Newcastle-under-Lyme Level 2 Strategic Flood Risk Assessment

Final Report

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Prepared by	Sarah Hambling BSc MSc Analyst Elsa Holm BAEcon Technical Analyst
Reviewed by	Helen Dawson BSc MCIWEM C.WEM Chartered Senior Analyst
Authorised by	Joanne Chillingworth BSc MSc MCIWEM C.WEM Associate Director

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Contract

JBA Project Manager	Sarah Hambling
Address	1 Broughton Park, Old Lane North, Broughton, Skipton, North Yorkshire, BD23 3FD
JBA Project Code	2024s1870

This report describes work commissioned by Newcastle-under-Lyme Borough Council by an instruction dated 5 December 2024. The Client's representative for the contract was Allan Clarke of Newcastle-under-Lyme Borough Council. Sarah Hambling, Elsa Holm, Amy Ewens, and Jay Cafferkey of JBA Consulting carried out this work.

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Abbreviations

AEP	Annual Exceedance Probability
AIMS	Asset Information Management System
AStGWF	Areas Susceptible to Groundwater Flooding
BGS	British Geological Survey
CC	Climate Change
CCTV	Closed Circuit Television
EA	Environment Agency
FAA	Flood Alert Area
FMfP	Flood Map For Planning
FRA	Flood Risk Assessment
FWA	Flood Warning Area
GIS	Geographical Information System
JBA	Jeremy Benn Associates
LiDAR	Light Detection And Ranging
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
mAOD	metres Above Ordnance Datum
NULBC	Newcastle-under-Lyme Borough Council
NaFRA2	National Flood Risk Assessment 2
NPPF	National Planning Policy Framework (December 2024)
OS	Ordnance Survey
PPG	Planning Practice Guidance (2022)
RMA	Risk Management Authority
RoFSW	Risk of Flooding from Surface Water
SCC	Staffordshire County Council
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems

Definitions

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.

Dry island: Land which may not be at risk of flooding itself but is surrounded by flood risk and therefore may become cut off during a flood event.

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

Green infrastructure: A network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs, and urban fringe.

Greenfield: An undeveloped parcel of land.

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

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

Major development: Defined in the National Planning Policy Framework 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 provide in the Town and Country Planning (Development Management Procedure) (England) Order 2015 (gov.uk).

Natural Flood Management: 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 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: 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.

Risk Management Authority: The Environment Agency, Lead Local Flood Authorities, District and Borough Councils in an area where there is no unitary authority, Coast Protection Authorities in coastal areas, Water and sewerage companies, Internal Drainage Boards, and Highways authorities.

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: Sustainable Drainage Systems are 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

Introduction and context

This Level 2 Strategic Flood Risk Assessment (SFRA) document was prepared with the purpose of providing part of the evidence base for the Local Plan 2020 - 2040 for Newcastle-under-Lyme Borough Council (NULBC). It follows on from the NULBC Level 1 SFRA produced in 2024 and should be read in conjunction.

The primary purpose of the Level 2 SFRA is to provide an appropriate understanding of the level of flood risk affecting development included in the updated Local Plan. The assessment takes into account all sources of flooding and considers other factors affecting flood risk such as residual risk. The information provided as part of the Level 2 SFRA enables NULBC to apply the exception test to sites in accordance with the National Planning Policy Framework (NPPF, December 2024).

SFRA objectives

The Government's Planning Practice Guidance (PPG, 2022) on Flood Risk and Coastal Change advocates a tiered approach to risk assessment involving Level 1 and Level 2 SFRAs.

After undertaking the sequential test, NULBC have shortlisted sites which cannot be relocated outside of flood risk areas due to additional factors. The Level 2 assessment aims to build on identified risks from the Level 1 in order to provide a greater understanding of fluvial, surface water, groundwater, sewer, and reservoir related flooding risks to these shortlisted sites. From this, NULBC and developers can make more informed decisions regarding future development. The Level 2 assessment also identifies sites requiring further risk analysis at the site-specific Flood Risk Assessment (FRA) stage.

Summary of Level 2 SFRA

NULBC provided 55 sites which were subject to initial screening through the use of an 'overlap analysis' tool in GIS. The site boundaries were screened against flood risk datasets and a R-A-G (Red-Amber-Green) analysis applied to assess the potential viability of the sites and provide flood risk recommendations. Responses provided by the Environment Agency (EA) and United Utilities on the Regulation 19 Consultation were also considered.

The R-A-G system was applied to the sites on the basis that:

- 'red' sites have significant obstacles or challenges for development which would need consideration if taken forward. These sites may need the exception test to show that the site can be developed safely, from a flood risk perspective.
- 'amber' sites are flagged for developer considerations, but these are likely to be able to be addressed at the planning application stage. These sites are flagged as they may have some surface water issues related to access and escape routes for the site.

- 'green' sites that have no significant obstacles for development. However, it is noted sites may need an FRA and drainage strategy depending on the location of the site.

Of the 55 sites, 12 were identified as 'red sites', i.e. having a significant flood risk. A further 19 were identified as 'amber sites', based on minor surface water flooding within the site and/or access and escape route problems, and/or having a high risk of groundwater emergence within the site based on the JBA Groundwater Emergence Map.

NULBC confirmed removal of six sites (3 with significant flood risk issues, and 2 'amber sites') following the initial screening, as five of the sites had progressed to commitments and one site was removed due to other planning criteria prior to the final Local Plan site selection.

This Level 2 SFRA therefore provides detailed site assessments for nine 'red' sites identified as having significant flood risk:

- Site BL8: Land adjacent to roundabout at West Avenue, Kidsgrove.
- Site TB19: Land south of Newcastle Golf Club, Whitmore Road.
- Site AB33: Land off Nantwich Road/Park Lane (1) Audley.
- Site SP22: Former playground off Ash Grove, Silverdale.
- Site CH13: Castletown Grange, Douglas Road, Cross Heath.
- Site TC40: Blackfriars Road Car Park.
- Site BW1: Chatterley Valley, Lowlands Road, Bradwell.
- Site AB2: Land adjoining corner of A500 and M6 southbound.
- Site 11: Hardingswood Road, Kidsgrove.

These sites have been assessed in detail within Appendix B. The detailed site assessments include:

- An assessment of all sources of flooding including fluvial, surface water, groundwater, reservoir, and sewer, and the potential increases in fluvial and surface water flood risk due to climate change, and how these may be mitigated.
- Reporting on conditions of flood defence infrastructure, where applicable.
- An assessment of existing flood warning and emergency planning procedures, including an assessment of safe access and escape routes during an extreme event.
- Advice and recommendations on the likely applicability of Sustainable Drainage Systems (SuDS) for managing surface water runoff.
- Advice on whether the sites are likely to pass the second part of the exception test with regards to flood risk and on the requirements for a site-specific FRA, and outline measures or objectives required to manage flood risk.

To accompany each site assessment, flood risk mapping for each of the sites is available in the GeoPDF Mapping in Appendix C. Due to licencing and confidentiality restrictions, sewer data has not been represented on the mapping.

17 'amber sites' were also assessed as part of this Level 2 SFRA: a brief description of the risk to the site and general recommendations are provided in Section 5.

The following points summarise the Level 2 assessment:

- **Fluvial flooding** - There is limited fluvial risk to the proposed development sites across Newcastle-under-Lyme borough. The main watercourses associated with fluvial risk to the sites within the Level 2 assessment are Lyme Brook, Ashfields Brook, and Park Brook. There are also other smaller watercourses and drainage channels presenting a fluvial risk to sites across Newcastle-under-Lyme borough. The site with the most significant fluvial risk is CH13 which is along Ashfields Brook.
- **Flood Warning Areas (FWAs)** - Sites CH13 and TC40 are partially located within existing EA FWAs. For proposed development within existing EA FWAs, developers should consult the EA to ensure that adequate flood warning procedures and evacuation processes are in place and that Risk Management Authorities (RMAs) are not put under any additional burden.
- **Surface water flooding** - Surface water tends to follow topographic flow routes, for example, along watercourses or isolated pockets of ponding where there are topographic depressions. The majority of sites assessed are at surface water risk. The degree of flood risk varies with some sites being only marginally affected along their boundaries, e.g. BW1 and Site 11, whilst other sites are more significantly affected across the site area, e.g. AB33, and SP22. The sites at most significant surface water risk are AB33, BL8, SP22, and Site 11.
- **Access and escape routes** - Sites SP22, CH13, and TB19 have potential access and escape route issues as a result of fluvial and/or surface water flooding of the surrounding roads. At these sites, consideration should be made as to how safe access and escape routes can be provided during flood events, both for people and emergency vehicles. Consideration should also be given to the nature of the risk, for example whether the flooding forms a flow path or bisects the site meaning access across the site from one side to another may be compromised.
- **Climate change** - Fluvial and surface water climate change mapping indicates that flood extents are predicted to increase. As a result, the depths, velocities, and hazard of flooding may also increase. The significance of the increase will depend on the topography of the site and the climate change percentage allowance used. Site-specific FRAs should confirm the impact of climate change using latest guidance. The sites most at risk from increased risk due to climate change are AB33 and SP22. It is recommended that NULBC work with other RMAs to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the borough.
- **Historic flooding** - None of the sites are shown to fall within the EA Historic Flood Map or Recorded Flood Outlines datasets. No other historic flooding records were made available for this assessment.

