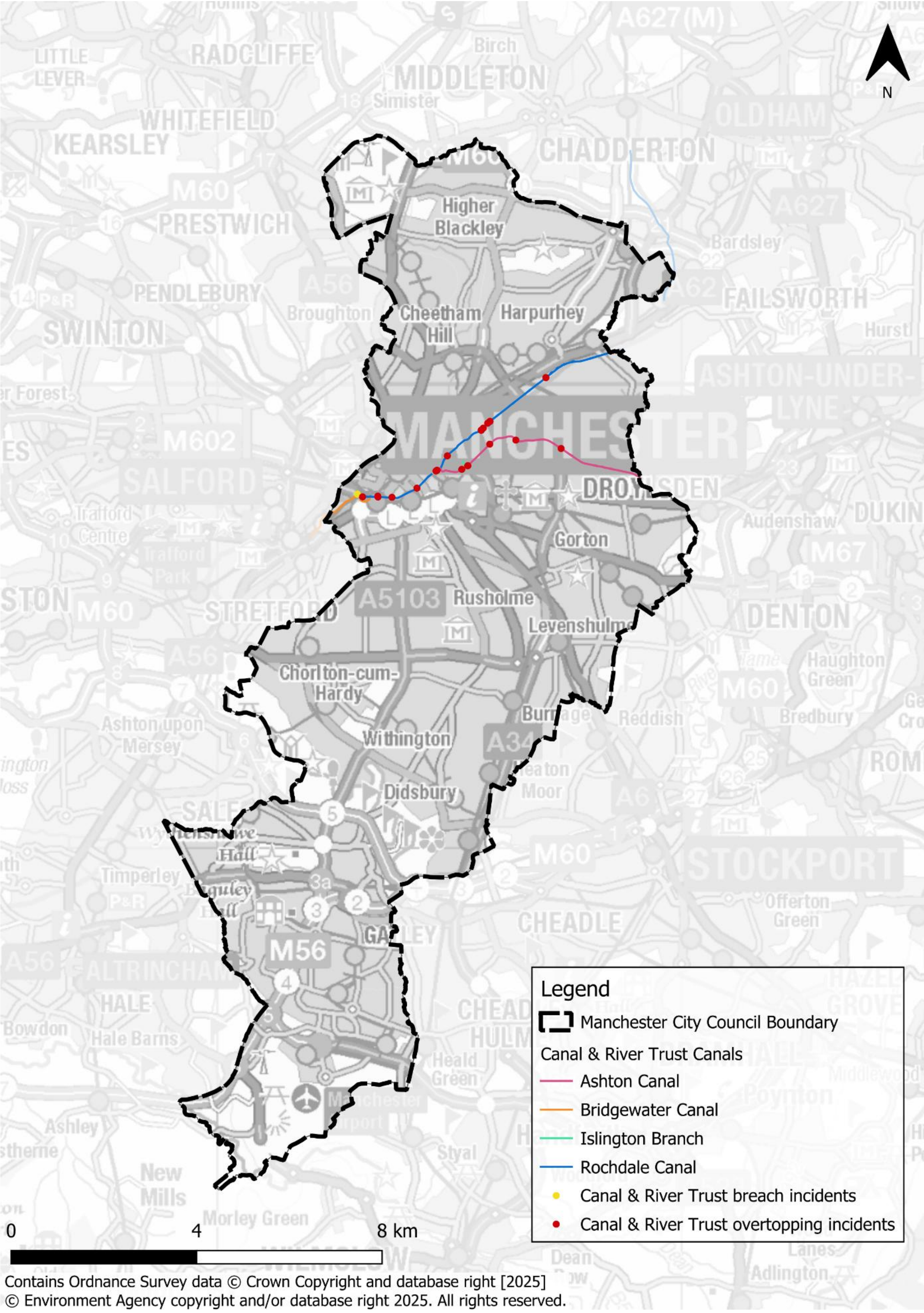


Figure 4-8: Canal & River Trust canal breach and overtopping incident records

4.4 Fluvial flood risk

4.4.1 Flood Map for Planning - Flood Zones

Present day fluvial flood risk across the city is assessed based on Flood Zones. The definition of the Flood Zones is provided below. The Flood Zones do not consider defences, except when considering the functional floodplain. 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 used in this SFRA are:

- FMfP Flood Zone 1: Low risk: less than a 0.1% chance of river or sea flooding in any given year.
- FMfP Flood Zone 2: Medium risk: between a 1% and 0.1% chance of river or sea flooding in any given year.
- Flood Zone 3a (distinct from FMfP Flood Zone 3): 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. This Flood Zone includes all areas in the FMfP Flood Zone 3 that are not in Flood Zone 3b.
- Flood Zone 3b: Functional Floodplain: land where water has to flow or be stored in times of flood. 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. See Appendix D for details on the functional floodplain and how it has been delineated through this SFRA.

Important note on Flood Zone information in this SFRA

The FMfP Flood Zones for the City of Manchester are shown in Figure 4-9 and are included in the SFRA mapping (Appendix H). These have been derived from the EA's Flood Map for Planning (FMfP) (gov.uk) (Section 4.4.1) and detailed hydraulic modelling received from the EA. Flood Zones 2 and 3a within this SFRA show the same extent as the online EA's Flood Map for planning, at the time of publication of this SFRA.

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.

As stated in EA guidance, flood defences should be considered when delineating the functional floodplain. The methodology for functional floodplain delineation is described in Appendix D. Caution should also be applied where the 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.

4.4.2 Summary of fluvial flood risk across the City of Manchester

According to the EA's FMfP (as shown in Figure 4-9), much of the fluvial flood risk comes from the River Mersey flowing through Didsbury and Northenden. Flood risk along the Mersey is largely confined to its floodplain. There is also fluvial flood risk along Corn Brook and the River Medlock, affecting areas of the city centre. The River Irk is also a source of fluvial flood risk, in the north of the city, affecting areas of Cheetham Hill and Blackley. In the centre of the city centre, there is noticeable fluvial flood risk originating from Platt Brook, Chorlton Brook, Cringle Brook and Gore Brook, with Flood Zone 3 prevalent in areas of Rusholme and Moss Side.

The FMfP is shown on the SFRA mapping in Appendix H. The impacts of climate change on fluvial flooding are discussed in Section 5.2.

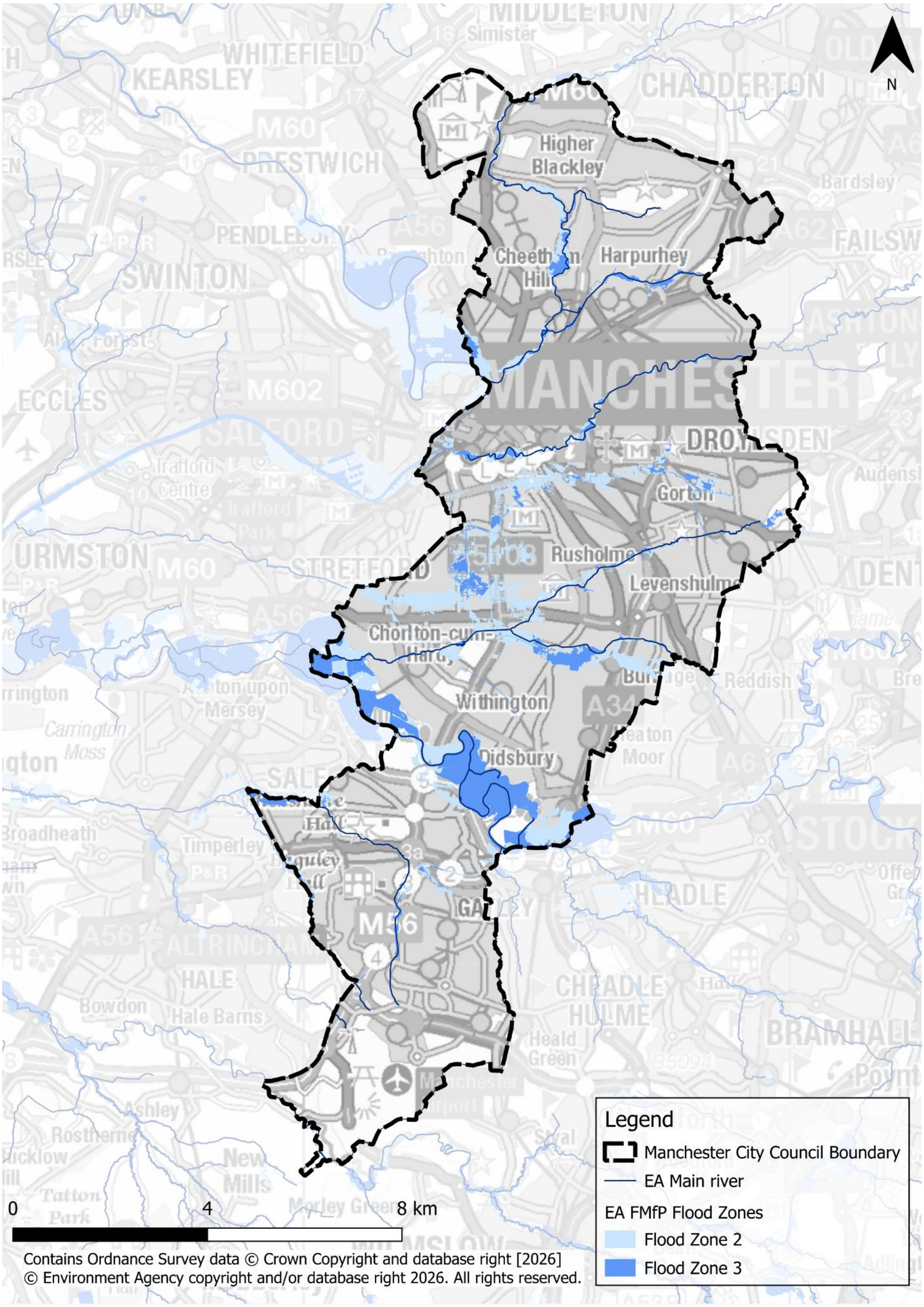


Figure 4-9: EA's FMfP for Rivers and Sea - Flood Zones

4.5 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.

4.5.1 Flood Map for Planning - Surface Water Spatial Planning

The EA's Flood Map for Planning - Surface Water Spatial Planning Extents mapping (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. Mapping 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 surface water mapping should not be used to understand flood risk for individual properties but is suitable for high level assessments such as SFRAs for local authorities.

4.5.2 Summary of surface water flood risk across the City of Manchester

The EA's Flood Map for Planning - Surface Water Spatial Planning Extents dataset (as shown in Figure 4-10) highlights several communities at risk from surface water flooding. Modelled high risk of surface water flooding is widespread across the City of Manchester, given it is highly urbanised.

Surface water flow paths generally follow areas of topographic low spots with areas of isolated ponding. Additionally, surface water flow routes are also established on road networks highlighting risk to transport networks while posing a risk to buildings which water can be routed to.

