Yorkshire Dales National Park Level 1 Strategic Flood Risk Assessment

Final Report

June 2022

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Revision history

Revision Ref / Date	Amendments	Issued to
S3-P01 – Draft report / May 2022		Thomas Harland, Yorkshire Dales National Park Authority
A1-C01 – Final Report / June 2022	Addressed stakeholder comments	Thomas Harland, Yorkshire Dales National Park Authority

Contract

This report describes work commissioned by Thomas Harland, on behalf of the Yorkshire Dales National Park Authority, by an email dated 10 February 2022. Helen Dawson, Sarah Hambling and Alex Clark of JBA Consulting carried out this work.

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Purpose

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Acknowledgements

We would like to acknowledge the assistance of

- Yorkshire Dales National Park Authority
- Environment Agency
- Cumbria County Council
- North Yorkshire County Council
- Lancashire County Council
- United Utilities
- Yorkshire Water
- North Yorkshire Fire and Rescue Service; and
- Planners at the neighbouring authorities

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Executive summary

This report provides a comprehensive and robust evidence base on flood risk issues to support the review and update of the Yorkshire Dales National Park Authority Local Plan and associated Planning Policy documents using the best available information. This is a Level 1 Strategic Flood Risk Assessment (SFRA), and it will be used to inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk.

Introduction

To support the preparation of a new Local Plan for the Yorkshire Dales National Park, the key objectives of the assessment are:

- To update the Yorkshire Dales National Park Local Plan from 2016, taking into account the most recent policy and legislation in the National Planning Policy Framework (2021).
- To collate and analyse the latest available information and data for current and future (i.e. climate change) flood risk from all sources, and how these may be mitigated.
- To inform decisions in the emerging Local Plans, including the selection of development sites and planning policies.
- To provide evidence to support the application of the Sequential Test for the allocation of new development sites, to support the Yorkshire Dales National Park Authority's preparation of the Local Plan.
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as evidence base for use in the emerging Local Plan.
- To provide advice for applicants carrying out site-specific Flood Risk Assessments and outline specific measures or objectives that are required to manage flood risk.

Summary of flood risk in the Yorkshire Dales

- There are numerous recorded flooding incidents across the National Park, including in western settlements such as Sedbergh, Giggleswick, Settle and Horton in Ribblesdale, and in eastern settlements including High and Low Fremington, Grinton and Reeth.
- The main rivers associated with fluvial flooding are the:
    - River Eden and its tributaries, which pose a flood risk to a number of rural settlements in the northwest of the National Park including Crosby Ravensworth, Great Asby and Ravenstonedale,
    - River Lune and its tributaries, which pose a flood risk to a number of rural settlements in the west of the National Park including Gawthrop,
    - River Ribble and its tributaries, which pose a flood risk to a number of rural settlements in the south of the National Park including Horton in Ribblesdale and Stainforth,
    - River Aire and its tributaries, which pose a flood risk to a number of rural settlements in the south of the National Park including Malham, Kirkby Malham and Embsay,

- River Wharfe and River Skirfare and their tributaries, which pose a flood risk to a number of rural settlements in the southeast of the National Park including Hubberholme, Kettlewell, Starbotton and Threshfield,
- River Ure and its tributaries, which pose a flood risk to a number of rural settlements in the east of the National Park including Hawes and Gayle, and
- River Swale and its tributaries, with pose a flood risk to a number of rural settlements in the northeast of the National Park including Reeth, Fremington and Grinton.

- Surface water risk largely follows the topography of watercourses, but there are also additional flow paths and areas of ponding, for example where water is impounded at road or rail embankments. The National Park is a predominantly rural area, but there are a number of settlements where there is surface water flood risk to properties and infrastructure.
- Historic data provided by United Utilities showed 11 records of external drainage issues and two records of internal drainage issues from 2009 to 2017. Historic data provided by Yorkshire Water showed 291 records of external drainage issues and 15 records of internal drainage issues from 2008 to 2022.
- Areas at risk of flooding today are likely to become at increased risk in the future and the frequency of flooding will also increase in such areas as a result of climate change. Flood extents will increase; in some locations, this may not be by very much, but flood depth, velocity and hazard may have more of an impact due to climate change. It is recommended that the Yorkshire Dales National Park Authority work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the National Park.
- JBA's Groundwater Flood Risk map shows the areas with the shallowest groundwater levels generally follow the flow paths of the major watercourses in the National Park, particularly along the River Ure in the east, the Rivers Wharfe and Ribble in the south, and the Rivers Lune and Eden in the northwest. There are large areas across the northeast and west of the National Park, and also areas in the south, where the risk of groundwater flooding is considered to be negligible due to the nature of the local geological deposits.
- There is one canal located within the National Park, the Leeds and Liverpool Canal, which covers a short stretch of the southern boundary of the National Park by Gargrave. This has the potential to interact with other watercourses which flood in the area and become a conduit for flow paths during flood events or in a breach scenario.
- For the reservoirs located in the study area, there are no records of flooding and the level and standard of inspection and maintenance required under the Reservoirs Act 1975 means that the risk of flooding from reservoirs is relatively low. However residual risk of a reservoir breach should be considered in any site-specific Flood Risk Assessments (where relevant).