- **Sewer flooding** - United Utilities identified three sites which have a modelled risk of sewer flooding (AB12, NC13, and BL18) and four sites with recorded hydraulic flooding incidents from the public sewer in the wider vicinity of the site (AB15, AB33, NC13, BL18). Severn Trent Water classified two of the sites (CT20 and SB12) as potentially having a high impact to the existing public sewerage system based on known hydraulic incidents within the vicinity of the site or the return period analysis on the downstream connection showing sewer flooding. A further 17 sites were classified as having a medium impact due to several different factors including the size of the development, proximity to sewage treatment works, return period analysis showing predicted flooding, and historic hydraulic incidents within the vicinity of the site.
- **Groundwater flooding** - A number of sites across Newcastle-under-Lyme borough are shown by the Areas Susceptible to Groundwater flooding (AStGWF) map to have a high susceptibility to groundwater flooding with corresponding high ground water levels shown in the JBA emergence map. An appropriate assessment of the groundwater regime for a site should be carried out at the site-specific FRA stage. Sites with the greatest risk are Site 11 and TC40.
- **Reservoirs** - There are two sites (AB2 and Site 11) assessed within the detailed site assessments that are shown to be at risk of reservoir flooding during a 'Wet Day' and/or 'Dry Day' scenario. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is very low. However, there is a residual risk of a reservoir breach, and this risk should be considered in any site-specific FRA.
- **Main Rivers** - Any sites located where there is a Main River (including culverted reaches) will require an easement of 8m either side of the watercourse from the top of the bank. In Newcastle-under-Lyme borough, this applies to TC40 which borders Lyme Brook. This may introduce constraints regarding what development will be possible and consideration will need to be given to access and maintenance at locations where there are culverts. Developers will be required to apply for appropriate permits so the activity being carried out over easements does not increase flood risk.
- **SuDS** - A strategic assessment was conducted of SuDS options using regional datasets. A detailed site-specific assessment of suitable SuDS techniques would need to be undertaken at site-specific level to understand which SuDS option would be best. As set out in Paragraph 182 of the NPPF (December 2024) '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.'

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

Paragraph 171 of the National Planning Policy Framework (2024) (gov.uk) states that 'Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.'

1.2 Levels of SFRA

The Planning Practice Guidance (PPG, 2022) Flood risk and coastal change (gov.uk) advocates a staged approach to risk assessment and identifies two levels of a Strategic Flood Risk Assessment (SFRA):

- A Level 1 assessment, which all Local Planning Authorities (LPAs) are required to undertake. Where potential site allocations are not at major flood risk and where development pressures are low a Level 1 assessment is likely to be sufficient, without the LPA progressing to a 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 (December 2024) exception test, or if an LPA believe they may receive high numbers of applications in flood risk areas on sites not identified in the Local Plan. In these circumstances the assessment should consider the detailed nature of the flood characteristics within a Flood Zone and assessment of other sources of flooding.

This SFRA report fulfils the requirements for a Level 2 assessment of development sites identified for potential allocation within Newcastle-under-Lyme borough and has been prepared in accordance with the NPPF (December 2024) and PPG (2022).

This report should be read alongside the Newcastle-under-Lyme Borough Council (NULBC) Level 1 SFRA (2024) and builds upon information presented within the Level 1 SFRA.

1.3 SFRA objectives

The objectives of this Level 2 SFRA are to:

- Provide detailed assessments of the flood risk at nine development sites identified in consultation with NULBC, using the latest available flood risk data, thereby assisting NULBC in applying the exception test to their proposed development sites through the new Local Plan.

- Use available data to provide information and a comprehensive set of maps presenting flood risk from all sources for each site option.
- Where the exception test is required, provide recommendations for making the site safe throughout its lifetime.
- Take into account the most recent policy and legislation in the NPPF (December 2024), PPG (2022), and Lead Local Flood Authority (LLFA) Sustainable Drainage Systems (SuDS) guidance.

1.4 Consultation

In addition to NULBC, the following parties were consulted during the preparation of the Level 1 SFRA (which also informed this Level 2 assessment) through data requests and draft report reviews:

- Staffordshire County Council (SCC) LLFA
- Environment Agency (EA)
- Severn Trent Water
- United Utilities

In addition, the following parties were consulted through data requests during the preparation of the Level 1 SFRA:

- Neighbouring LPAs to provide data on cross-boundary development implications:
  - Cheshire East Council
  - Shropshire Council
  - Stafford Borough Council
  - Staffordshire Moorlands District Council
  - Stoke-on-Trent City Council
- Canal and River Trust
- Natural England
- Staffordshire Wildlife Trust

1.5 How to use this report

Table 1-1 below outlines the contents of this report and details how different users can apply this information.

Table 1-1: Outline of the contents of each section of this report.

Section	Contents	How to use
1. Introduction	Outlines the purpose and objectives of the Level 2 SFRA	For general information and context.
2. Planning framework and flood risk policy	Includes information on the implications of recent changes to planning and flood risk policies and legislation.	Users should refer to this section and the relevant sections of the Level 1 SFRA for any relevant policy which may underpin strategic or site-specific assessments.

Section	Contents	How to use
3. Information used in the Level 2 SFRA	Summarises the data used in the Level 2 detailed site assessments and mapping.	Users should refer to this section in conjunction with the detailed site assessments (Appendix B) and GeoPDF Mapping (Appendix C) to understand the data presented.
4. Level 2 Assessment Methodology	Summarises the sites taken forward to a Level 2 assessment and the outputs produced for each of these sites.	Users should refer to this section in conjunction with the detailed site assessments (Appendix B) and GeoPDF Mapping (Appendix C) to understand the data presented.
5. 'Amber sites' assessment	Includes an assessment of flood risk at the 'amber sites' (those sites identified at a lower, but still notable, flood risk than those requiring a full Level 2 assessment).	This section should be used in conjunction with the 'amber site' mapping. Developers of 'amber sites' should use this section to understand the flood risk and associated recommendations for their sites.
6. Flood risk management requirements for developers	Identifies the scope of the assessments that must be submitted in Flood Risk Assessments (FRAs) supporting applications for new development. Refers to relevant sections in the Level 1 SFRA for mitigation guidance.	Developers should use this section alongside the relevant sections of the Level 1 SFRA to understand requirements for FRAs, which conditions/guidance documents should be followed, and information on flood mitigation options.
7. Summary of Level 2 assessment and recommendations	Summarises the results and conclusions of the Level 2 assessment, and signposts to the Level 1 SFRA for planning policy recommendations.	Developers and planners should use this section to see a summary of the Level 2 assessment and understand the key messages from the detailed site assessments. Developers should refer to the Level 1 SFRA recommendations when considering requirements for site-specific assessments.
Appendix A: Site screening summary for Level 2 sites	Provides a table which lists all the sites that were carried forward to a Level 2 assessment and the results of the initial site screening.	Developers should use this table to understand flood risk issues for site-specific assessments.
Appendix B: Detailed site assessments	Provides a detailed summary of flood risk for sites requiring a more detailed assessment, which considers flood risk, emergency planning, climate	Planners should use this appendix to inform the application of the sequential and exception tests, as relevant. Developers should use these assessments to understand flood

Section	Contents	How to use
	change, broadscale assessment of possible SuDS, exception test requirements, and requirements for site-specific FRAs.	risk, access and escape route requirements, climate change, SuDS, and FRA requirements for site-specific assessments.
Appendix C: GeoPDF Mapping and User Guide	Provides GeoPDF mapping of the flood risk at each of the sites afforded a detailed site assessment. Includes depth, velocity and hazard information for fluvial and surface water flood risk where available, alongside climate change risk.	Planners should use this appendix to inform the application of the sequential and exception tests, as relevant. Developers should use these assessments to understand flood risk, access and escape route requirements, climate change, SuDS, and FRA requirements for site-specific assessments.
Appendix D: 'Amber sites' surface water mapping	Provides static mapping of the surface water flood risk to identified 'amber sites'.	Developers of 'amber sites' should use this mapping, in conjunction with Section 5 of this report, to understand the flood risk and associated recommendations for their sites.
Appendix E: 'Amber sites' groundwater emergence mapping	Provides static mapping of the groundwater emergence risk to identified 'amber sites'.	Developers of 'amber sites' should use this mapping, in conjunction with Section 5 of this report, to understand the flood risk and associated recommendations for their sites.
Appendix F: Sewer flood risk assessment.	Includes an overview of site-specific sewer flooding risks identified by United Utilities and Severn Trent Water.	Developers should use this appendix to understand the potential sewer flood risk issues requiring more detailed assessment and consideration and associated recommendations for their sites.

1.6 SFRA study area

Newcastle-under-Lyme is located in northeast Staffordshire, in west-central England. The main urban areas in the borough are located in the north and the east. Newcastle-under-Lyme is the largest of the settlements, with others including Kidsgrove, Talke, Silverdale, and Keele. The southern and western parts of the borough are more rural and consist of smaller settlements, such as Madley, Audley, Almington, and Ashley. The key watercourses which run through the borough are Lyme Brook, the River Tern, and the River Lea. Their main tributaries include Checkley Brook, Coal Brook, and Park Brook.

For further details and mapping of the study area, see Section 1.5 of the Level 1 SFRA report.

2 Planning framework and flood risk policy

The flood risk management roles and responsibilities for different organisations and relevant legislation, policy and strategy are detailed within Section 2 of the NULBC Level 1 SFRA (2024).

This contains details on:

- Key legislation for flood and water management.
- Key national, regional, and local policy documents and strategies.
- Roles and responsibilities for flood risk management in Newcastle-under-Lyme borough.

2.1 National Planning Policy Framework

The NPPF (December 2024) (gov.uk) sets out Government's planning policies for England and how these are expected to be applied. The NPPF is based on core principles of sustainability and forms the national policy framework in England, also accompanied by a number of PPG. It must be taken into account in the preparation of local plans and is a material consideration in planning decisions.