The Flood Map for Planning - Surface Water Spatial Planning Extents datasets for the City of Manchester can be found in the Appendix H GeoPDF mapping. The impacts of climate change on surface water flooding are discussed in Section 5.3

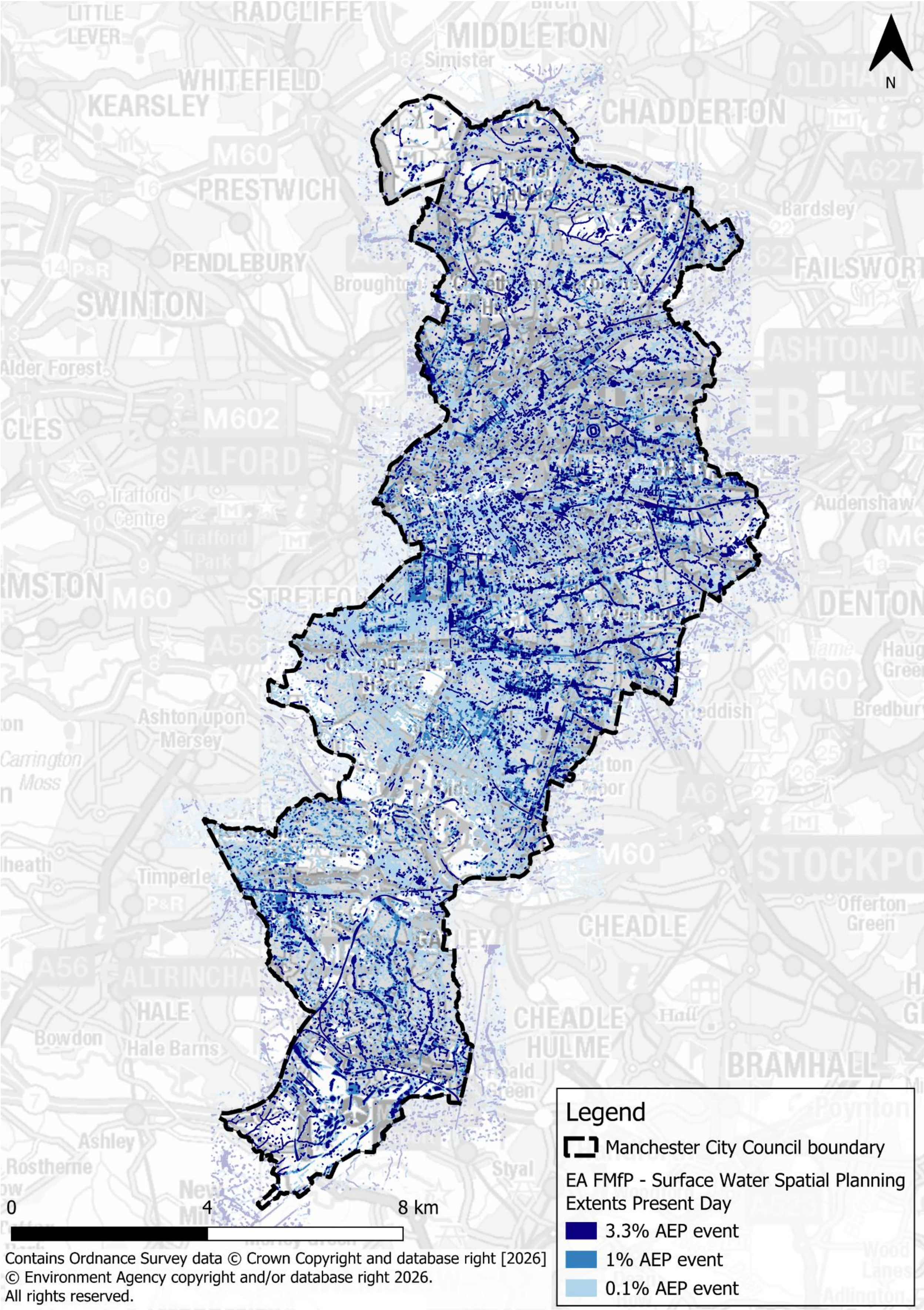


Figure 4-10: EA's FMfP - Surface Water Spatial Planning Extents dataset

4.6 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. Water Cycle Studies can also assist LPAs in planning for new development and subsequent increased pressures on the sewerage and wastewater network.

United Utilities is the water company responsible for the management of the sewerage networks across Manchester.

4.6.1 Summary of sewer flood risk across Manchester

Sewer flood risk is greatest in urban locations, particularly in areas where surface water and wastewater share the same combined sewer. Based on the United Utilities historic flood incident data, the areas with the highest risk of sewer flooding are Chorlton-cum-Hardy, Withington, West Didsbury and Levenshulme.

4.7 Groundwater flood risk

In general, less is known about groundwater 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 4-3).

Table 4-4: JBA Groundwater Emergence Map category descriptions

Category	Potential risk
0-0.025 - 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.
0.025 - 0.5 - 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.
0.5 - 5 - 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.
>5 - Groundwater levels are at least 5m below the ground surface.	Flooding from groundwater is not likely.
N/A - 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 for the prediction of the likelihood of groundwater flooding or quantification of the volumes of groundwater that might be expected to emerge in a given area.

4.7.1 Summary of groundwater emergence risk across the City of Manchester

The risk of groundwater emergence within the city is varied. There are several areas shown in the JBA Groundwater Emergence Map where groundwater levels are either at or very near the ground surface. These areas include:

- Withington and Fallowfield
- Chorlton-Cum-Hardy
- Moss Side
- Northenden and Sale
- Areas of the city centre, surrounding the sites of the Universities

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. The JBA Groundwater Emergence Map is shown in Figure 4-11 and on the SFRA mapping in Appendix H.

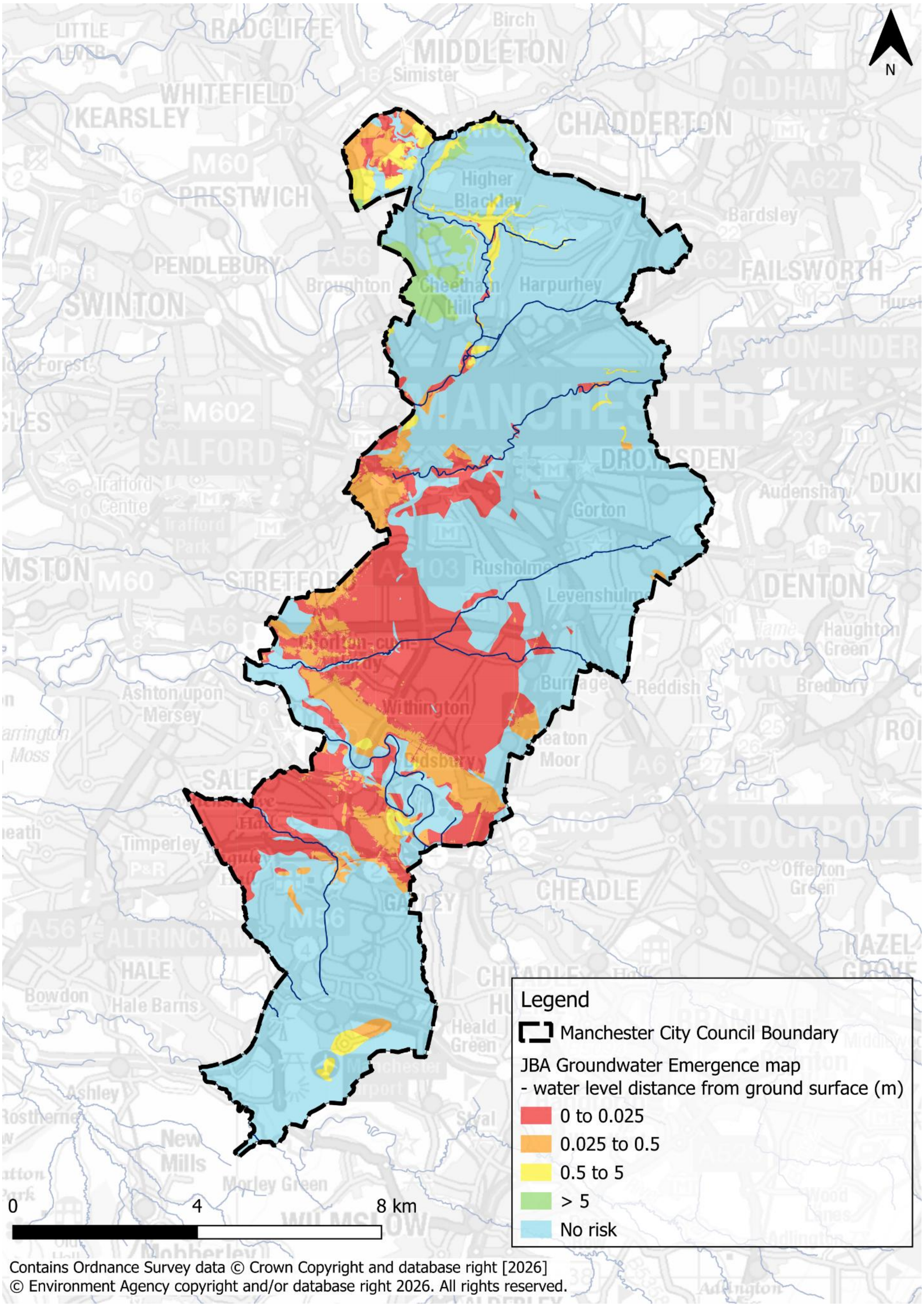


Figure 4-11: JBA Groundwater Emergence Map

4.8 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 Level 1 SFRA does not assess the probability of infrastructure failure. However, in accordance with the NPPF, all sources of flooding need to be considered. If a defence breach or overtopping event were to occur, then the consequences to people and property could be significant. 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.

Section 6.4 includes details on the raised defences present within the City of Manchester, which are also shown on the mapping in Appendix H. However, there is currently no available mapping or data showing areas at residual risk. A Level 2 SFRA would investigate further, where required.

Examples of residual flood risk to a single 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 not acting upon them.

4.8.1 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.

Rochdale Canal, Ashton Canal and Bridgewater Canal run through the City of Manchester. The Rochdale and Ashton Canal are managed by the Canal & River Trust. The Bridgewater Canal is owned and operated by divisions of the Peel Group.

The canals have the potential to interact with other watercourses in Manchester, including the River Medlock, River Irwell and River Irk. 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 would impact the site, as part of a site-specific Flood Risk Assessment (FRA). Guidance on development near canals is available from the Canal and River Trust (canalrivertrust.org.uk).