How to use this report

Planners

The SFRA provides recommendations regarding all sources of flood risk in the Yorkshire Dales National Park, which can be used to inform policy on flood risk within Local Plans. This includes how the cumulative impact of development should be considered.

It provides the latest flood risk data and guidance to inform the Sequential Test and provides guidance on how to apply the Exception Test. The Yorkshire Dales National Park Authority can use this information to apply the Sequential Test to strategic allocations and identify where the Exception Test will also be needed.

The SFRA provides guidance for developers, which can be used by development management staff to assess whether site specific Flood Risk Assessments meet the required quality standard.

Developers

This SFRA provides guidance for the application of the Sequential and Exception Tests at a site level and for detailed site-specific Flood Risk Assessments. For sites that are not strategic allocations, developers will need to apply the Sequential Test (including consideration of reasonably available alternatives). For the following sites, whether strategic allocations or windfall sites, developers will need to apply the Exception Test and use information in a site-specific Flood Risk Assessment to inform this test at planning application stage:

- Highly vulnerable and in Flood Zone 2
- Essential infrastructure in Flood Zone 3a or 3b
- More vulnerable in Flood Zone 3a

This is a strategic assessment and does not replace the need for site-specific Flood Risk Assessments where a development is either within Flood Zones 2 or 3, and either greater than a hectare or land identified in an SFRA as being at increased risk in the future, in Flood Zone 1. In addition, a Surface Water Drainage Strategy will be needed for all major developments in any Flood Zone to satisfy North Yorkshire County Council, Cumbria County Council or Lancashire County Council, the Lead Local Flood Authorities (LLFAs).

Developers can use the information in this SFRA, alongside site-specific research to help scope out what additional work will be needed in a detailed Flood Risk Assessment. To do this, they should refer to Section 5, Appendix A (Interactive PDF mapping) and Appendix B (Data sources used in the SFRA). At the planning application stage, developers may need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances, last updated in May 2022), inform Masterplanning and demonstrate, if required, that the Exception Test is satisfied. As part of the Environment Agency's updated guidance on climate change, which must be considered for all new developments and planning applications, developers will need to undertake a detailed assessment of climate change as part of the planning application process when preparing FRAs.

Developers need to ensure that new development does not increase surface water runoff from a site and should appropriately address the implications of proposals on surface water flow routes and surface storage. Section 9 provides information on the

surface water drainage requirements of North Yorkshire County Council, Cumbria County Council or Lancashire County Council as LLFA. Sustainable Drainage Systems should be considered at the earliest stages that a site is developed which will help to minimise costs and overcome any site-specific constraints.

Site-specific Flood Risk Assessments will need to identify how flood risk will be mitigated so the development is safe from flooding. In high-risk areas, the site-specific Flood Risk Assessment will also need to consider emergency arrangements, including how there will be safe access and egress from the site.

Any developments located within an area protected by flood defences and where the standard of protection is not of the required standard (either now or in the future) should be identified and the use of developer contributions considered to fund improvements.

Neighbourhood plans

The SFRA provides:

- Information on the sources of flooding and the variation in the risk across the Yorkshire Dales National Park.
- Identification of organisations that are involved in flood risk management and their latest strategic plans, current plans for major flood defences.
- The requirements for detailed Flood Risk Assessments and to inform the site selection process.

Neighbourhood planning groups can use this information to assess the risk of flooding to sites within their community, using Section 5, the sources of flooding in the Yorkshire Dales National Park and the flood mapping in the appendices. The SFRA will also be helpful for developing community level flood risk policies in high flood risk areas.

Mapping

The SFRA mapping highlights on a broad scale where flood risk from fluvial, coastal, surface water, groundwater and the effects of climate change are most likely. The maps are useful to provide a community level view of flood risk but may not identify if an individual property is at risk of flooding or model small scale changes in flood risk. Local knowledge of flood mechanisms will need to be included to complement this broadscale mapping. Similarly, all known available recorded historical flood events for the Yorkshire Dales National Park are listed in Section 5.1 and this can be used to supplement local knowledge regarding areas worst hit by flooding. Ongoing and proposed flood alleviation schemes planned by North Yorkshire County Council, Cumbria County Council and Lancashire County Council are outlined in Section 6.6 and Section 8.4 discusses mitigations, resistance and resilience measures which can be applied to alleviate flood risk to an area.