At the time of the Level 1 SFRA, the latest version of the NPPF was the December 2023 update. The NPPF has since been updated in December 2024. Overall, the changes in relation to flood risk (Paragraphs 170 to 182) are considered to be relatively minor and strengthen ambiguity within the previous framework rather than materially changing anything and therefore no changes to the Level 1 SFRA are considered necessary.

The following points summarise the changes in the December 2024 NPPF:

- **Paragraph 173**: A new paragraph has been added with the purpose of specifying that the sequential test should apply to individual applications as well as plans. This was already included within the PPG (2022) and as such has been included in the NPPF for completeness.
- **Paragraph 174 (previously Paragraph 168)**: Reference to the sequential approach ('the sequential approach should be used in areas known to be at risk now or in the future from any form of flooding') has been deleted from this paragraph.
- **Paragraph 175**: A new paragraph has been added which brings across changes which were made in the EA standing advice in August. This addition clarifies under what circumstances the sequential test would not need to be applied; where a site-specific FRA demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).

- **Paragraph 176**: This paragraph is largely the same as paragraph 174 in the previous version of the NPPF, but it has been moved further up the document to a more appropriate location.
- **Paragraph 177 (previously Paragraph 169)**: The start of this paragraph has been updated to include 'Having applied the sequential test' – providing more clarification that the sequential test needs to be applied before the exception test.
- **Paragraph 182 (previously Paragraph 175)**: The reference to 'Major developments' has been removed, thus applying the need for SuDS to all development. A statement on proportionality has also been included in place of 'unless there is clear evidence that this would be inappropriate'. Greater emphasis has also been placed on the multifunctional benefits.

3 Information used in the Level 2 SFRA

This section outlines the datasets used in assessing the Local Plan proposed development sites in the Level 2 SFRA.

3.1 Historic flooding

The EA's Historic Flood Map and Recorded Flood Outlines datasets have been used to understand whether historic flooding has been recorded at the sites. No other historic flooding records were available for this assessment. None of the sites assessed within the detailed site assessments in Appendix B are located within the EA's Historic Flood Map or Recorded Flood Outlines extent.

It is important to note that the absence of historic flood records does not mean that an area has never flooded, only that records are not held. For previously undeveloped sites, it is likely that historic flooding incidents may have gone unreported due to a lack of site use or interest. In addition, it is also possible that flooding mechanisms have changed since the date of a recorded flooding incident, making it more or less likely for flooding to occur on site.

3.2 Fluvial flooding

As part of the Level 1 SFRA, existing fluvial hydraulic modelling was incorporated into the SFRA. At the time of writing this was considered more up to date than the EA Flood Map for Planning (FMfP); however, over time the online FMfP (service.gov.uk) is likely to be updated with new hydraulic modelling more often than the SFRA, and therefore should be checked before any future assessments are undertaken.

In places where no detailed modelling is available, Flood Zones are derived from the FMfP. This is the 'best available data' at the time this SFRA was prepared, although may not provide a comprehensive understanding of flood risk. It is important to note that the FMfP does not identify the functional floodplain (Flood Zone 3b) which would normally comprise land having a 3.3% Annual Exceedance Probability (AEP) or greater annual probability of flooding. The SFRA uses the best available information to identify the functional floodplain. In locations where there is no detailed modelling available, as part of the Level 1 SFRA, a precautionary approach was adopted by considering the maximum extent of Flood Zone 3a as an 'indicative' functional floodplain. In these locations, detailed modelling will be required within a site-specific FRA to identify the extent of the functional floodplain to inform development at certain locations, where appropriate.

Of the nine detailed site assessments in Appendix B, four of the sites are shown to be at fluvial flood risk (CH13, TC40, AB2, and Site 11).

The current FMfP will be superseded by the National Flood Risk Assessment 2 (NaFRA2) evidence assessment which is currently being undertaken by the EA. This is due to be

published on the 25 March 2025. Users should check the EA's online mapping to ensure they are using the latest available data to assess flood risk at a site.

Further details on the Flood Zones and hydraulic models used can be found within the Level 1 SFRA.

3.3 Flood defences

For sites where existing flood defences provide a reduction in the flood risk to the site, it is important to understand the standard of protection these structures and measures provide. It is also necessary to understand how this level of protection changes over time, considering the implications of climate change.

If flood defences are required to protect a development site, evidence will be required to show that the new development does not adversely impact and increase flood risk to other areas, for example that there is no net loss in floodplain storage in circumstances where this is a material consideration. It will need to be established that these defences can be appropriately managed and maintained during the lifetime of the development. In some cases, it will be a requirement to demonstrate that there is an appropriate level of commitment to the maintenance of the standard of protection afforded by existing defences, where reliance is placed on the standard they provide.

Current flood defence information has been taken from the EA's Asset Information Management System (AIMS) Spatial Defences dataset. This dataset includes all flood defences currently owned, managed or inspected by the EA and includes information pertaining to their current condition and standard of protection.

None of the sites assessed within the detailed site assessments in Appendix B are shown to be offered protection by formal flood defences.

3.4 Surface water flooding

Mapping of surface water flood risk in the Newcastle-under-Lyme borough has been taken from the EA's Risk of Flooding from Surface Water (RoFSW) mapping. Surface water flood risk is subdivided into the following four categories:

- **High:** An area has a chance of flooding greater than 3.3% AEP (1 in 30) each year.
- **Medium:** An area has a chance of flooding between 1% AEP (1 in 100) and 3.3% AEP (1 in 30) each year.
- **Low:** An area has a chance of flooding between 0.1% AEP (1 in 1,000) and 1% AEP (1 in 100) each year.
- **Very Low:** An area has a chance of flooding of less than 0.1% AEP (1 in 1,000) each year.

The results should be used for high-level assessments. If a particular site is indicated in the EA mapping to be at risk from surface water flooding, a more detailed assessment may be required to understand the flood risk more accurately at a site-specific scale. Such an

assessment should use the RoFSW in partnership with other sources of local flooding information to confirm the presence of a surface water risk at that particular location.

Of the nine detailed site assessments in Appendix B, the highest risk of surface water flooding is shown at sites BL8, AB33, SP22, and BW1.

Detailed modelling using site survey will be necessary where there is a significant risk of surface water flooding. It is the intention that the EA will prepare updated and improved surface water mapping in the course of updating NaFRA2. The initial updated NaFRA2 surface water extents were published during the preparation of this Level 2 SFRA however the full dataset is not yet available at the time of publishing this SFRA. Therefore, the NaFRA2 surface water outputs were not used within this assessment. An addendum will be prepared to accompany this Level 2 SFRA, detailing the new information currently available as part of NaFRA2 and any implications for the findings of the Level 2 SFRA. It is not anticipated that the updated mapping will fundamentally change the locations identified to be at risk from surface water flooding, but the improved analysis techniques will reduce some of the uncertainties associated with the assessment.

3.5 Climate change

Climate change mapping is shown in the Appendix C GeoPDFs for fluvial and surface water flooding using modelled outputs with the latest climate change uplifts where available.

Developers should undertake detailed modelling of climate change allowances as part of a site-specific FRA, following the climate change guidance (gov.uk) set out by the EA.

3.5.1 Impact of climate change on fluvial flood risk

Climate change is expected to increase the peak flows of rivers, meaning that flows which were previously thought to be extreme will now be considered far more possible. Areas benefiting from flood defences will find the standard of protection changes over time with overtopping of defences more likely unless they are upgraded.

Peak river flow climate change allowances developed by the EA are divided into a series of Management Catchments. Newcastle-under-Lyme borough is covered by three Management Catchments, with the relevant allowances for each Management Catchment detailed in Table 3-1, Table 3-2, and Table 3-3.

Table 3-1: Peak river flow allowances for the Weaver Gowy Management Catchment.

Allowance category	Total potential change (%) anticipated for '2020s' (2015 to 2039)	Total potential change (%) anticipated for '2050s' (2040 to 2069)	Total potential change (%) anticipated for '2080s' (2070 to 2125)
Upper end	36	64	106
Higher Central	24	40	67
Central	19	30	52

Table 3-2: Peak river flow allowances for the Trent Valley Staffordshire Management Catchment.

Allowance category	Total potential change (%) anticipated for '2020s' (2015 to 2039)	Total potential change (%) anticipated for '2050s' (2040 to 2069)	Total potential change (%) anticipated for '2080s' (2070 to 2125)
Upper end	30	39	61
Higher Central	19	23	39
Central	15	17	29

Table 3-3: Peak river flow allowances for the Severn Middle Shropshire.

Allowance category	Total potential change (%) anticipated for '2020s' (2015 to 2039)	Total potential change (%) anticipated for '2050s' (2040 to 2069)	Total potential change (%) anticipated for '2080s' (2070 to 2125)
Upper end	30	42	72
Higher Central	20	25	44
Central	15	18	33

For sites along Lyme Brook, the EA's 2015 detailed hydraulic model was used to assess the fluvial risk with climate change. The 3.3%, 1%, and 0.1% AEP events were run for the 2080s Central, Higher Central, and Upper End climate change allowances for the Trent Valley Staffordshire Management Catchment as part of the Level 1 SFRA.

Climate change uplifts were also available for Fowlea Brook; however, none of the sites assessed within this Level 2 SFRA are within close proximity of this watercourse.

Further details of the available model outputs can be found in the Level 1 SFRA.