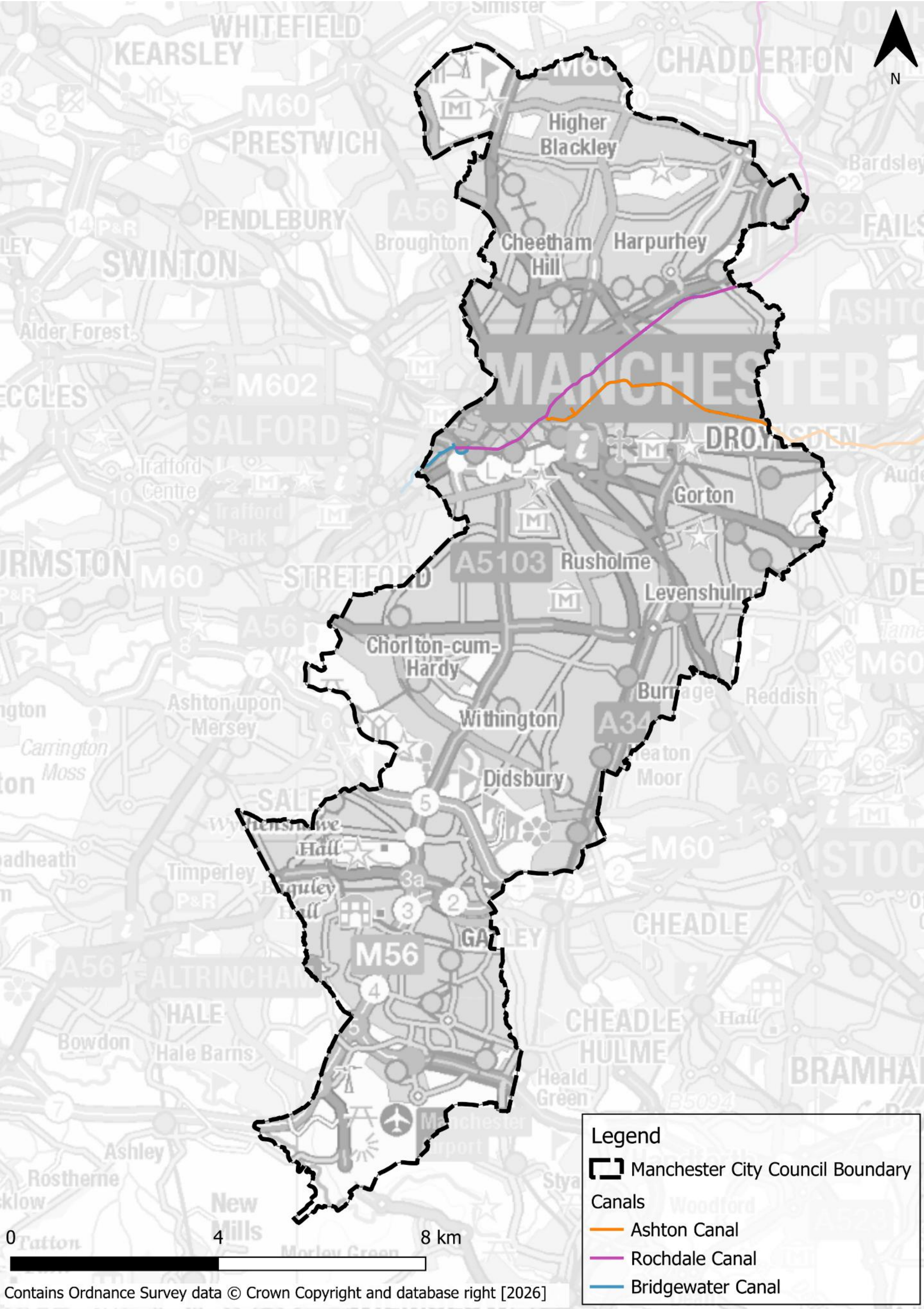


Figure 4-12: Location of the canals in the City of Manchester

4.8.2 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 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. The EA provide two flooding scenarios for the RFM: 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.

4.8.2.1 Summary of reservoir flood risk across the City of Manchester

The current mapping shows six reservoirs located within the City of Manchester, and a further 72 reservoirs located outside, which pose a risk to the city (detailed in Table 4-5). The EA's 'dry day' and 'wet day' reservoir flood extent maps are shown in Figure 4-13 and on the SFRA mapping in Appendix H.

Reservoir flood risk is present in the south of Manchester, along the River Mersey and its floodplain. Additionally, there is noticeable flood risk from reservoirs in the centre of the authority area surrounding various ordinary watercourses including Platt Brook, Cringle Brook and Chorlton Brook. This risk affects large areas to the south of the city centre, including Rusholme, Chorlton-On-Medlock and Moss Side.

Table 4-5: Reservoirs with flood extents that may impact Manchester

Reservoir	National Grid Reference	Owner	Local Authority	Risk Category	Does reservoir flooding impact the area in 'dry day' scenario?
Arnfield Reservoir	SK0140097400	United Utilities	Derbyshire	High-risk	No
Ashworth Moor	SD8300015500	United Utilities	Rochdale	High-risk	No
Audenshaw No.1	SJ9170096800	United Utilities	Tameside	High-risk	Yes
Audenshaw No.2	SJ9140096200	United Utilities	Tameside	High-risk	Yes
Audenshaw No.3	SJ9110096700	United Utilities	Tameside	High-risk	Yes
Belmont	SD6729716798	United Utilities	Blackburn with Darwen	High-risk	No
Black Moss	SE0330008800	Canal & River Trust	Kirklees	High-risk	No
Blackstone Edge	SD9713018240	United Utilities	Rochdale	High-risk	No
Bollinhurst	SJ9740083600	United Utilities	Cheshire East	High-risk	Yes
Bottoms (Longdendale)	SK0263996949	United Utilities	Derbyshire	High-risk	Yes
Bottoms (Macclesfield)	SJ9460471587	United Utilities	Cheshire East	High-risk	Yes
Brushes (Stalybridge)	SJ9940099100	United Utilities	Tameside	High-risk	Yes
Calf Hey	SD7530022410	United Utilities	Lancashire	High-risk	Yes
Castle Irwell FSR	SD8200001200	Environment Agency	Salford	High-risk	Yes
Castleshaw Lower	SD9950009500	United Utilities	Oldham	High-risk	Yes
Castleshaw Upper	SD9974510039	United Utilities	Oldham	High-risk	Yes

Reservoir	National Grid Reference	Owner	Local Authority	Risk Category	Does reservoir flooding impact the area in 'dry day' scenario?
Chew	SE0382601949	United Utilities	Oldham	High-risk	Yes
Cloughbottom	SD8460026700	United Utilities	Lancashire	High-risk	Yes
Clowbridge	SD8274928104	United Utilities	Lancashire	High-risk	Yes
Combs	SK0370079600	Canal & River Trust	Derbyshire	High-risk	No
Cowm	SD8800018800	United Utilities	Lancashire	High-risk	No
Cowpe	SD8427520136	United Utilities	Lancashire	High-risk	No
Crookgate	SD9805011400	United Utilities	Oldham	High-risk	No
Delph	SD7020015400	United Utilities	Blackburn with Darwen	High-risk	No
Didsbury FSR	SJ8444089499	Environment Agency	Manchester	High-risk	Yes
Dovestone	SE0160003600	United Utilities	Oldham	High-risk	Yes
Dowry	SD9850011100	United Utilities	Oldham	High-risk	No
Elton	SD7900009400	Canal & River Trust	Bury	High-risk	Yes
Entwistle	SD7225017450	United Utilities	Blackburn with Darwen	High-risk	Yes
Errwood	SK0140075200	United Utilities	Derbyshire	High-risk	Yes
Fernilee	SK0130077700	United Utilities	Derbyshire	High-risk	Yes
Gorton Lower	SJ8941396034	United Utilities	Manchester	High-risk	Yes
Gorton Upper	SJ8990096300	United Utilities	Manchester	High-risk	Yes

Reservoir	National Grid Reference	Owner	Local Authority	Risk Category	Does reservoir flooding impact the area in 'dry day' scenario?
Greenbooth	SD8559015460	United Utilities	Rochdale	High-risk	Yes
Greenfield	SE0280005400	United Utilities	Oldham	High-risk	Yes
Hanging Lees	SD9690012400	United Utilities	Rochdale	High-risk	No
Hatters	SD8700008200	United Utilities	Rochdale	High-risk	Yes
Heaton Park Boating Lake	SD8320003900	Manchester City Council	Manchester	High-risk	Yes
Heaton Park - Covered	SD8260004670	United Utilities	Manchester	High-Risk	Yes
Heaton Park Open	SD8266004970	United Utilities	Manchester	High-risk	Yes
High Rid	SD6690010200	United Utilities	Bolton	High-risk	No
Hollingworth Lake	SD9365914967	United Utilities	Rochdale	High-risk	Yes
Horse Coppice	SJ9688483718	United Utilities	Cheshire East	High-risk	Yes
Jumbles	SD7350013900	United Utilities	Bolton	High-risk	Yes
Kinder	SK0560088100	United Utilities	Derbyshire	High-risk	Yes
Lamaload	SJ9710075300	United Utilities	Cheshire East	High-risk	Yes
Littleton Road FSR	SD8111101051	Environment Agency	Salford	High-risk	Yes
Lowercroft Upper	SD7680011200	Mr Keith Talbot	Bury	High-risk	No
Naden Higher	SD8530017200	United Utilities	Rochdale	High-risk	Yes
Naden Middle	SD8540016600	United Utilities	Rochdale	High-risk	Yes
New Years Bridge	SD9850010500	United Utilities	Oldham	High-risk	No
Norman Hill	SD9670013000	United Utilities	Rochdale	High-risk	No

Reservoir	National Grid Reference	Owner	Local Authority	Risk Category	Does reservoir flooding impact the area in 'dry day' scenario?
Ogden Haslingden	SD7621022590	United Utilities	Lancashire	High-risk	Yes
Piethorne	SD9646112582	United Utilities	Rochdale	High-risk	No
Poynton Pool	SJ9230084500	Cheshire East Council	Cheshire East	High-risk	Yes
Readycon Dean	SD9873012290	United Utilities	Oldham	High-risk	No
Rhodes Lodge - Big Pond (ID256)	SD8595605322	Rochdale Borough Council	Rochdale	High-risk	Yes
Rhodeswood	SK0445098100	United Utilities	Derbyshire	High-risk	Yes
Ridgegate	SJ9529071420	United Utilities	Cheshire East	High-risk	Yes
Rooden	SD9710111809	United Utilities	Rochdale	High-risk	Yes
Rumworth	SD6740008300	United Utilities	Bolton	High-risk	No
Sale Ees FSR	SJ800009300	Environment Agency	Trafford	High-risk	Yes
Shore Top	SD7670006400	Mr Peter Lee	Bury	Not high-risk	No
Spring Mill	SD8750017000	United Utilities	Lancashire	High-risk	Yes
Springs	SD6894714744	United Utilities	Blackburn with Darwen	High-risk	No
Swineshaw Higher (Stalybridge)	SK0050099600	United Utilities	Tameside	High-risk	Yes
Swineshaw Lower (Stalybridge)	SK0040099200	United Utilities	Tameside	High-risk	Yes
Teggsnose	SJ9460071800	United Utilities	Cheshire East	High-risk	No

Reservoir	National Grid Reference	Owner	Local Authority	Risk Category	Does reservoir flooding impact the area in 'dry day' scenario?
Toddbrook	SK0065080900	Canal & River Trust	Derbyshire	High-risk	No
Torside	SK0565098300	United Utilities	Derbyshire	High-risk	Yes
Trentabank	SJ9627071320	United Utilities	Cheshire East	High-risk	Yes
Valehouse	SK0320097400	United Utilities	Derbyshire	High-risk	Yes
Walkerwood	SJ9883499019	United Utilities	Tameside	High-risk	Yes
Walves	SD7470015100	Mr John Ramwell	Blackburn with Darwen	High-risk	No
Watergrove	SD9100017700	United Utilities	Rochdale	High-risk	Yes
Wayoh	SD7370016400	United Utilities	Blackburn with Darwen	High-risk	Yes
Woodhead	SK0820099400	United Utilities	Derbyshire	High-risk	Yes
Yeoman Hey	SE0220004900	United Utilities	Oldham	High-risk	Yes