Cumulative Impact Assessment

A cumulative impact assessment has been carried out and has identified which catchments in the Yorkshire Dales National Park are more sensitive to the cumulative impact of development and where more stringent policy regarding flood risk is recommended. Any development in these areas should seek to contribute to work that reduces wider flood risk in those catchments.

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Abbreviations and definitions

Term	Definition
1D model	One-dimensional hydraulic model
2D model	Two-dimensional hydraulic model
ABD	Areas Benefiting from Defences
AEP	Annual Exceedance Probability – The probability (expressed as a percentage) of a flood event occurring in any given year.
AStGWf	Areas Susceptible to Groundwater flooding
Brownfield	Previously developed parcel of land
CC	Climate change - long term variations in global temperature and weather patterns caused by natural and human actions.
CCC	Cumbria County Council
CDA	Critical Drainage Area - A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, Main River and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure.
CFMP	Catchment Flood Management Plan - A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
CIRIA	Construction Industry Research and Information Association
Defra	Department for Environment, Food and Rural Affairs
Design flood	This is 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)”
EA	Environment Agency
Exception Test	Set out in the NPPF, the Exception Test is a method used to demonstrate that flood risk to people and property will be managed appropriately, where alternative sites at a lower flood risk are not available. The Exception Test is applied following the Sequential Test.
FAA	Flood Alert Area
FAS	Flood Alleviation Scheme
FCERM	Flood and Coastal Erosion Risk Management
FFL	Finished Floor Level
Flood defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Map for Planning	The Environment Agency Flood Map for Planning (Rivers and Sea) is an online mapping portal which shows the Flood Zones in England. The Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences and do not account for the possible impacts of climate change.
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG (Welsh Assembly Government).
Flood Risk Regulations	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.

Term	Definition
Floods and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
FWA	Flood Warning Area
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a River
FRA	Flood Risk Assessment - A site-specific assessment of all forms of flood risk to the site and the impact of development of the site to flood risk in the area.
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
FWMA	Flood and Water Management Act
FWS	Flood Warning System
GI	Green Infrastructure – a network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and urban fringe
Greenfield	Undeveloped parcel of land
Ha	Hectare
HFRR	Hydraulic Flood Risk Register
IDB	Internal Drainage Board
Indicative Flood Risk Area	Nationally identified flood risk areas based on the definition of 'significant' flood risk described by Defra and WAG.
JBA	Jeremy Benn Associates
LCC	Lancashire County Council
LFRMS	Local Food Risk Management Strategy
LIDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority - Local Authority responsible for taking the lead on local flood risk management
LPA	Local Planning Authority
m AOD	metres Above Ordnance Datum
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NRD	National Receptor Database
NRIM	National Reservoir Inundation Mapping
NVZs	Nitrate Vulnerability Zones
NYCC	North Yorkshire County Council
Ordinary Watercourse	All watercourses that are not designated Main River. Local Authorities or, where they exist, IDBs have similar permissive powers as the Environment Agency in relation to flood defence work. However, the riparian owner has the responsibility of maintenance.
PFRA	Preliminary Flood Risk Assessment
Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.

Term	Definition
Pluvial flooding	Flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (surface runoff) before it enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity.
RBMP	River Basin Management Plan
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Return Period	Is 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.
RMAs	Risk Management Authorities - operating authorities who's remit and responsibilities concern flood and / or coastal risk management.
RoFSW	Risk of Flooding from Surface Water (formerly known as the Updated Flood Map for Surface Water (uFMfSW))
SEPA	Scottish Environment Protection Agency
Sequential Test	Set out in the NPPF, the Sequential Test is a method used to steer new development to areas with the lowest probability of flooding.
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SFRA	Strategic Flood Risk Assessment
SHELAA	Strategic Housing and Economic Land Availability Assessments
SoP	Standard of Protection - Defences are provided to reduce the risk of flooding from a river and within the flood and defence field standards are usually described in terms of a flood event return period. For example, a flood embankment could be described as providing a 1 in 100-year standard of protection.
SPZ	(Groundwater) Source Protection Zone
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.
SuDS	Sustainable Drainage Systems - Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques
Surface water flooding	Flooding as a result of surface water runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity, thus causing what is known as pluvial flooding.
SWMP	Surface Water Management Plan - The SWMP plan should outline the preferred surface water management strategy and identify the actions, timescales and responsibilities of each partner. It is the principal output from the SWMP study.
UKCP	UK Climate Projections
UU	United Utilities
WFD	Water Framework Directive – Under the WFD, all waterbodies have a target to achieve Good Ecological Status (GES) or Good Ecological Potential (GEP) by a