For all other watercourses, a proxy approach was implemented as follows:

- 3.3% AEP (Flood Zone 3b) plus climate change scenario.
  - The 1% AEP outline was used as an indicative climate change extent. Where not available, the EA's FMfP Flood Zone 3a was used.
- 1% AEP (Flood Zone 3a) plus climate change scenario
  - The 0.1% AEP outline was used as an indicative climate change extent. Where not available, the EA's FMfP Flood Zone 2 was used.
- 0.1% AEP (Flood Zone 2) plus climate change scenario
  - There is currently no available flood extent which could be used as a proxy. It is therefore recommended that developers undertake detailed modelling when carrying out their site assessment as part of the planning application process when preparing FRAs.

3.5.2 Impacts of climate change on surface water flooding

Climate change is predicted to result in wetter winters and increased summer storm intensity in the future. This increased rainfall intensity will affect land and urban drainage systems, resulting in surface water flooding, due to the increased volume of water entering the systems. The potential impacts of surface water plus climate change will likely need to be considered at the site-specific FRA stage.

Peak rainfall climate change allowances developed by the EA are divided into the same Management Catchments as peak river flows and are detailed in Table 3-4, Table 3-5, and Table 3-6.

The following uplifts were applied to the EA RoFSW data as part of the Level 1 SFRA:

- For the Weaver Gowy Management Catchment:
  - 3.3% AEP with +40% uplift
  - 1% AEP with +45% uplift
- For the Trent Valley Staffordshire Management Catchment:
  - 3.3% AEP with +35% uplift
  - 1% AEP with +40% uplift
- For the Severn Middle Shropshire Management Catchment:
  - 3.3% AEP with +40% uplift
  - 1% AEP with +45% uplift

In addition, the 0.1% AEP surface water extent can be used as an indication of the impact of climate change on surface water flood risk from smaller watercourses which are too small to be covered by the EA's Flood Zones.

Table 3-4: Peak rainfall intensity allowances for small and urban catchments for the Weaver Gowy Management Catchment.

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

Table 3-5: Peak rainfall intensity allowances for small and urban catchments for the Trent Valley Staffordshire Management Catchment.

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

Table 3-6: Peak rainfall intensity allowances for small and urban catchments for the Severn Middle Shropshire Management Catchment.

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

3.6 Groundwater flooding

In general, less is known about groundwater flooding than other sources and availability of data is limited. It can last for days, weeks, or even months, and is much harder to predict and issue warnings for. Monitoring does occur in certain areas, for example where there are major aquifers or when mining stops. 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.

Two datasets were used to assess potential areas that are likely to be at higher risk of groundwater flooding:

- The EA's Areas Susceptible to Groundwater Flooding (AStGWF) dataset, showing the degree to which areas are susceptible to groundwater flooding based on geological and hydrogeological conditions. It does not show the likelihood of groundwater flooding occurring, i.e., it is a hazard, not risk, based dataset.
- The JBA Groundwater Emergence map, showing the likelihood of groundwater emergence posing a risk to both surface and subsurface assets, based on predicted groundwater levels during a 1% AEP event. Surface water mapping and topographic data is used to gain an understanding of the overland flow routes which may be impacted by this emergence.

The PPG (2022) states that all sources of flooding should be considered as part of the sequential test, including groundwater emergence risk. However, it should be noted that this data is not directly comparable to other datasets (for example Flood Zones), and therefore cannot categorise an area as high, medium, or low risk on its own. The map should be interpreted as an initial indicative tool to assess groundwater flood risk at preliminary stages of planning/site allocation. Where mapping indicates a risk of groundwater flooding a detailed assessment should be undertaken to confirm the risk to the site as part of any planning application, which may require ground investigations.

The JBA groundwater emergence mapping is categorised into five different classes; a detailed description of the classes is in Table 3-7 below.

Table 3-7: JBA Groundwater Emergence Map category descriptions.

Category	Potential risk
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.
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.
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.
Groundwater levels are at least 5m below the ground surface.	Flooding from groundwater is not likely.
No risk.	This zone is deemed as having a negligible risk from

Category	Potential risk
	groundwater flooding due to the nature of the local geological deposits.

Of the nine detailed site assessments completed, the greatest risk of groundwater emergence is identified at sites TC40 and Site 11 where emergence levels are within 0.025m of the ground surface across the entirety of the sites. There are also considerable areas of BW1 with emergence levels within 0.5m of the ground surface.

3.6.1 Impact of climate change on groundwater flooding

The impact of climate change is more uncertain for groundwater flooding associated with rivers and land catchments and those watercourses where groundwater has a large influence on winter flood flows. Changes in frequency and intensity of groundwater flooding due to climate change would depend on the flooding mechanism and geological characteristics.

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.

3.7 Reservoir flooding

The risk of inundation as a result of a breach or failure of a number of reservoirs within the area has been identified from the EA's Reservoir Flood Extents dataset (gov.uk). Although it is predicted that there is a risk to life if these reservoirs were to fail, the risk of such an event occurring is very low.

This dataset consists of flood extents for two scenarios including 'Wet Day' and 'Dry Day', for all large, raised reservoirs. The 'Dry Day' scenario shows flood extents in the event that reservoirs were to fail and release the water they hold when local rivers are at normal levels. The 'Wet Day' scenario shows flood extents in the event that reservoirs were to fail and release the water they hold when local rivers are in flood.

Flood extents are not included for smaller reservoirs or for reservoirs commissioned after the reservoir modelling programme began in October 2016. Furthermore, only those reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975.

Of the nine detailed site assessments carried out for this Level 2 SFRA, two sites (AB2 and Site 11) were assessed to be at residual risk of flooding from reservoirs included in the EA mapping.

3.8 River networks

Main Rivers are represented by the EA's Statutory Main River layer. Ordinary Watercourses are represented by the OS Watercourse Link dataset. Caution should be taken when using these layers to identify culverted watercourses which may appear as straight lines but, in reality, are not. Developers should check if a Flood Risk Activity Permit (FRAP) or any other permits or permissions will be needed prior to any activities being carried out to any Main Rivers. In Newcastle-under-Lyme borough, this applies to site TC40 which is adjacent to Lyme Brook.

Developers should be aware of the need to identify the route of, and flood risk associated with, culverts. CCTV condition survey will be required to establish the current condition of the culvert and hydraulic assessments will be necessary to establish culvert capacity of both culverts on site and those immediately offsite that could pose a risk to the site. The risk of flooding should be established using site survey, including the residual risk of culvert blockage.

3.9 Sewer flooding

Severn Trent Water and United Utilities are the water companies responsible for the management of the sewerage networks across Newcastle-under-Lyme borough. Most of the area is covered by Severn Trent Water. United Utilities cover parts of the northwest of the Newcastle-under-Lyme borough.

United Utilities provided their historic flood records of external or internal sewer flooding between September 2010 and May 2024, and also provided site-specific comments as part of the NULBC Regulation 19 consultation.

Severn Trent Water provided historical flooding data for reports of external and internal sewer flooding between 1 January 2004 and 19 March 2024, including locations with repeat incidents. Severn Trent Water also provided site-specific comments as part of the preparation of this Level 2 SFRA.

Due to licencing and confidentiality restrictions, sewer data has not been represented on the mapping, but incidents within the same postcode location as a site were referred to within the detailed site assessments. As sewer flood risk data is not publicly available, the SFRA should be considered a tool to identify a need for further detailed assessment at the planning application stage. Where the SFRA indicates a risk of sewer flooding a detailed assessment should be undertaken to confirm the risk to the site as part of any planning application in liaison with the statutory wastewater undertaker.

The site-specific information provided by United Utilities and Severn Trent Water for all sites assessed is captured in Appendix F alongside requirements for sites indicated in the SFRA as being at risk of sewer flood risk.

3.10 Residual risk

The residual flood risk to sites is identified as where potential blockages or overtopping/breach of defences could result in the inundation of a site, with the sudden release of water with little warning.

Several sites assessed within Newcastle-under-Lyme borough are near culverted sections of watercourses which flow beneath roads, railway lines, and footpaths, and present a residual flood risk should they become blocked or collapse. Potential culvert blockages that may affect a site were identified on OS Mapping and the OS Watercourse Link layer to determine where watercourses flow into culverts or through structures (i.e. bridges) in the vicinity of the sites. Any potential locations were flagged in the detailed site assessments.

Sites potentially affected by residual risk of culvert blockages are:

- AB2
- BW1
- CH13
- TB19
- TC40

The potential impacts of residual risk at sites will need to be considered by the developer as part of a site-specific FRA.

3.11 Canal flooding

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:

- 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 and River Trust monitor embankments at the highest risk of failure.

The Canal and River Trust were consulted to identify any instances of breaches and overtopping of each of the canals.

Of the detailed site assessments undertaken as part of this Level 2 SFRA, Site 11 is the only development site assessed which is within close proximity of a canal. The Trent and Mersey Canal runs adjacent to the northern site boundary and the Macclesfield Canal runs adjacent to the southern site boundary, and there is a residual risk of flooding due to breach or overtopping of the canals.

The canals have the potential to interact with other watercourses in the study area. 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 FRA. The Canal and River Trust (canalrivertrust.org.uk) provide guidance on development near canals.

3.12 Depth, velocity, and hazard to people

The Level 2 assessment seeks to map the probable depth and velocity of flooding as well as the hazard to people and use this within the detailed site assessments.

Where detailed model outputs are available which have a 2D element representing the floodplain in detail, the 1% AEP plus climate change depth, velocity and hazard data can used. This is the case for the model used in this SFRA, the EA's 2015 Estry-TuFLOW detailed hydraulic model of Lyme Brook.

In the absence of detailed hydraulic models, fluvial flood depth, velocity, and hazard are not available as part of the FMfP dataset so have not been included as part of this Level 2 SFRA and may need to be considered further during a site-specific FRA.