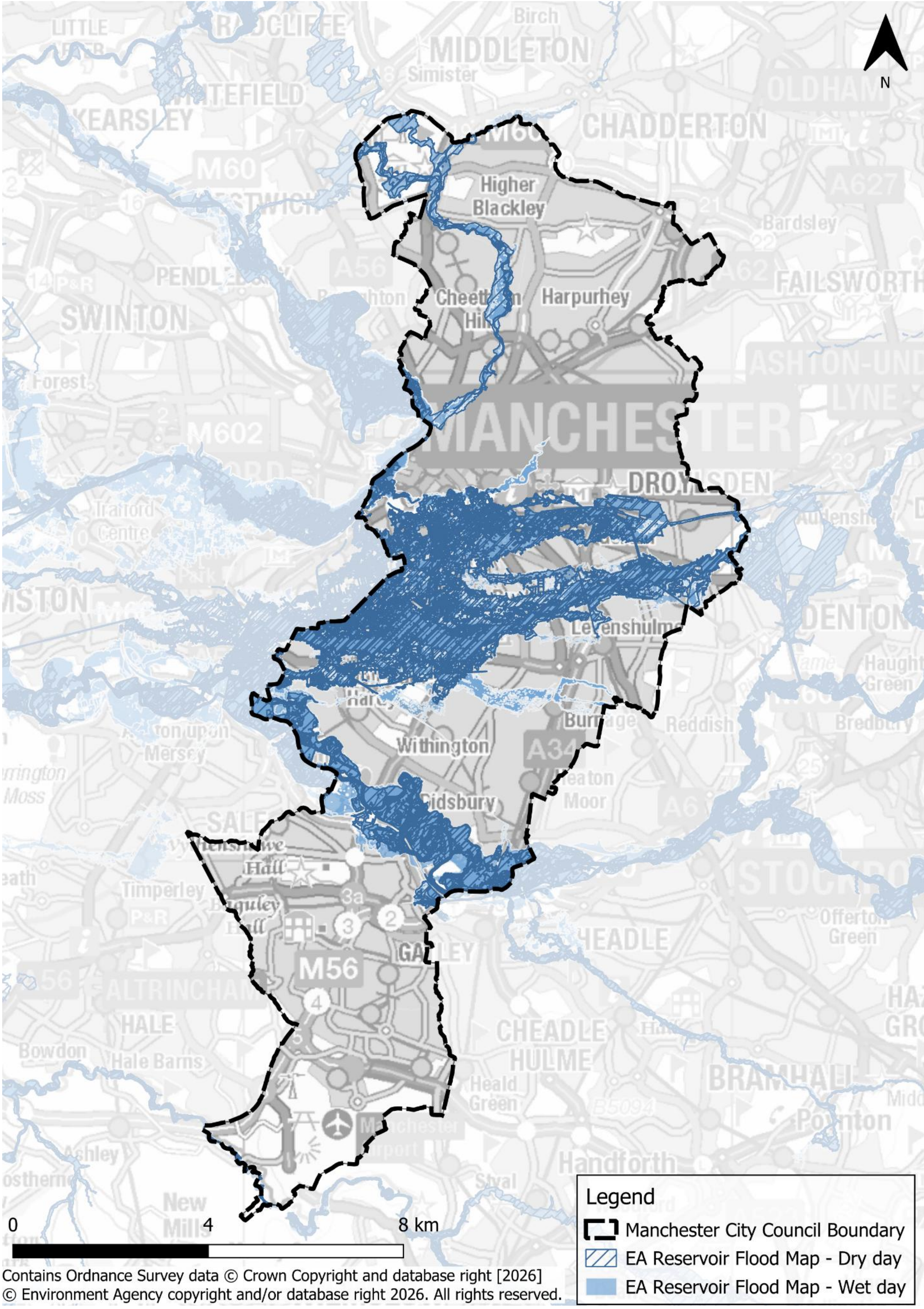


Figure 4-13: EA's Reservoir Flood Map in the City of Manchester

4.8.3 Combined sources of flood risk

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.

4.9 Summary of flood risk in the City of Manchester

The risk across the City of Manchester is varied:

- Fluvial flood risk predominantly originates from the River Mersey, the River Medlock and the River Irk as well as various ordinary watercourses including Corn Brook. Platt Brook and Chorlton Brook.
- Surface water risk is scattered and prevalent across the study area, which is largely urbanised.
- Groundwater emergence risk is greatest in areas of Chorlton, Withington and Northenden.
- Reservoir flood risk is present around the River Mersey in Didsbury and Northenden, along the channels of the River Irk in the city centre and the north of the authority area and surrounds various watercourses in the centre of the authority area, including the River Medlock, Chorlton Brook, Platt Brook and Gore Brook.

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 on flood risk 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 city are shown in Figure 5-1. The northern half of the authority area is located within the Irwell Management Catchment, and the south is within the Upper Mersey Management Catchment.

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

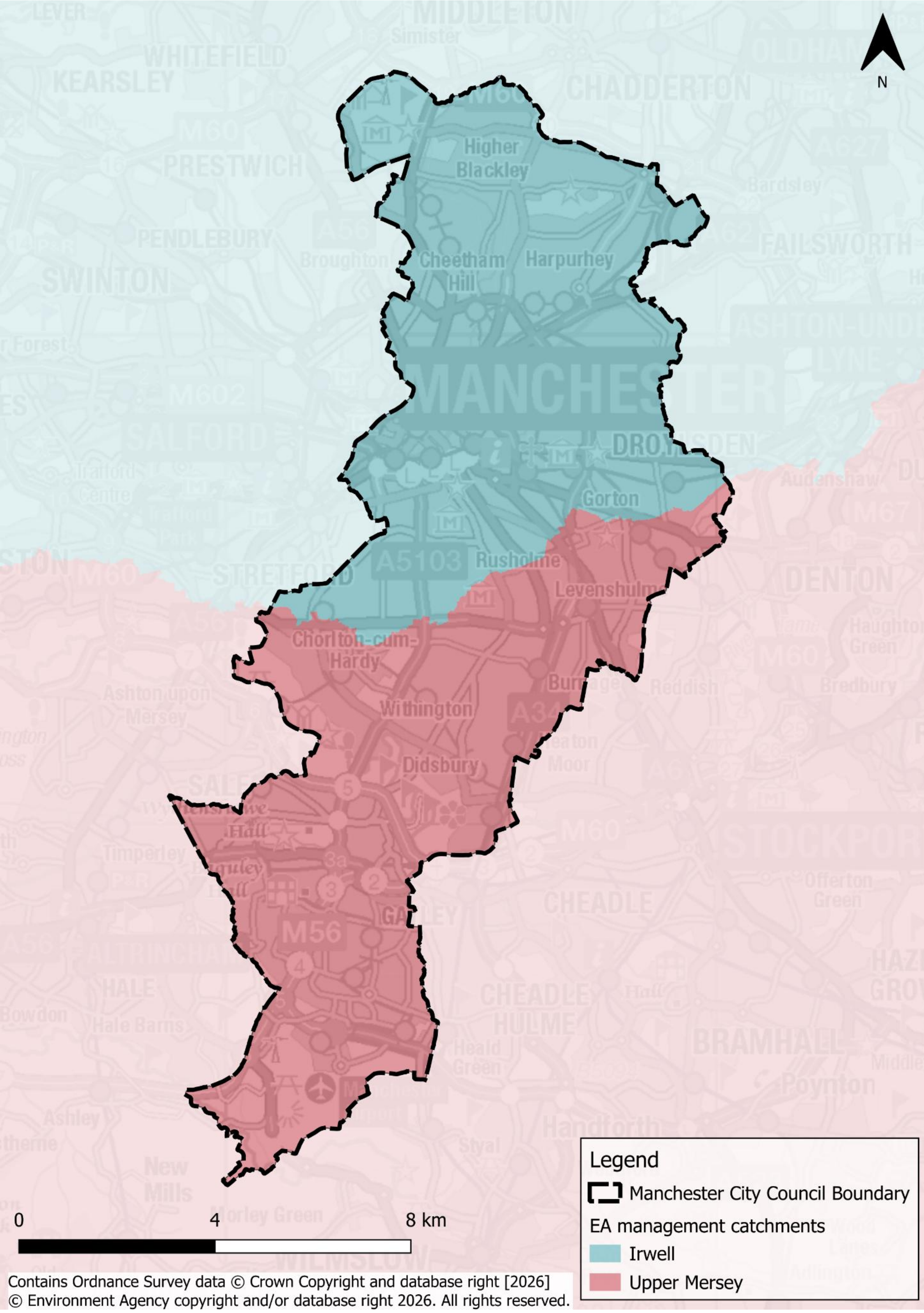


Figure 5-1: Management Catchments (assigned by the EA) across Manchester

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 City of Manchester is located within both the Upper Mersey and Irwell Management Catchments for peak river flow allowances. Table 5-1 displays the peak river flow allowances that apply for each management catchment.

Table 5-1: Peak river flow allowances for the Upper Mersey and Irwell Management Catchments

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 Mersey	Upper end	27	51	85
	Higher Central	17	31	53
	Central	13	22	41
Irwell	Upper end	24	43	75
	Higher Central	15	26	46
	Central	12	19	35

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.

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 central allowance for the 2080s epoch has been assessed for risk of flooding from rivers, as per the EA's guidance on climate change. 10 of the available river models provided by the EA for use in this SFRA are up to date with the latest climate change allowances, namely:

- 2007 Boggart Hole Brook
- 2009 Gatley Brook
- 2011 River Medlock
- 2017 Corn Brook
- 2017 Cringle Black Brook
- 2017 Upper Mersey
- 2018 Manchester Ship Canal
- 2022 Chorlton Platt Gore
- 2022 Micker Brook
- 2023 Chorlton Brook

These EA models have been used to inform the future fluvial risk across the city. It should be noted that some of these models are over 10 years old and are therefore unlikely to represent the latest hydrology and topographic conditions. However, at the time of writing, these models provide the best estimate of fluvial flood risk within the City of Manchester.

This Level 1 SFRA will require updating following the release of any new EA detailed models, or any significant revisions of the Flood Map for Planning to ensure that it remains consistent with the latest modelling and continues to provide a robust and reliable evidence base.

The FMfP also now includes the Flood Zones plus Climate Change dataset. This dataset represents how the combined extent of Flood Zones 2 and 3 could increase with climate change, ignoring the benefits of any existing flood defences. This dataset has been used to represent fluvial climate change in areas not subject to detailed modelling. No additional modelling has been completed as part of this Level 1 SFRA.

5.2.4 Implications of climate change for fluvial risk across the City of Manchester

According to the available EA detailed model climate change outlines, as shown in Figure 5-2, there is an increase in fluvial flood risk when taking into account the impact of climate change, primarily along Chorlton Brook, Platt Brook and the River Mersey.