Term	Definition
	set deadline. River Basin Management Plans (RBMPs) set out the ecological objectives for each water body and give deadlines by when objectives need to be met.
YDNP	Yorkshire Dales National Park
YDNPA	Yorkshire Dales National Park Authority
YW	Yorkshire Water

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

> ***"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."***
>
> (National Planning Policy Framework, paragraph 160)

JBA Consulting were commissioned by the Yorkshire Dales National Park Authority to prepare a Level 1 Strategic Flood Risk Assessment (SFRA). This study provides a comprehensive and robust evidence base to support the production of a new Local Plan for the Yorkshire Dales National Park. This document provides an update and replaces the 2014 Yorkshire Dales National Park Authority SFRA.

This 2022 SFRA will be used to inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk.

1.2 Local Plan

The Yorkshire Dales National Park Authority new Local Plan will update the local planning policy framework currently set by the **Yorkshire Dales National Park Local Plan 2015 - 2030** (https://www.yorkshiredales.org.uk/wp-content/uploads/sites/13/2019/06/Yorkshire-Dales-National-Park-Local-Plan-2015-30.pdf) as well as a suite of other policy documents applicable to the areas of Eden, South Lakeland and Lancaster that were designated as National Park in 2016. They will be informed by new data and will cover a period extending to 2040. The aim of the Local Plan is to establish a planning framework for future development, identifying how much land is available and where such land should be provided for new homes and employment, alongside associated infrastructure.

1.3 Levels of SFRA

The **Planning Practice Guidance** (PPG) (https://www.gov.uk/guidance/flood-risk-and-coastal-change#Strategic-Flood-Risk-Assessment-section) identifies the following two levels of SFRA:

- **Level 1**: where flooding is not a major issue in relation to potential site allocations and where development pressures are low. The assessment should be of sufficient detail to enable application of the Sequential Test.

  The L1 should be used to attempt to allocate sites in areas of lowest overall flood risk (including other sources of risk).

- **Level 2:** where allocations are proposed in flood risk areas (i.e. from any source now and in the future), or where future windfall pressures in flood risk areas are expected. The L2 SFRA should be detailed enough to identify which development sites have the least risk of flooding and the application of the Exception Test, if relevant. The above text suggests that the L2 SFRA will only be used to assess whether the Exception Test can be passed, and not the Sequential Test.

This Level 1 SFRA is intended to aid the Yorkshire Dales National Park Authority in applying the Sequential Test for their site allocations and identifying where the application of the Exception Test may be required as part of a Level 2 SFRA.

1.4 SFRA outputs

- Identification of policy and technical updates.
- Identification of any strategic flooding issues which may have cross boundary implications.
- Appraisal of all potential sources of flooding, including main river, ordinary watercourse, surface water, sewers, groundwater, reservoirs and canals.
- Review of historic flooding incidents.
- Reporting on the standard of protection provided by existing flood risk management infrastructure.
- Mapping showing distribution of flood risk across all Flood Zones from all sources of flooding including climate change allowances.
- Assessment of the potential increase in flood risk due to climate change.
- Flood Risk Assessment guidance for developers.
- Assessment of surface water management issues, how these can be addressed through development management policies and the application of Sustainable Drainage Systems.
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk.
- Assessment of strategic flood risk solutions that can be implemented to reduce risks.

1.5 SFRA study area

The study area encompasses the entire area of the Yorkshire Dales National Park. This covers an of just under 2,200km^2 and has a population of approximately 24,000.

On the 1 August 2016, the National Park area was extended to include the entirety of the Howgill Fells, much of the Orton Fells to the northwest in addition to a small extension on the Lancashire side of the National Park. The National Park now intersects five districts: Craven, Eden, Lancaster, South Lakeland and Richmondshire.

The predominant land use across the National Park is agriculture. Most of this land is restricted to grazing livestock due to the topography, climate, and soil quality. Other land uses across the National Park are open moorland, water, settlements, and commercial forestry. A large proportion of the open moorland is actively managed for grouse shooting. The largest settlement wholly within the National Park is Sedbergh (c1000 properties), followed by Grassington/Threshfield, Hawes/Gayle and Reeth. The larger market towns (e.g. Skipton, Kirkby Stephen, Kirkby Lonsdale, Settle, Leyburn) lie predominantly or wholly outside the National Park.