The depth, hazard, and velocity of the 1% AEP plus upper end climate change surface water flood event, produced by uplifting the EA RoFSW map using the pluvial upper end allowance, has also been mapped and considered in this assessment.

Hazard to people has been calculated using the below formula as suggested in Defra's FD2321/TR2 Flood Risk to People (gov.uk). The different hazard categories are shown in Table 3-8. Developers should also test the impact of climate change depths, velocities, and hazard on the site, as part of the site-specific FRA.

Table 3-8: Defra's FD2320/TR2 'Flood Risks to People' classifications

Description of Flood Hazard Rating	Flood Hazard Rating	Classification Explanation
Very Low Hazard/ Caution	<0.75	'Flood zone with shallow flowing water or deep standing water'
Danger For Some (i.e. children)	0.75 - 1.25	'Danger: flood zone with deep or fast flowing water'
Danger For Most	1.25 - 2.00	'Danger: flood zone with deep fast flowing water'
Danger For All	>2.00	'Extreme danger: flood zone with deep fast flowing water'

As part of a site-specific FRA, developers will need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood depth, velocity and hazard based on the relevant 1% AEP plus climate change event, using the relevant climate change allowance based on the type of development and its associated vulnerability classification. Not all this information is known at the strategic scale and the level of resolution may not be appropriate to enable site scale assessment of proposed development schemes.

3.13 SuDS suitability

The hydraulic and geological characteristics of each site have been assessed to determine the factors that potentially constrain schemes for surface water management. This assessment is designed to inform the early-stage site planning process and is not intended to replace site-specific detailed drainage assessments. A high-level assessment of suitability of SuDS is included in the site assessments in Appendix B.

The assessment is based on catchment characteristics, topography, JBA's Groundwater Emergence mapping, and British Geological Survey (BGS) mapping. The permeability of the underlying soils can determine the infiltration capacity and percolation capacities. As such, a review of the soil characteristics has been undertaken across the borough:

- **Northern region:** Soils are loamy, clayey, and sandy, slowly permeable, and seasonally wet.
- **Eastern region:** Soils are mainly slightly acidic but base-rich loamy and clayey soils, slowly permeable and seasonally wet. There are also smaller areas of loamy and clayey floodplain soils with naturally high groundwater located near Newcastle-under-Lyme.
- **Southeastern region:** Soils are freely draining acidic sandy and loamy soils with smaller areas of fen peat and loamy and sandy soils with naturally high groundwater and peaty surface.
- **Western region:** Soils are mainly freely draining slightly acid loamy soils with small areas of slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.
- **Southern region:** Soils are mainly freely draining slightly acid loamy, sandy, and clayey soils with a small area of loamy and clayey floodplain soils with naturally high groundwater located south of Hales.

In general, the soils across the borough are seasonally wet and slowly draining, with high groundwater levels and reduced permeability. This may impact infiltration and would need to be considered within any SuDS design (see Section 9 of the Level 1 SFRA for further information on SuDS).

The British Geological Survey website (bgs.ac.uk) provides data on soils across Newcastle-under-Lyme borough; however, specific site investigations should be undertaken to determine soil types across the study area.

Other datasets used to determine factors such as potential water quality and flood constraints include:

- Historic landfill sites
- Groundwater Source Protection Zones
- Nitrate Vulnerable Zones
- Detailed River Network
- RoFSW mapping
- Flood Zones derived as part of this Level 2 SFRA.

This data was then collated to provide an indication of particular groups of SuDS systems which might be suitable at a site. SuDS techniques were categorised into five main groups, as shown in Table 3-9. This assessment should not be used as a definitive guide as to which SuDS would be suitable but used as an indicative guide of general suitability. Further site-specific investigation should be conducted to determine what SuDS techniques could be used on a particular development, informed by detailed ground investigations.

Table 3-9: Summary of SuDS categories

SuDS Type	Technique
Source Controls	Green Roof, Rainwater Harvesting, Pervious Pavements, Rain Gardens
Infiltration	Infiltration Trench, Infiltration Basin, Soakaway
Detention	Pond, Wetland, Subsurface Storage, Shallow Wetland, Extended Detention Wetland, Pocket Wetland, Submerged Gravel Wetland, Wetland Channel, Detention Basin
Filtration	Surface Sand Filter, Sub-Surface Sand Filter, Perimeter Sand Filter, Bioretention, Filter Strip, Filter Trench
Conveyance	Dry Swale, Under-drained Swale, Wet Swale

The suitability of each SuDS type for the development sites has been described in the detailed site assessments, where applicable. The assessment of suitability is broadscale and indicative only; more detailed assessments should be carried out during the site planning stage to confirm the feasibility of different types of SuDS.

Further site-specific investigation should be conducted to determine what SuDS techniques could be utilised at a particular development. The result of this assessment does not remove the requirements for geotechnical investigation or detailed infiltration testing.

SuDS in Newcastle-under-Lyme borough should be designed in accordance with Staffordshire County Council's SuDS guidance. SCC have a SuDS Handbook (2017) (staffordshire.gov.uk) produced for use by anyone undertaking, or granting, and reviewing permissions for construction work which has surface water drainage implications. The Surface Water Management roles and responsibilities for different organisations and relevant legislation, policy and strategy are detailed within Section 9 of the Level 1 SFRA.

This contains detail on:

- Role of the LLFA and LPA in surface water management.
- Sources of SuDS guidance.
- Other surface water considerations including Groundwater Vulnerability Zones, Groundwater Source Protection Zones, and Nitrate Vulnerable Zones.

3.14 Emergency Planning

Flood Warning Areas (FWAs) and Flood Alert Areas (FAAs) are detailed in the EA's GIS datasets and can be used to inform emergency planning. FAAs inform the EA when there is flooding first in the catchment, irrespective of properties, hence this coverage tends to apply to whole watercourses or stretch of coastline. FWAs are derived from the extreme flood outline (0.1% AEP event), focussed on communities, properties, and/or infrastructure. Modelled depth, velocity and hazard data can be used to understand safe access and escape routes for each site.

4 Level 2 Assessment Methodology

This section outlines how sites were screened against flood risk datasets to determine which sites required a Level 2 detailed site assessment. It also identifies other sites, referred to in this SFRA as 'amber sites', at lower risk with general recommendations for developers.

4.1 Site screening

NULBC provided 55 sites for assessment. These sites were screened using an 'overlap analysis' tool in GIS. This analysed various flood risk datasets against the site allocations layer and calculated the percentage cover for each flood risk dataset against each site. This was used to provide a summary of risk to each site, including:

- the proportion of the site in each Flood Zone derived from detailed hydraulic model outputs where available, and where detailed modelling was unavailable the information is taken from the EA's FMfP (see Section 3.2 for a summary of how the Flood Zones were derived for this SFRA).
- the proportion of the site affected by climate change within the central, higher central, and upper end allowances for the 1% AEP fluvial event where available.
- whether the site is shown to be at risk from surface water flooding in the RoFSW mapping for the 3.3%, 1%, and 0.1% AEP events, and the 1% AEP event plus 2070s Upper End climate change allowance.
- whether the site is within, or partially within, the reservoir 'Dry Day' or 'Wet Day' flood extents.
- whether the site is within, or partially within, the EA Historic Flood Map dataset.
- whether the site is within 100m of watercourses shown within the OS Open Watercourse Link dataset.
- whether the site is at risk from groundwater emergence using the JBA Groundwater Emergence Map.

A R-A-G (Red-Amber-Green) system was applied to the sites on the basis that:

- 'red' sites have significant obstacles or challenges for development which would need consideration if taken forward. These sites may need the exception test to show that the site can be developed safely, from a flood risk perspective.
- 'amber' sites are flagged for developer considerations, but these are likely to be able to be addressed at the planning application stage. These sites are flagged as they may have some surface water issues related to access and escape routes for the site.
- 'green' sites that have no significant obstacles for development. However, it is noted sites may need an FRA and drainage strategy depending on the location of the site.

The results of the screening provide a quick and efficient way of identifying sites that are likely to require a Level 2 assessment, assisting NULBC with sequential test decision-making so that flood risk is taken into account when considering allocation options.

The screening also provides an opportunity to identify sites which may show to be 100% in Flood Zone 1, but upon visual inspection in GIS, have an ordinary watercourse flowing through or adjacent to them. Although there are no Flood Zone maps available for these watercourses, it does not mean the watercourse does not pose a risk, it just means no modelling has yet been undertaken to identify the risk. Of the nine sites requiring further assessment, the sites which have an unnamed ordinary watercourse that is not represented within the Flood Zones are as follows:

- AB2
- BW1
- TB19

Flood Zones are not provided for specific sites or land where the catchment of the watercourse falls below 3km². For this reason, the Flood Zones are not of a resolution to be used as application evidence to provide the details of possible flooding for individual properties or sites and for any sites with watercourses on, or adjacent to the site. The RoFSW has been used to assess flood risk in these cases because it is comparable to fluvial flooding from smaller watercourses and is therefore a reasonable representation of the floodplain of such watercourses to use for a strategic assessment.

The results of the site screening are shown in Appendix A.

4.2 Sites taken forward to a Level 2 assessment

Of the 55 sites considered within the site screening process, 12 were identified as 'red sites', i.e. having a significant flood risk, and a further 19 were identified as 'amber sites' based on minor surface water flooding within the site and/or access and escape route problems, and/or having a high risk of groundwater emergence within the site based on the JBA Groundwater Emergence Map.

NULBC confirmed removal of six of these sites, as five had progressed to commitments (RC8, CH3, LW74, LW87, and MD29) and one site was removed due to other criteria prior to the final Local Plan site selection (HD10).