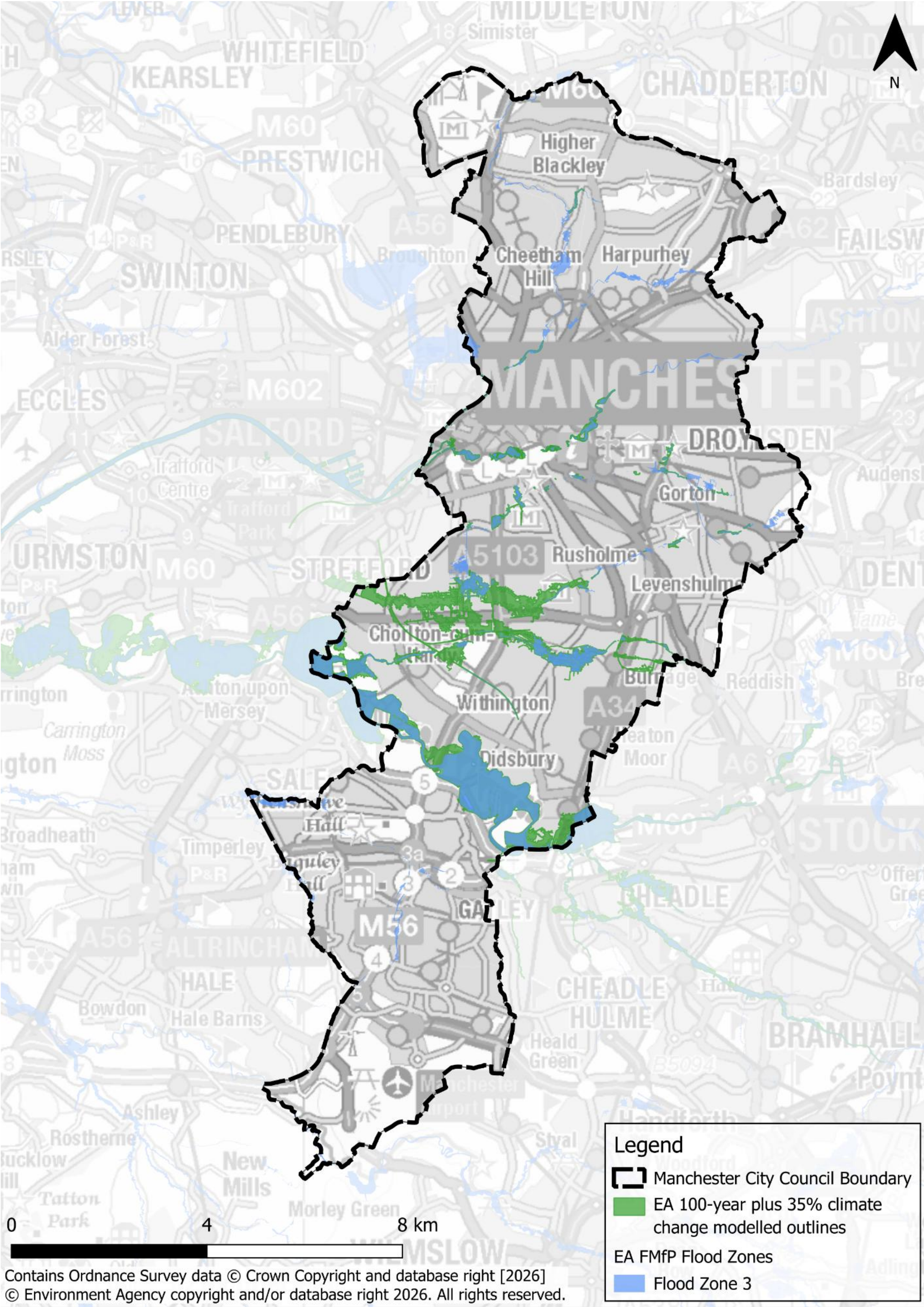


Figure 5-2: EA Detailed Flood Model Outlines - 100-year plus 35% climate change (central allowance)

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 City of Manchester

The City is located within both the Upper Mersey and Irwell Management Catchment for peak rainfall allowances. Table 5-2 shows the peak rainfall allowances that apply to the City.

Table 5-2: Peak rainfall intensity allowances for small and urban catchments for Upper Mersey and Irwell Management Catchments

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 Mersey	Upper end	35	40	40	30
	Central	20	25	30	30
Irwell	Upper end	35	40	40	45
	Central	25	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 an expected shorter lifetime, the central allowance can be used.

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

The EA published the FMfP - Surface Water Spatial Planning Climate Change extents on 28 May 2026. Climate change extents are now available for the 3.3%, 1%, and 0.1% AEP events for the Upper End allowance for the 2070's epoch (2061-2125). This dataset has been used to assess the implications of climate change on surface water risk across the study area. The surface water climate change mapping is shown on the Appendix H GeoPDF mapping.

5.4 Groundwater

The effect of climate change on groundwater flooding, and those watercourses where groundwater has a large influence on winter flood flows, is uncertain. 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 may be an issue, as informed at a strategic level by the JBA Groundwater Emergence map (Section 4.7), should be considered appropriately at the planning application stage. There is currently no available dataset that assesses the impacts of climate change on groundwater.

5.5 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.

The Manchester City Council Climate Change Action Plan (2025-2030) sets out how the Council will look to reduce contributions to global warming and meet ambitious net-zero targets. This follows the Council's declaration of a climate emergency in July 2019.

6 Flood risk infrastructure

This section provides a summary of existing flood alleviation schemes and assets in the City of Manchester. 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 known as the Asset Information Management System (AIMS).
- The LLFA should hold a register of significant local flood risk assets, required under Section 21 of the FWMA (2010).
- Highways authorities (National Highways for major roads in England, Manchester City Council for local, minor roads) 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 the assets the RMAs directly maintain, and also 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.

The public register of structures and features which have a significant effect on local flood risk is published as the Flood Risk Database hosted online and viewable by the public.

Using powers under Section 30 of the Flood and Water Management Act 2010, the LLFA may designate features or structures it considers to affect flood risk. This would prevent alteration, removal or replacement of the structure / feature without prior approval. In most circumstances the owners of flood risk management infrastructure – formal or otherwise – are aware of their important role to maintain assets in a fit and proper condition. In situations where they are in a poor state of repair, ownership is unknown or there is a risk to the continued function, the LLFA may choose to designate.

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 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 on-going 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 City of Manchester.

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 riparian owner.
Local authorities	Permissive powers to maintain and improve ordinary watercourses, ultimate responsibility for maintaining watercourses rests with the riparian owner.
LLFA	Permissive powers, limited resources are prioritised and targeted to where they can have the greatest effect
Highways authorities (Council and National)	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 in urban areas can also frequently become blocked with debris and this can lead to blockages at culverts or bridges.

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 City of Manchester

The EA's AIMS dataset includes raised flood defences. 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 EA AIMS dataset is shown on the SFRA mapping in Appendix H.

Table 6-3: Locations likely to be benefitting from major flood defences, based on the EA AIMS dataset

Watercourse	Location	Type	Design SoP (AEP)	Actual SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Asset maintainer
River Irk	Heaton Park	Embankment	Unknown	Unknown	Unknown	Unknown	Private individual, Company or Charity
River Irk	Harpurhey	Embankment (2)	Unknown (1) 25 (1)	Unknown (2)	Unknown (1) 3 (1)	Unknown (1) 4 (1)	Private individual, Company or Charity (1) Environment Agency (1)
River Irk	Harpurhey	Wall (12)	25 (12)	Unknown (12)	3 (12)	5 (2) 4 (2) 3 (5) 2 (3)	Environment Agency (12)
Moss Brook	Collyhurst	Engineered high ground	5	Unknown	Unknown	Unknown	Private individual, Company or Charity
River Irk	Northeast of Victoria station, city centre	Wall	Unknown	Unknown	Unknown	Unknown	Private individual, Company or Charity
Gore Brook	Birchfields Park	Engineered high ground	5	Unknown	Unknown	Unknown	Local Authority

Watercourse	Location	Type	Design SoP (AEP)	Actual SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Asset maintainer
Platt Brook	Platt Fields Park	Wall (3)	100 (3)	Unknown (3)	3 (3)	3 (3)	Environment Agency (3)
Platt Brook	Platt Fields Park	Embankment	100	Unknown	3	3	Environment Agency
Cringle Brook	Levenshulme	Engineered high ground (3)	100 (3)	Unknown (3)	Unknown (1) 3 (2)	Unknown (1) 3 (2)	Private individual, Company or Charity (1) Environment Agency (2)
Cringle Brook	Ladybarn	Wall (8)	100 (8)	Unknown (8)	3 (8)	2 (4) 3 (4)	Environment Agency (8)
Cringle Brook	Ladybarn	Engineered High Ground (2)	100 (2)	Unknown (2)	3 (2)	3 (2)	Environment Agency (2)
Platt Brook	Withington	Embankment (4)	100 (3)	Unknown (3)	3 (3)	3 (3)	Environment Agency (3)
Platt Brook	Withington	Wall (2)	100 (2)	Unknown (2)	3 (2)	3 (2)	Environment Agency (3)

Watercourse	Location	Type	Design SoP (AEP)	Actual SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Asset maintainer
River Mersey	East Didsbury	Embankment (23)	100 (13) 50 (5) 75 (4) Unknown (1)	Unknown (23)	3 (9) 2 (12) Unknown (2)	4 (2) 3 (5) 2 (1) Unknown (15)	Environment Agency (21) Private individual, Company or Charity (1) Local Authority (1)
River Mersey	East Didsbury	Engineered High Ground (19)	100 (5) 75 (12) 50 (1) 5 (1)	Unknown (19)	2 (14) 3 (4) Unknown (1)	3 (2) 5 (1) Unknown (16)	Environment Agency (18) Private individual, Company or Charity (1)
River Mersey	Didsbury Flood Storage Area spillway	Spillway	100	Unknown	2	Unknown	Environment Agency
River Mersey	East Didsbury	Wall (4)	100 (1) 50 (2) Unknown (1)	Unknown (4)	3 (3) Unknown (1)	3 (1) 2 (1) 4 (1) Unknown (1)	Environment Agency (3) Private individual, Company or Charity (1)
Fielden Park Brook	Withington Golf Club	Embankment (2)	75 (2)	Unknown (2)	2 (2)	2 (2)	EA (2)

Watercourse	Location	Type	Design SoP (AEP)	Actual SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Asset maintainer
Fielden Park Brook	Withington Golf Club	Engineered High Ground (10)	5 (2) 75 (8)	Unkno1n (10)	2 (8) Unknown (2)	Unknown (2)	Environment Agency (8) Private individual, Company or Charity (2)
River Mersey	Northenden Golf Club	Embankment (12)	150 (2) 100 (10)	Unknown (12)	2 (5) 3 (5) Unknown (2)	4 (2) 3 (3) Unknown (7)	Environment Agency (10) Private individual, Company or Charity (2)
River Mersey	Northenden Golf Club	Engineered High Ground (10)	100 (8) 150 (2)	Unknown (10)	3 (9) 2 (1)	3 (7) 4 (1) 5 (1) Unknown (1)	Environment Agency (10)
River Mersey	Northenden Golf Club	Wall (5)	150 (4) 100 (1)	Unknown (5)	3 (5)	3 (2) 2 (2)	Environment Agency (5)
River Mersey	Chorlton	Embankment (7)	100 (6) 20 (1)	Unknown (7)	3 (7)	3 (5) 2 (1) 4 (1)	Environment Agency (7)
River Mersey	Chorlton	Engineered High Ground (3)	100 (2) 50 (1)	Unknown (3)	3 (3)	3 (3)	Environment Agency (3)
Chorlton Brook	Chorlton	Embankment (4)	50 (3)	Unknown (4)	3 (3)	3 (3)	EA (3)

Watercourse	Location	Type	Design SoP (AEP)	Actual SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Asset maintainer
			Unknown (1)		Unknown (1)	Unknown (1)	Private (1)
Chorlton Brook	Chorlton	Engineered High Ground (3)	5 (2) 50 (1)	Unknown (3)	3 (1) Unknown (2)	3 (1) Unknown (2)	Private (2) EA (1)
Baguley Brook	Wythenshawe	Engineered High Ground (4)	5 (4)	Unknown (4)	Unknown (4)	Unknown (4)	Private individual, Company or Charity (4)

6.5 Existing and future flood alleviation schemes

The EA manages government investment to reduce flood risk and coastal erosion in England. The LLFA works with the EA and other RMAs to deliver Local Flood Risk Management Strategies, focusing on surface water, groundwater, and ordinary watercourse flooding, and deliver specific flood risk management projects outlined in the local strategy and action plan.

6.5.1 Completed schemes in the City of Manchester

The EA's programme of FCERM schemes details the completed schemes within the city area. The completed schemes relevant to the City of Manchester include:

- Didsbury Flood Storage Reservoir Drawdown
- Shaw-Cringle-Ley and Willow Brook

There are no further details available on these schemes.

6.5.2 Future or pipeline schemes in the City of Manchester

The flood risk management programme is ‘live’ and subject to change to reflect any variation in priorities. This could occur if the City experiences further significant flooding events or if other funding streams and opportunities become available. Projects put forward for the programme are areas targeted on a risk based approach, with the highest chances of attracting funding.