This Level 2 SFRA therefore provides detailed site assessments of nine sites identified as having significant flood risk:

- Site BL8: Land adjacent to roundabout at West Avenue, Kidsgrove.
- Site TB19: Land south of Newcastle Golf Club, Whitmore Road.
- Site AB33: Land off Nantwich Road/Park Lane (1) Audley.
- Site SP22: Former playground off Ash Grove, Silverdale.
- Site CH13: Castletown Grange, Douglas Road, Cross Heath.
- Site TC40: Blackfriars Road Car Park.
- Site BW1: Chatterley Valley, Lowlands Road, Bradwell.

- Site AB2: Land adjoining corner of A500 and M6 southbound.
- Site 11: Hardingswood Road, Kidsgrove.

Appendix B provides the detailed site assessments, with the accompanying GeoPDF mapping in Appendix C.

17 'amber sites' identified with minor flooding within the site and/or access and escape route problems are assessed in Section 5 with general recommendations.

Sewer flood risk data is not publicly available so United Utilities and Severn Trent Water were consulted as part of the preparation of this SFRA and site-specific comments on sewer flood risk are detailed in Appendix F.

4.3 Detailed site assessments

As part of the Level 2 SFRA, detailed site assessments have been produced for the nine sites. The site assessment can be found in Appendix B. Each site assessment sets out the following information:

- Basic site information.
- Location of the site in the catchment.
- Area, current land use (greenfield/brownfield), proposed site use.
- Sources of flood risk.
- Existing drainage features.
- Fluvial – proportion of site at risk including description from mapping/modelling, utilising depth, hazard, and velocity information from detailed hydraulic models where available.
- Surface Water – proportion of site at risk including description from RoFSW mapping using available depth, hazard, and velocity information.
- Reservoir flood risk in both the 'Dry Day' and 'Wet Day' scenarios.
- Flood history - historic incidents on or surrounding the site from the EA Recorded Flood Outline and Historic Flood Map datasets.
- Flood risk management infrastructure.
- Description of residual risk.
- Emergency planning.
- FWAs and FAAs.
- Access and escape routes.
- Fluvial climate change - summary of available climate change allowances and increase in flood extent compared to the 1% AEP event (Flood Zone 3a).
- Surface water climate change - summary of available climate change allowances and increase in flood extent compared to the 1% AEP event.
- Requirements for drainage control and impact mitigation.
- Broadscale assessment of possible SuDS to provide indicative surface water drainage advice for each site assessed for the Level 2 SFRA.
- Groundwater Source Protection Zones.
- Nitrate Vulnerable Zones

- Historic landfill sites.
- NPPF (December 2024) Planning implications.
- Exception test requirements.
- Requirements and guidance for site-specific FRA (including consideration of opportunities for strategic flood risk solutions to reduce flood risk).
- Key messages – summarising considerations if development proceeds.

5 'Amber sites' assessment

5.1 Overview

As set out in Section 4.2, 17 sites that are being taken forward by NULBC were identified as 'amber sites' based on the surface water risk on or surrounding the site and/or groundwater emergence potential at the site. This section provides a more detailed overview of the flood risk at the identified 'amber sites' and general recommendations that should be applied to any future development at these sites.

5.2 'Amber sites' assessment - surface water

5.2.1 Sites overview

Table 5-1 provides an overview of the risk to each of the 'amber sites' identified based on surface water risk. The surface water risk to the 'amber sites' was not deemed significant enough to require a full site assessment; however, a minor risk to the site and/or potential impacts on access and escape routes has been identified and should be considered further within a site-specific FRA.

Appendix D provides figures showing the surface water risk to each site.

Table 5-1: Description of the surface water risk at the 'amber sites'.

Site code	Location	Description of surface water risk
KS3	Land at Blackbank Road, Knutton (adjacent Knutton Children's Centre)	In the 3.3% AEP event, there is an area of isolated surface water ponding in the southwest of the site. This ponding extends to cover a slightly greater area in the 1% AEP event. In the 0.1% AEP event, there is a flow path that develops across the west of the site, which flows northwards from High Street towards Lyme Brook.
KL13	Keele Science Park Phase 3, University of Keele	In the 3.3% and 1% AEP events, there are a number of small areas of isolated surface water ponding in the northern portion of the site, as well as a larger area of ponding near the northern border close to Keele Road (A525). There is also a flow path moving southeast from the carpark north of Caudwell Children. In the 0.1% AEP event, additional areas of isolated surface water ponding emerge across the northern part of the site. The flow path also extends further across the eastern boundary of the carpark and continuing approximately 60m beyond.
TB23	Land West of Galingale View, Thistleberry	There are two unnamed watercourses that bisect the site. One flows from the northwest and the other from the southwest, converging just after crossing

Site code	Location	Description of surface water risk
		the eastern border and flowing northeast before joining the Lyme Brook. In the 3.3% AEP event, there are a number of isolated areas of surface water ponding along these watercourses and on the western border, as well as a flow path forming by the eastern boundary. In the 1% and 0.1% AEP events, flow paths emerge along both watercourses, as well as a path flowing north along the western border, connecting the two tributaries.
AB12	Land East of Diglake Street, Bignall End	There is minimal surface water flood risk in the 3.3% AEP event, with only a small area of ponding from Ravens Lane (B5500) by the southern boundary, however, this may impede access and escape from the site. In the 1% AEP event, there are two areas of isolated ponding in the west of the site, as well as a flow path that crosses the northwestern boundary and merges with a larger flow path extending horizontally to the west. In the 0.1% AEP event, this develops into a large flow path that crosses the western part of the site, flowing northwest.
NC13	Land West of Bullockhouse Road, Harriseahead	In the 3.3% and 1% AEP events, there is a large area of surface water ponding in the west and central part of the site. There are also areas of ponding by the boundaries in the northeast, east, and south. In the 0.1% AEP event, the large area of ponding develops into a flow path that bisects the site, connecting to the areas of ponding in the northeast. The topography of the site shows that the water flows southwest, towards Merlin Way.
CH14	Maryhill Day Centre, Wilmott Drive, Cross Heath	There is minimal risk of surface water flooding within the site in the 3.3%, 1% or 0.1% AEP events, only along the northeastern boundary. However, there are potential issues with access and escape. In the 0.1% AEP event there is a flow path along all sides of the site, except for the western border on Wilmot Drive. Parts of Lower Milehouse Lane (B5368), Rise Road, and the entirety of Wilmot Close are at risk from surface water flooding in the 0.1% AEP event.
TC7	Land bound by Ryecroft, Ryebank, Merrial Street, Corporation Street and Liverpool Road, Newcastle	In the 3.3% AEP event, there is minimal surface water flood risk to the site, aside from an area of ponding by the northwest boundary. In the 1% AEP event, there are two new areas of isolated ponding in the central western portion of the site. In the 0.1% AEP event, there is a flow path which covers a larger area in the northwest of the site, potentially impeding access from Liverpool Road. There are

Site code	Location	Description of surface water risk
		also additional areas of surface water flood risk, including along the west of the car park and an area of ponding on the eastern boundary.
TC52	Goose Street Car Park	There is no surface water flood risk to the site in the 3.3% and 1% AEP events. In the 0.1% AEP event, a flow path begins to develop that bisects the site and flows from the northeast to the southwest.
SP11 (1)	Former Keele Municipal Golf Course, Plot 1	There is no surface water flood risk to the site in the 3.3% AEP event. In the 1% and 0.1% AEP events, a flow path develops along an unnamed watercourse that flows northwest from the centre of the site. The flow path intersecting the boundary in the northwest, before flowing through Keele Golf Course and towards the residential area around Daleview Drive, within 350m of the site.
Site 8	Land west of Silverdale Business Park, Silverdale	There is no surface water flood risk to the site in the 3.3% and 1% AEP events. In the 0.1% AEP event, there are a few areas of ponding, in the centre of the site and by the northern and southern boundaries.
TK17	Land off St Martins Road, Talke	There is no surface water flood risk to the site in the 3.3% AEP event. However, in the 1% and 0.1% AEP events, a flow path develops which crosses into the west of the site. Access and escape routes are potentially impeded during the 1% and 0.1% AEP events, as there is surface water flood risk across High Street in the west, along Saint Martin's Road in the north, and on Newcastle Road (A34) by the eastern boundary of the site.
TK27	Land off Coppice Road, Talke (2)	In the 3.3% and 1% AEP events, there is a flow path forming by the northwest boundary, that also flows northwest. There are two areas of ponding on Merelake Road by the southwest and southeast boundaries. In the 0.1% AEP event, the flow path covers a greater area and bisects the site, from the northwest to the southeast. There is no risk shown to Coppice Road to the north of the site, however access and escape routes could be impeded via Merelake Road to the south of the site where a flow path develops from the 3.3% AEP event.

5.2.2 Planning implications

The developer should undertake a site-specific FRA at the planning stage and take particular consideration of the surface water flow routes/areas at risk and how these will impact the site itself as well as access and escape routes.

The following considerations should be made for development in areas with a risk from surface water flooding:

- Development should be steered away from existing flow paths and the areas of surface water risk on the site.
- Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.
- The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.
- Arrangements for safe access and escape routes will need to be provided for the 1% AEP surface event with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.
    - For any sites bisected by surface water flow paths, access and escape arrangements should be considered for each area of the site, should access between areas of the site not be possible.
- Provisions for safe access and escape routes should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

5.3 'Amber sites' assessment - groundwater emergence

5.3.1 Sites overview

The JBA Groundwater Emergence Map was used to locate areas where groundwater is most likely to emerge. Sites with considerable areas where groundwater levels are predicted to be within 0.5m of the surface level were identified. The RoFSW mapping and LiDAR data were then used to identify where any groundwater emerging in these locations is most likely to flow.
Table 5-2 provides an overview of the groundwater emergence risk at each of the identified 'amber sites'.