6.5.2.1 River Mersey (South Manchester Catchments) Strategy Project

There are a number of significant EA maintained flood risk management assets along the River Mersey which are approaching the end of their design life. The current management approach involves investment in the maintenance of raise earth embankments, which does not align well with current EA objectives and targets. Therefore, the River Mersey (South Manchester Catchments) Strategy Project aims to:

- Understand the condition, purpose and performance specification of the existing flood risk management assets and the value of the benefits they provide, and
- Identify a long term (100 years) flood risk management approach which aligns with current objectives and aspirations

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 and United Utilities 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. The pre-application consultation is key to define the scope of the FRA and identify data requirements, making sure that latest available datasets are used.

It should be noted that some of these consultees may need to charge for data and/or advice requested by developers or landowners. The pre-application service provided by the EA is discretionary and subject to available resources. Developers should first consult the LPA when considering a site for development on whether the site has already been subject to the Sequential Test as part of the local plan making process

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 for its lifetime 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) proposed:

- In Flood Zones 2, 3, or 3b.
- Within Flood Zone 1 with a site area of 1 hectare or more.
- Within Flood Zone 1 and the FMfP shows it is though shown to be at risk of flooding from surface water.
- In areas with critical drainage problems (as identified by the LLFA or GMCA).
- Within Flood Zone 1 where the LPA's SFRA shows it will be at increased risk of flooding during its lifetime, as shown in the Environment Agency detailed climate change modelled and the 'Flood Zones plus Climate Change' extent shown on the EA FMfP.
- 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. This 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 LPA 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 12 of this report.

7.2.4.1 LLFA surface water management guidance

The GMCA have developed guidance for the management of surface water to inform the development of planning applications. The Surface Water Management Plan (SWMP) for Greater Manchester was completed in 2012 and is comprised of five key aims and objectives:

- Using the communication and engagement strategy and through involvement with the technical work, the SWMP should support and be part of the delivery mechanism for the AGMA (now GMCA) and unitary level capacity building initiatives.
- Deliver output that can be used to satisfy the requirements of the Flood Risk Regulations as far as possible. Note the Flood Risk Regulations have now been revoked.
- Provide greater detailed understanding of flood risk at identified local hotspots.
- Consider interactions between surface water and other sources of flooding.
- Provide an evidence base that can be used cross-departmentally by all Greater Manchester authorities, such as ongoing spatial planning and Local Flood Risk Management Strategies.
- Provide an evidence base that can be used by external partners, such as the EA to feed into their strategy work and local asset systems management planning, and United Utilities to feed into future planning for the AMP6 period (Note AMP6 ended March 2020, currently in the AMP8 period) through the Period Review process.
- Provide a robust and widely supported SWMP, which can inform, align and deliver public and private investment over the next 10-20 years.

The key hotspots within the City of Manchester that were identified in the SWMP are:

- City Centre
- Chorlton-On-Medlock
- Withington
- Sharston

The LLFA should be contacted to access full and up to date guidance.

7.3 Emergency planning

Safe access and escape routes 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 responsibility for preparing and implementing a site-specific emergency or evacuation plan rests with the developer, informed by local emergency planning arrangements. Emergency planners, emergency services, the local resilience forum should be consulted when designing an evacuation plan. It should be noted that the EA are not responsible for approving evacuation plans. For further details on emergency planning, see Section 10.2 of this report.

8 Principles for site design and master planning

In accordance with national planning policy, the Sequential Test should be applied at the earliest stage of plan-making and site selection to steer development to areas at lowest risk of flooding. Where development is proposed in areas of higher flood risk and has been demonstrated to be necessary, the Exception Test may be required. The following site design and masterplanning measures should be considered only once the Sequential Test has been satisfied and, where relevant, the Exception Test passed. These measures are intended to manage and mitigate flood risk at the site level and do not replace the need to locate development appropriately. 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.

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., vehicular parking, recreational space) can be located in higher risk areas (Section 3.4). 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. 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 act as green infrastructure, being used for recreation, amenity, and environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should provide safe access to higher ground from these areas and avoid the creation of isolated 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 or modify ground levels should be discussed at an early stage with the EA and its impacts assessed as part of a detailed FRA. Designs should be modelled and fully tested to ensure there is no increase in ponding or runoff on third party land.

In line with the sequential, risk-based approach, development should first seek to avoid and minimise flood risk wherever possible. Measures such as raising ground levels and providing compensatory flood storage should not be relied upon as a primary solution and should only be considered where it has been demonstrated that flood risk cannot be adequately addressed through site layout and design alone.

8.2 Raised floor levels

If raised floor levels are proposed, these should be agreed with the LPA 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 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 plus climate change floodplain would not be acceptable and should be discouraged. New development offers opportunities to improve the resilience of buildings.

Building design and raised floor levels is 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, safe access and escape routes must still be available, 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.

Where development is located behind, or in an area benefitting from defences, both the undefended risk and residual risk of flooding must be considered by the developer and 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 to maintain the current Standard of Protection (SoP) 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.

Details of defences in the authority area and their location are available in Section 6 and shown on the SFRA mapping in Appendix H

8.3.2 Breach assessment

The assessment of the residual risk from a breach event should consider an assessment of the hazards that might be present from flood flows from a breach event, considering depth and flow velocities, so that the safety of people and structural stability of properties and infrastructure can be appropriately considered. Breach assessments should be considered at the Level 2 SFRA or site-specific FRA stage, where required.

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 from the EA. 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 location(s) and approach for the breach assessment.

Details of defences in the authority area and their location are available in Section 6 and shown on the SFRA mapping in Appendix H

8.3.3 Overtopping assessment

The assessment of the residual risk from overtopping of defences should consider the risk which is based on the relative heights of property or defence, the distance from the defence level, and the height of water above the crest level of the defence. 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. This should be considered at the Level 2 SFRA or site-specific FRA stage, where required.

Details of defences in the authority area and their location are available in Section 6 and shown on the SFRA mapping in Appendix H

8.3.4 Developer contributions

In some cases, and following the 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).

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 and can also contribute to Biodiversity Net Gain (see Section 12.2). A buffer strip of 8m is recommended for any non-tidal main river, which should be measured from the bank top of the main river. Where flood defences are present, these distances should be taken from the landward toe of the defence. Whilst a minimum buffer strip of 8m is encouraged, it may be optimal to consider a 10m buffer strip to maximise wider objectives for nature recovery and Biodiversity Net Gain.

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/flood defences (where present).

8.5 Property Flood Resilience (PFR)

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 (NPPF paragraph 177), 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 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.

9.1 Sustainable Drainage Systems (SuDS)

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 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 LPA. This assists with the delivery of well designed, appropriate, and effective SuDS. Applicants are also encouraged to engage with United Utilities 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 9.1. 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, 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 North West SuDS Pro-forma contains design and technical guidance.

The Greater Manchester Sustainable Drainage Design Guide provides guidance on the design, delivery and maintenance of SuDS in Greater Manchester. The guide promotes holistic SuDS design through providing standards for common SuDS features and potential design and infrastructure options.

The Highways Developer Design Guidance explains approaches of implementation of SuDS on Highways Major Projects and on new development.

9.3 Roles of the LLFA, LPA and GMCA

Manchester City Council, as 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, ensure there are clear arrangements for ongoing maintenance over the lifetime of the development.

In their role 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.

Whilst the responsibility of managing the risk posed from surface water flooding and ordinary watercourses remains with the LLFA, GMCA provides sub-regional policy, coordination and emergency planning guidance to promote cross-boundary flood risk management.

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 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.

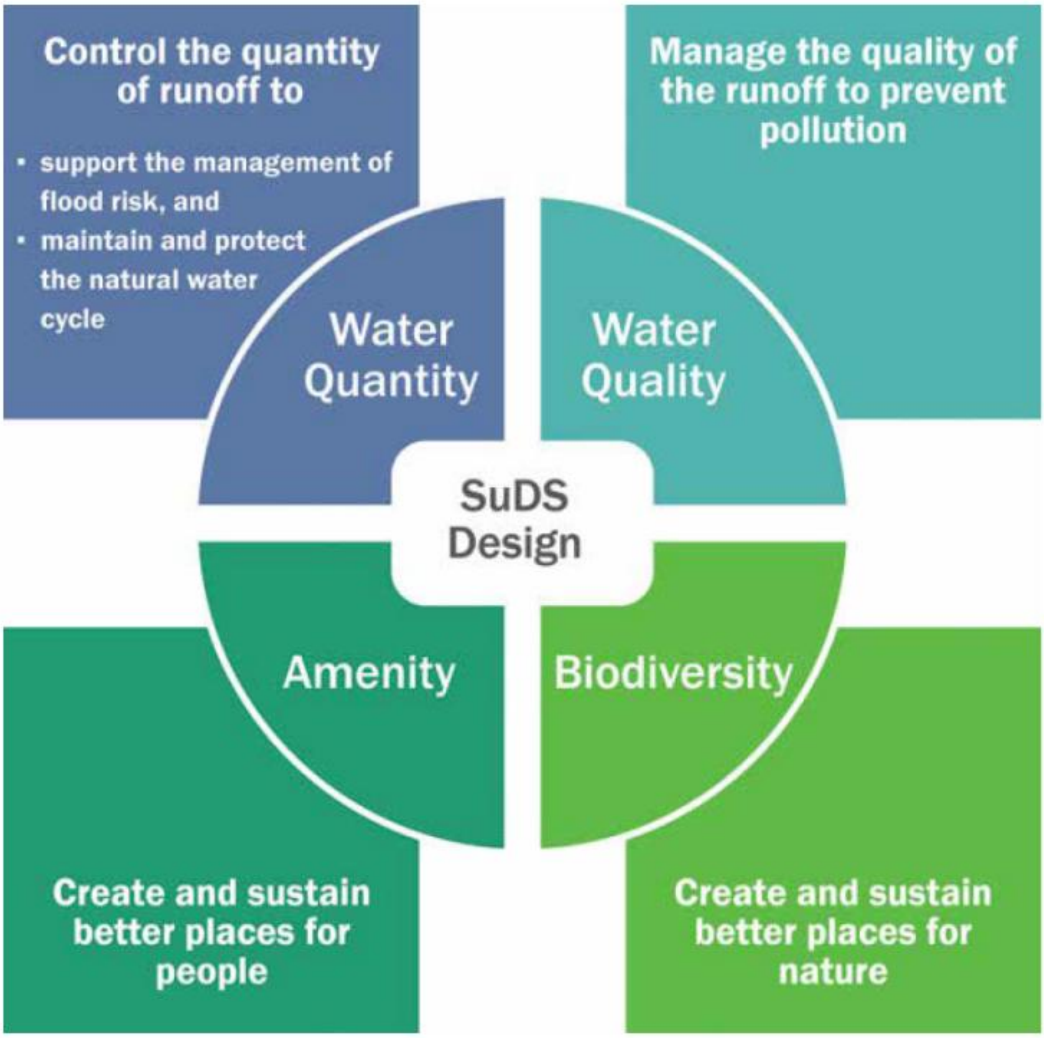


Figure 9-1: Four pillars of SuDS design (The SuDS Manual C753, 2015).

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 of 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.

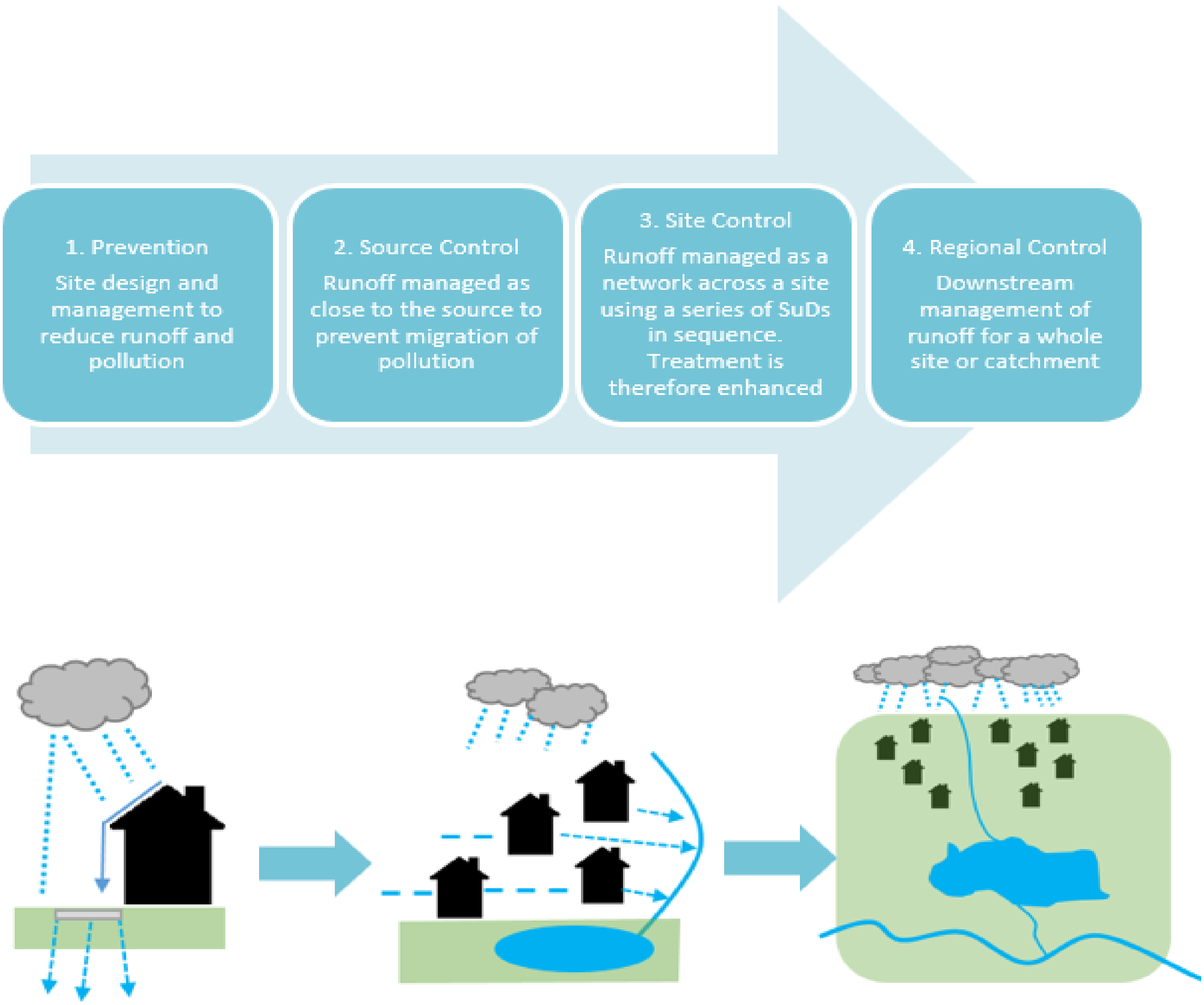


Figure 9-2: SuDS Management Train.

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 Vulnerability Zones (Section 9.5.1), 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 should also be investigated as it may be possible in some locations within the site. If infiltration is not possible linings can be used with features to prevent infiltration.
High groundwater levels	Non-infiltrating features can be used. Features can be lined with an impermeable line or clay to prevent the egress of water into the feature. Additional, 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 be done to take into consideration 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. Facts 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 on-going 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.

There are areas of high and medium-high groundwater vulnerability within Northenden and Didsbury.

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

The EA also defines 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.

Online mapping shows there is currently a GSPZ designated in Moss Side. Where a site is located in a GSPZ used for public water supply, applicants should engage with the EA to understand any concerns and any necessary mitigating measures to manage the risk of development to public water supply.

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).

North of the city centre, land is designated as NVZ, covering Cheetham Hill, Harpurhey and Blackley. 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 Critical Drainage Areas

There are currently no EA Areas with Critical Drainage Problems (ACDP) within the City of Manchester.

Local authorities can choose to designate Critical Drainage Areas (CDAs) within their authority area. GMCA updated their CDAs for the ten Greater Manchester authorities in 2022, however these were delineated prior to the release of the NaFRA2 surface water mapping in March 2025. The current CDAs are based on the river catchments with the highest number of properties predicted to be at risk from surface water flooding, based on the third-generation release of the Risk of Flooding from Surface Water mapping, and sewer flooding, based on UU modelled data. It is recommended that the CDA boundaries are updated using the latest available information. The GMCA CDA boundaries have not been updated through this Level 1 SFRA.

Based on the current GMCA CDA boundaries, the majority of the City of Manchester is designated as a critical drainage area. Given the urbanised nature of the authority area, and therefore significant surface water flood risk, it may be beneficial to impose more stringent surface water management measures for new development across the entirety of the City of Manchester.

The council may in future require that all major development (greenfield & brownfield) limit surface water discharge to the equivalent site-specific greenfield runoff rate for all return periods up to the 1 in 100 year plus climate change event.

9.5.4.1 Local Critical Drainage Area guidance

Policy EN 9 of the Council's Draft Local Plan (September 2025) states that an appropriate FRA will be required for all development proposals on sites greater than 0.5ha that are within CDAs.

10 Flood warning and emergency planning

This section provides an overview of the requirements for emergency plans, including any local emergency planning arrangements, and an overview of the available flood alerts and warnings from the EA in the City of Manchester.

10.1 NPPF requirements

The NPPF Flood Risk Vulnerability and Flood Zone "incompatibility" table seeks to avoid inappropriate development in areas at risk from fluvial 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 flood water, or that such infrastructure is resistant to the effects of flooding such that it remains serviceable/operational during 'Central' allowance events for the majority of development types, and 'Upper End' allowance events for essential infrastructure, as defined in the Environment Agency’s climate change allowances.

The outputs of this Level 1 SFRA should be compared and reviewed against any existing emergency plans and continuity arrangements. This includes any 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. The EA's online FMfP should also be consulted to ensure the latest data is being considered.

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, this SFRA, the Council's LFRMS (2014) and an updated SWMP (currently GMCA-wide SWMP (2012)) 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. Emergency plans can be provided as part of a FRA or as a separate document. Decisions regarding whether an emergency plan is required sits with the LPA, with advice from the Council's emergency planning teams, the EA, and the LLFA.

According to the PPG, 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 Community flood plan (2023)
- Environment Agency Personal flood plans (2023).

10.2.1 Safe access and escape routes

Safe access and escape routes need to be available during the design flood event with consideration of climate change. 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. The Greater Manchester Resilience Forum (GMRF) in their co-ordinating role oversee emergency planning and effective multi-agency response may wish to offer advice on evacuation arrangements. 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 Greater Manchester Resilience Forum (GMRF)

Greater Manchester Resilience Forum works to prepare for, respond to and recover from any emergency incident, including flooding. The GMRF brings together local authorities, emergency services, utility companies, charities and volunteers and supports flood resilience by providing guidance on how to prepare homes and businesses for emergencies, promoting actions such as developing flood maps and access to flood warnings.

The GMRF also provides advice on how to safeguard homes and what to do during and after flooding has taken place.

10.4 Flood alerts and flood warnings

The EA is the lead organisation for providing warnings of river 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 three Flood Alert Areas (FAA) and 26 Flood Warning Areas (FWAs) covering the city area, which are shown in Figure 10-1.

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’.

The FAAs and FWAs are shown on the SFRA maps in Appendix H.

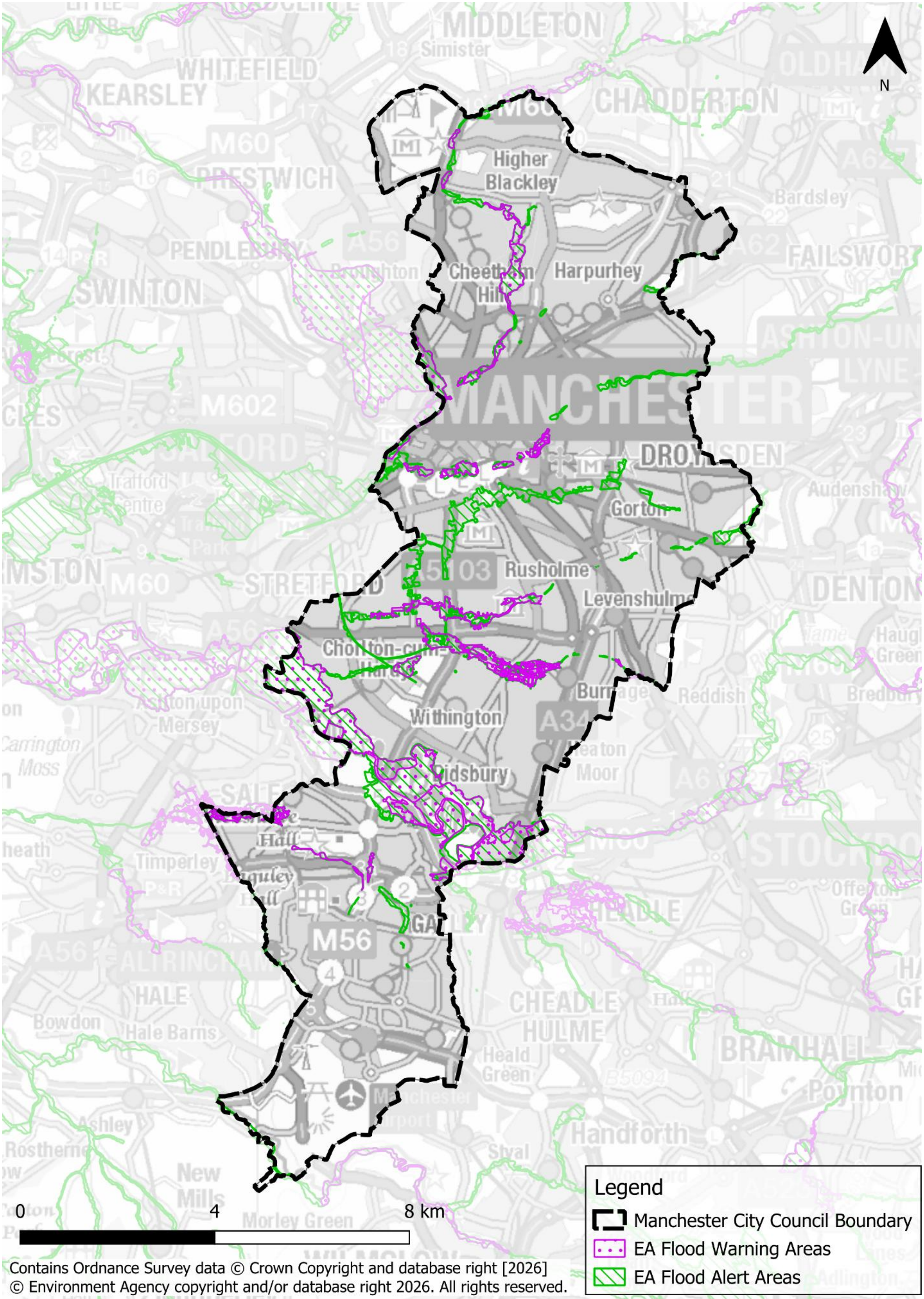


Figure 10-1: EA Flood Warning Areas and Flood Alert Areas

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 developments comply with the latest guidance and legislation relating to flood risk and sustainable drainage, and appropriate consideration is given to flow paths and storage 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.