Appendix E provides figures showing the groundwater emergence risk to each site.

Table 5-2: Description of the groundwater emergence risk at the 'amber sites'.

Site code	Location	Description of groundwater emergence risk
LW53	Land corner of Mucklstone Wood Lane & Rock Lane, Loggerheads	The EA's AStGWF dataset does not indicate that the site is susceptible to groundwater flooding. However, the JBA groundwater emergence map shows that groundwater levels are between 0.025m and 0.5m below the ground surface across most of the north of the site with a small band of groundwater levels within 0.025m of the ground surface. Based on the underlying topography, any groundwater emerging is likely to flow away from the site in a north-westerly direction.
TK17	Land off St Martins Road, Talke	The EA's AStGWF dataset shows a groundwater flood susceptibility of less than 25% across more than half of the site, including the entire eastern and central portions. The remainder of the site in the west has a susceptibility between 25% and 50%. The JBA groundwater emergence map shows that groundwater levels are between 0.025m and 0.5m below the ground surface in the central areas of the site. The east of the site has groundwater levels between 0.5m and 5m. From assessing the 0.1% AEP surface water flooding outputs, any groundwater emerging may pool in the west of the site and flow north onto Saint Martin's Road.
TK27	Land off Coppice Road, Talke (2)	The EA's AStGWF dataset indicates groundwater flood susceptibility of less than 25% across the entire site. The JBA groundwater emergence map shows that over half of the site in the west has groundwater levels between 0.025m and 0.5m below the ground surface. The remaining eastern area has groundwater levels between 0.5m and 5m below the ground surface. The 0.1% AEP surface water flood extents show a flow path across the centre of the site flowing northwest. Any groundwater emerging on the site is likely to follow this flow path through the site.
TC20	King Street Car Park	The EA's AStGWF dataset indicated groundwater flood susceptibility of less than 25% across the entire site. The JBA groundwater emergence map shows that groundwater levels are between 0.025m and 0.5m below the ground surface in the northwest and in most of the eastern half of the site. Topography suggests that any groundwater emerging at the site is likely to flow west towards Water Street.
TC71	Midway Car Park	The EA's AStGWF dataset indicated a groundwater flood susceptibility ranging from 25% to 50% across the entire site. The JBA groundwater emergence map shows that

Site code	Location	Description of groundwater emergence risk
		groundwater levels are within 0.025m of the ground surface along the whole southwestern border, which is parallel to Lower Street (A34). Over half of the site in the west has groundwater levels that are between 0.025m and 0.5m below the ground surface. The 0.1% AEP surface water flood extents suggest that any groundwater that emerges is likely to flow south to Lower Street (A34).
Madeley High School Extension	Land to the rear of Madeley High School, Newcastle Road	The EA's AStGWF dataset indicates a groundwater flood susceptibility of 75% or greater across the entire site. The JBA groundwater emergence map shows that the whole site has groundwater levels that are within 0.025m of the ground surface. There are three areas of isolated ponding according to the 0.1% AEP surface water flooding outputs, located by the borders in the southwest, northeast, and in the north. Any emerging groundwater could pond in these areas. Topography suggests any emerging groundwater may also flow west towards the River Lea.

5.3.2 Planning implications

As the sites within this document have been identified as susceptible to groundwater flooding, additional investigation work may be required to support the detailed design of the site and drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level.

The following considerations should be made for development in areas with a higher risk from groundwater flooding:

- A sequential approach should be adopted to the site layout, steering more vulnerable development to the lowest areas of flood risk.
- High groundwater levels could be a potential constraint in the design of the surface water drainage system and this should be consulted with SCC as LLFA.
- Attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity.
- Below ground development such as basements are not appropriate in areas of higher groundwater flood risk.
- Infiltration testing may be required in accordance with BRE365 at the locations of and depths commensurate with proposed infiltration features. This is particularly important in areas where the underlying geology means that the site is more impermeable.

6 Flood risk management requirements for developers

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

6.1 Early consultation with statutory and non-statutory consultees

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

6.2 Site-specific FRAs

6.2.1 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. It is recommended that the assessment is undertaken by a suitably qualified person. 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 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, for the LPA to apply the sequential test.
- The evidence, if applicable, to show whether the development will be safe and pass the exception test.

6.2.2 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 are of 1 hectare or more.
- In areas with critical drainage problems.
- Within Flood Zone 1 where the LPA's SFRA shows it will be at increased risk of flooding during its lifetime.
- That increases the vulnerability classification and may be subject to sources of flooding other than rivers or sea.

It is recommended that site-specific FRAs are also undertaken for proposals with a site area of less than 1 hectare in Flood Zone 1 where they could be affected by sources of flooding other than rivers or sea (e.g. surface water) regardless of the vulnerability classification of the development.

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

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

6.2.4 Guidance for FRAs

FRAs should follow the approach recommended by the NPPF (December 2024) and associated guidance as well as 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:

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

Guidance should be sought from the EA and the Council at the earliest possible stage, and opportunities should be taken to incorporate environmental enhancements and reduce flooding from all sources both to and from the site through development proposals. Developers should seek to go beyond managing the flood risk and support opportunities to reduce the causes and impacts of flooding, whilst enhancing and conserving the natural environment. PPG (2022): Flood risk and coastal change (gov.uk) Paragraphs 062 - 067 provide further information.

6.3 Emergency planning

Safe access and escape routes from the site should be provided. The developer should seek to incorporate an emergency plan and a safe refuge point if the development site has been identified to be at risk of flooding. The local authority and Emergency Services should be consulted when designing an emergency plan.

Appendix D of the Level 1 SFRA details the EA FWAs and FAAs available within Newcastle-under-Lyme borough at the time of publication. This Level 2 assessment has identified four proposed sites (AB2, CH13, Site 11, and TC40) located within existing EA FWAs and/or FAAs. For proposed development within existing EA FWAs, developers should consult the EA to ensure that adequate flood warning procedures and evacuation processes are in place and that Risk Management Authorities (RMAs) are not put under any additional burden.

Section 8.5 of the Level 1 SFRA report discusses NPPF requirements and what an emergency plan will need to consider and other relevant information on emergency planning. Further information is provided on the SCC's Preparing For Emergencies webpage (staffordshire.gov.uk).

6.4 Duration and onset of flooding

The duration and onset of flooding affecting a site depends on several factors:

- The position of the site within a river catchment, with those at the top of a catchment likely to flood sooner than those lower down. The duration of flooding tends to be longer for areas lower in river catchments.
- Upstream storage: upstream reservoirs within a catchment may provide some online flood storage that reduces the flood risk downstream and delays the onset of flooding.
- Timing of peak flow: at the confluence of the larger watercourses and smaller tributaries, there may be different timings of peak flows, for example smaller tributaries would peak much earlier than the larger catchments.
- The principal source of flooding: where this is surface water, depending on the intensity and location of the rainfall, flooding could be experienced within 30 minutes of the heavy rainfall event e.g., a thunderstorm. Typically, the duration of flooding for areas at risk of surface water flooding, or from flash flooding from small watercourses, is short (hours rather than days).
- The preceding weather conditions prior to the flooding: wet weather lasting several weeks will lead to saturated ground. Rivers respond much quicker to rainfall in these conditions.
- Whether a site is defended, noting that if the defences were to fail, a site could be affected by very fast flowing and hazardous water within 15 minutes of a breach developing (depending on the size of the breach and the location of the site in relation to the breach), causing danger to life.
- Catchment geology: the permeability of a catchment affects its response time, for example chalk catchments take longer to respond than clay catchments.

Table 6-1 provides guidelines on the typical response time that may be expected for fluvial and surface water flooding. However, these are only broad guidelines, and it is recommended that a site-specific FRA refines this information based on more detailed modelling work where necessary, and assessment within an emergency response plan.

Table 6-1: Guidelines on the duration and onset of flooding

Principal source of flooding	Duration	Onset
Surface water	Up to 4 hours	Within 30 minutes
Fluvial	Between 4 and 24* hours	Within 2 to 8 hours

*Depending on where in the catchment a site is located, flooding could be rapid and flashy in the upper catchment (e.g. small tributaries) and slower responding and longer in duration in the lower catchment.

7 Summary of Level 2 assessment

7.1 Overview

This Level 2 SFRA delivers site-specific guidance and recommendations for sites in the NULBC study area. As part of the Level 2 SFRA, nine detailed site assessments have been produced and can be found in Appendix B. Flood risk mapping at these sites can be viewed through NULBC's GeoPDF Mapping. The Level 2 SFRA should be read in conjunction with the Level 1 SFRA which delivers a strategic assessment of all sources of flooding across the authority area.

7.2 Recommendations

7.2.1 Level 1 SFRA

Recommendations from this report should be considered in addition to recommendations from the Level 1 SFRA, which still stands for the site allocations and any windfall development that comes forward. The recommendations for the Level 1 SFRA are set out in Section 10 of the Main Report.

7.2.2 Level 2 SFRA

When required, to pass the exception test it must be shown that the development will provide wider sustainability benefits that outweigh the risk, and that the development will be safe throughout its lifetime without increasing risk elsewhere. The former is a planning-related consideration and the Level 2 SFRA helps to answer the latter part of the test.