There is currently no national guidance available for assessing the cumulative impacts of development. The cumulative impact assessment (CIA) in this SFRA provides a relative assessment of the catchments within the City of Manchester and are not comparable across other boroughs/districts. The full methodology for the CIA is set out in Appendix G

11.2 Results

The CIA has identified the following catchments as high risk:

- Irwell (Croal to Irk)
- Medlock (Lumb Brook to Irwell)
- Mersey (upstream of Manchester Ship Canal)

Specific recommendations for catchments identified as high risk, alongside broadscale recommendations applicable across the whole authority area, are set out in Section 12. The full CIA methodology can be found 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 City of Manchester, including natural flood management. It also details notable partnership working opportunities.

Section 11 and Appendix G consider the cumulative impacts of development across the city 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, 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 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 the city include:

- Irwell Catchment Partnership
- Upper 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 November 2023 for developments in the Town and Country Planning Act 1990, unless exempt, and has been applicable to small sites since April 2024. 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

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) or nature-based solutions, 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 city include:

- Creation of offline storage areas.
- Re-meandering streams (creation of new meandering courses or reconnecting cut-off meanders to slow the flow of the river).
- Targeted woodland planting.
- 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 through local plan policy. This is particularly important for infrastructure that reduces the risk of flooding to large areas 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.

NFM measures can also make a valuable contribution in delivering multiple benefits beyond flood risk reduction. In addition to attenuating flows, many NFM techniques can contribute positively to BNG and support the objectives of Local Nature Recovery Strategies (LNRS). Measures such as wetland creation, floodplain reconnection, woodland planting, and riparian buffer establishment can provide valuable habitat creation and ecological enhancement opportunities.

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

12.3.1 Working with natural processes

The EA published their updated evidence base in February 2025 for Working with Natural Processes to reduce flood risk 2024 (gov.uk) 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.

12.3.2 North West NFM Measures: A practical guide for farmers

The North West NFM Measures: A practical guide for farmers document has been developed to provide guidance for landowners and farmers within the North West on the range of NFM measures available and which would be appropriate for their land. Measures include soil management, buffer strips, leaky barriers and woodland creation. It also sets out the consents and approvals process prior to construction.

12.3.3 Ongoing NFM schemes

One of the Government's funding policy and strategic objectives is to increase investment in natural flood management (NFM), prioritising projects with contributions from others to include interventions that protect, restore, or mimic the natural functions of catchments, floodplains and rivers to reduce flood risk.

12.3.4 Completed NFM schemes

12.3.4.1 Mayfield Park Regeneration (2023)

The creation of Mayfield Park involved the daylighting of the River Medlock as it flows through the city centre, near Manchester Picadilly Station. The project saw the creation of 2.4 hectares of green space. Flood attenuation features were included in the design, using planting that will tolerate periodic flooding.

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.

There are multiple culverted sections of watercourse in the city. 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 for access.

It is recommended that investigations of any culverted watercourses on any development sites establish their full route, condition and capacity are carried out through site-specific flood risk assessments at the planning application stage.

Manchester City Council is generally opposed to the culverting of watercourses due the adverse ecological, flood risk, human safety and aesthetic impacts. The Council resists culverting on conservation and other grounds, and consent for such works will not normally be granted except for access crossings.

The Council will consider each application to culvert a watercourse on its own merits and will only approve a culvert if there is no reasonably practicable alternative. It is recognised that there are situations where culverting may be unavoidable in practice, such as short lengths for access purposes or where highways cross watercourses. In these cases, open span bridges or diversion of the watercourse must be considered first as alternatives to culverts.

De-culverting can bring many benefits including; reducing the need for regular maintenance and trash screens, reducing blockages and enhancing the river environment by providing a more varied habitat. In some cases, small sections of open channel can be beneficial for flood risk management allowing for flood water to disperse naturally and thus slowing the movement of flood water downstream. 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.

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 areas of the city and consist of:

- Open spaces – parks, lakes / ponds.
- 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 are 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 such as Manchester 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.

The Manchester Climate Ready Plan (2025-2030) sets out actions to:

- Require developers to consider climate resilience and green and blue infrastructure in planning, retrofitting and development approvals.
- Enhance and increase Manchester’s green and blue infrastructure as integral components of resilient urban systems
- Attract new funding for green and blue infrastructure and explore new innovative funding models for both capital investment and ongoing revenue costs, maximising internal and external funds, and building on success of Managing Manchester’s Trees

- Utilise the support and investment of external partner organisations to deliver objectives on green and blue infrastructure, using Council resources to stimulate investment where relevant.

13 Recommendations and next steps

13.1 Requirements for a Level 2 SFRA

Following the application of the Sequential Test using Appendix E and F of this Level 1 SFRA, where sites cannot be appropriately accommodated in low-risk areas, the Council may need to show that sites proposed for allocation 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 planning application stage.

As part of this Level 1 SFRA, an initial site screening exercise using the Council's potential development site boundaries and the latest flood risk data has been undertaken (Appendix E and F) to help inform the application of the Sequential Test and the subsequent potential requirement for a Level 2 SFRA.

Appendix F provides a strategic assessment of the suitability, relative to flood risk, of the sites to be considered for allocation in the Council's new local plan, summarising the outcomes of the sites screening assessment spreadsheet in Appendix E.

SFRA Strategic Recommendation B applies to sites where a Level 2 SFRA may be required in order to allocate. Of the 606 potential development sites screened, Strategic Recommendation B applies to 426 sites, considering the NPPF. However, a Level 2 SFRA may not be required for all of these sites, depending on the proportion and spatial variation of risk across each site. The sites where Strategic Recommendation B applies should be reviewed by the Council to identify those where further assessment would be required in order to allocate.

13.2 Recommendations from SFRA findings

The following overarching SFRA recommendations have been developed to guide future development and inform planning decisions across the City of Manchester 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 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, the modelled climate change flood outlines and the FMfP Flood Zones plus Climate Change flood risk area. 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.
- 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 for access. It is recommended that investigations of any culverted watercourses on any development sites establish their full route, condition and capacity are carried out through site-specific flood risk assessments at the planning application stage.
- 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, as well as for flood attenuation and storage.
- 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, at risk from any other flood source, or within Flood Zone 1 and the site area is 1 hectare or greater.
- Built development within at least 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, with a focus on achieving BNG.
- 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 (required to be updated in line with the National 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
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.
	Level 2 SFRA	Reviewing of EA flood zones in those areas not covered by existing detailed hydraulic models (i.e., the FMfP 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 FMfP, 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.
	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, following application of the Sequential Test by the Council.
	SWMP/ detailed surface water modelling	The LLFA may wish to produce a SWMP for the City of Manchester, or an updated study for Greater Manchester, based on the most up to date surface water flood risk information and climate change allowances or consider targeted areas of high surface water flood risk.
	LFRMS update	The LLFA may wish to produce an updated LFRMS for the City of Manchester, based on the most up to date information.

Type	Study	Reason
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.
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 authority area.
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.
Data collection	Flood incident data	The Council should record flood events including such information as date, location, weather, flood source (if apparent without an investigation), impacts (properties flooded or number of people affected) and response by any RMA. This should be made available in GIS format.
	FRM Asset Register	The LLFA should continue to update and maintain its asset register as per FWMA requirements.
Risk assessment	Asset inspection	The LLFA should carry out condition inspections of critical flood risk management assets (see Section 6.4).
Capacity	SuDS review / guidance	The LLFA and LPA should clearly identify requirements of developers for inclusion of SuDS in new developments. Internal capacity, within the Council should be in place to deal with SuDS applications, set local specifications and set policy for adoption and future maintenance of SuDS.
Partnership	United Utilities	The Council should continue to collaborate with United Utilities on sewer and surface water projects to ensure their assets can remain operational and resilient at all times across the city and that capacity for new development is appropriate.
	EA	The Council should continue to work with the EA on fluvial flood risk management projects. Potential opportunities for joint schemes to tackle flooding from all sources should be identified.
	Community	Continued involvement with the community through existing flood risk partnerships.

Appendices

A Data Sources used in this SFRA

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

C Legislation and Policy Summary for Flood and Water Management

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 Interactive GeoPDF Mapping

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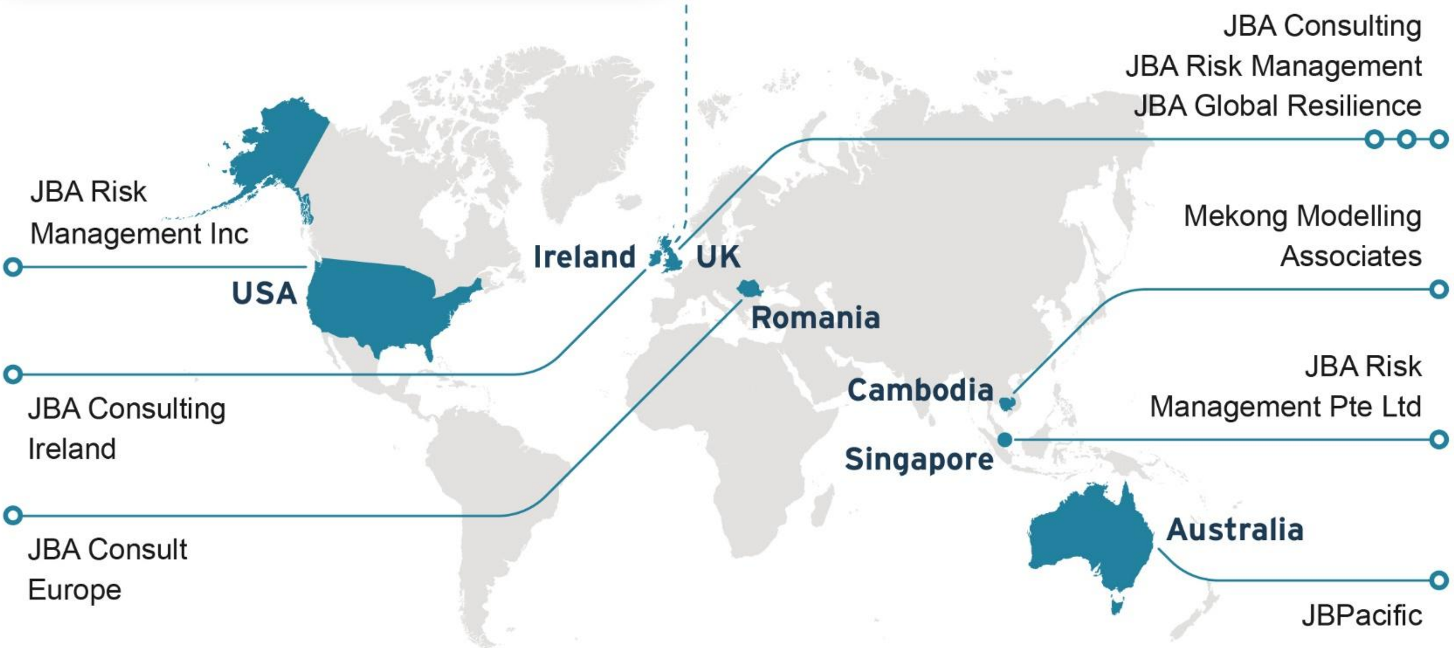

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