Some of the sites assessed in this Level 2 SFRA are at greater risk and will require careful consideration and significant mitigation to pass the flood risk element of the exception test, while other sites are likely to pass the flood risk element of the exception test by:

- Undertaking a sequential approach to site planning so development is steered away from areas within the site at the highest risk.
- Considering safe access/escape routes in the event of a flood (from all parts of the site, if say the site is severed by a flood flow path). If access and escape routes are affected, a Flood Response Plan may be required.
- Finished floor levels should be above the estimated flood level (Fluvial 1% AEP event with an allowance for climate change), including an allowance for freeboard.
- Using areas in Flood Zone 2 for the least vulnerable parts of the development in accordance with Table 2 in the PPG (2022). No development should be permitted in Flood Zone 3b (aside from Essential Infrastructure).
- Considering space for green infrastructure in the areas of highest flood risk.

Although not explicitly required within the PPG (2022), consideration should be given to the surface water risk where this is high, with regards to the exception test. For example, site

SP22 is not at fluvial risk but is at significant surface water risk. For sites AB2, BW1, and TB19 the fluvial flood extents do not affect the site in the present day or future scenarios, however there is risk from ordinary watercourses which is demonstrated in the surface water modelling.

If a site is split in future into smaller land parcels for development, and some of those parcels are in areas of flood risk, the exception test may need to be re-applied by the developer at the planning application stage.

In some cases, and following the application of the sequential test, it may be appropriate for the developer to contribute to the improvement of maintenance and provision of flood risk management assets, flood warning and the reduction of surface water flooding (i.e. SuDS).

Developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourses, including latest climate change allowances, to verify flood extent in order to inform the sequential approach within the site and demonstrate, as required, that the exception test is satisfied.

7.3 Guidance for windfall sites and sites not assessed in the Level 2 SFRA

The following points should be considered when developing windfall sites, or sites not assessed within this Level 2 SFRA:

- Where no recent detailed hydraulic modelling is present, it is recommended that developers construct new, or update existing, detailed hydraulic models at these sites as part of a site-specific FRA using channel, structure, and topographic survey to confirm flood risk during the 1% AEP plus climate change 'design event'. Site-specific flood modelling will likely need to be developed in locations where it is necessary to understand the effects of proposed development schemes on the existing flood flow paths and flood volume storage, in the present day and in the future.
- If a site's boundary includes or borders an EA Main River (including a culverted reach of a Main River), an easement of 8m is required from both banks for access and maintenance. Any future development will require a flood risk permit for any activity within 8m of a Main River. Further information relating to this can be viewed on the government website Flood risk activities: environmental permits (gov.uk).
- If an ordinary watercourse is within or immediately adjacent to the site area, consultation with the SCC as the LLFA should be undertaken. If alterations or discharges are proposed to the watercourse, a land drainage consent will be required.
- Where necessary, blockages of nearby culverts may need to be simulated in a hydraulic model to confirm residual risk to the site.
- Surface water risk should be considered in terms of the proportion of the site at risk in the 3.3%, 1% and 0.1% AEP events (with an appropriate allowance for

climate change), whether the risk is due to isolated minor ponding or deeper pooling of water, or whether the risk is due to a wider overland flow route.

- Surface water risk and mitigation should be considered as part of a detailed site-specific FRA and surface water drainage strategy.
- Access and escape routes should be considered at the site, but also in the vicinity of the site, for example, a site may have low surface water risk, but in the immediate locality, access/escape routes to and from the site could be restricted for vehicles and/or people.
- For any sites shown to be at risk of reservoir flooding the residual risk will need to be considered further as part of a site-specific FRA. An emergency plan may be required, demonstrating that the residual risks to the site can be safely managed and that appropriate evacuation plans are in place.
- Early consultation should be undertaken with the relevant wastewater undertaker to confirm whether there are historic or modelled sewer flooding records at the site and requirements for the site layout and design and any mitigation measures required.

7.4 Use of SFRA data and future updates

It is important to recognise that the SFRA has been developed using the best available information at the time of preparation. This relates both to the current risk of flooding from all sources and the potential impacts of future climate change.

The SFRA should be a 'living document', and as a result should be updated when new information on flood risk, flood warning or new planning guidance or legislation becomes available. Additional guidance should be sought from NULBC, SCC as LLFA, the EA, Severn Trent Water, and United Utilities where relevant to ensure the most up to date information is considered within any new assessments. Such information may be in the form of:

- Policy/legislation updates (provided by the Government, NULBC, or SCC as LLFA).
- Flood event information following a flood event (provided by NULBC,SCC as LLFA Severn Trent Water, or United Utilities).
- New hydraulic modelling results (provided by the EA).
- EA flood map updates (provided by the EA).
- New flood defence or alleviation schemes (provided by NULBC, SCC as LLFA, or the EA).

The EA regularly reviews their flood risk mapping, and it is important that they are approached to determine whether updated information is available prior to commencing a detailed FRA. The EA are currently undertaking new nationalised modelling (NaFRA2) which is due to go live in Spring 2025.

It is recommended that the SFRA is reviewed in line with the EA's Flood Zone map updates to ensure latest data is still represented in the SFRA, allowing a cycle of review and a review of any updated data by checking with the above bodies for any new information.

7.5 Neighbourhood plans

Flood risk should be fully addressed in development plan preparation and in bringing forward policies for the allocation of land. Therefore, SFRA findings should be used in the production of neighbourhood plans.

Neighbourhood planners can use the information in the Level 1 and Level 2 SFRAs on the sources of flood risk across Newcastle-under-Lyme borough and the flood risk mapping, to assess the risk of flooding to sites within their community. The SFRA will also be helpful for developing community level flood risk policies in high flood risk areas.

Appendices

A Site screening summary for Level 2 sites

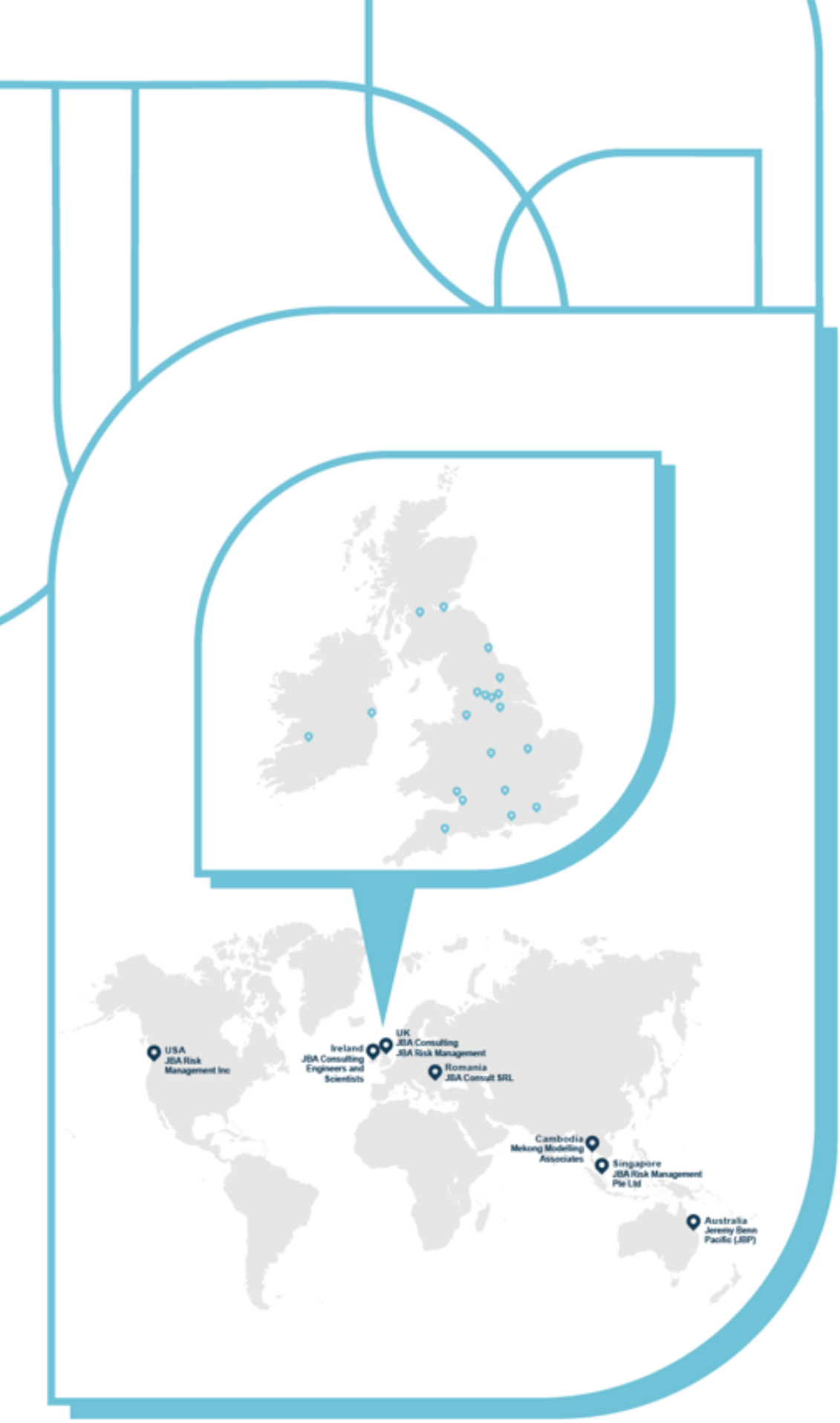
B Detailed site assessments

C GeoPDF mapping

D 'Amber sites' surface water mapping

E 'Amber sites' groundwater emergence mapping

F Sewer flood risk assessment



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United Kingdom

+44(0)1756 799919
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