Figure 1.1 and Figure 1.2 show the study area and the neighbouring Local Authorities. There are eight Local Authorities that lie within or border the National Park.

The Yorkshire Dales National Park is covered by United Utilities as the water and sewerage provider in the western part of the National Park and Yorkshire Water across the rest of the National Park. Figure 1.3 shows the boundaries of United Utilities and Yorkshire Water.

The Yorkshire Dales National Park is covered by three Lead Local Flood Authorities (LLFAs). North Yorkshire County Council cover the largest area across the north, east and south of the National Park, with Cumbria County Council covering the northwest and Lancashire County Council covering a small area in the west. Figure 1.4 shows the boundaries of the three LLFAs.

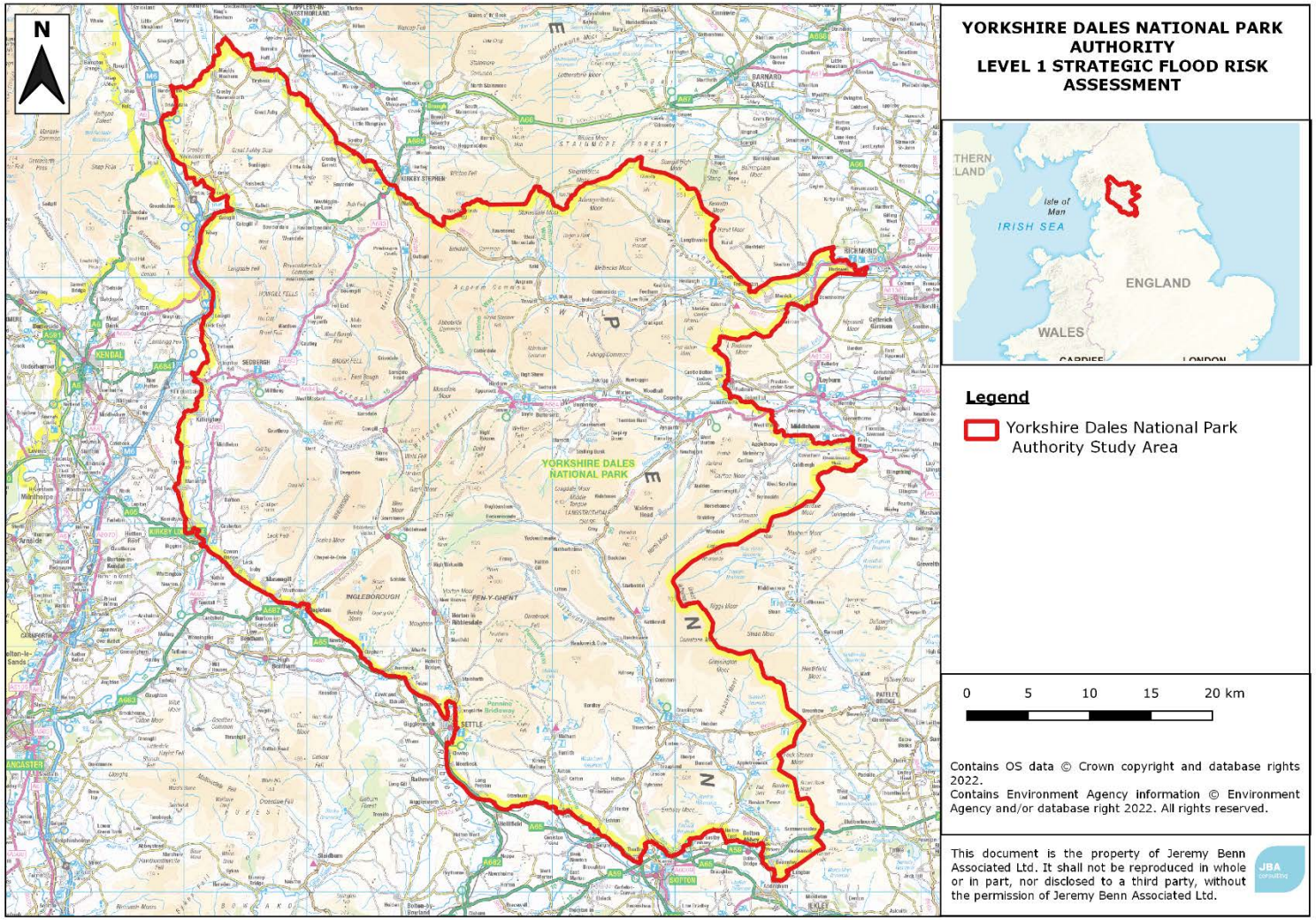


Figure 1.1: Yorkshire Dales National Park study area

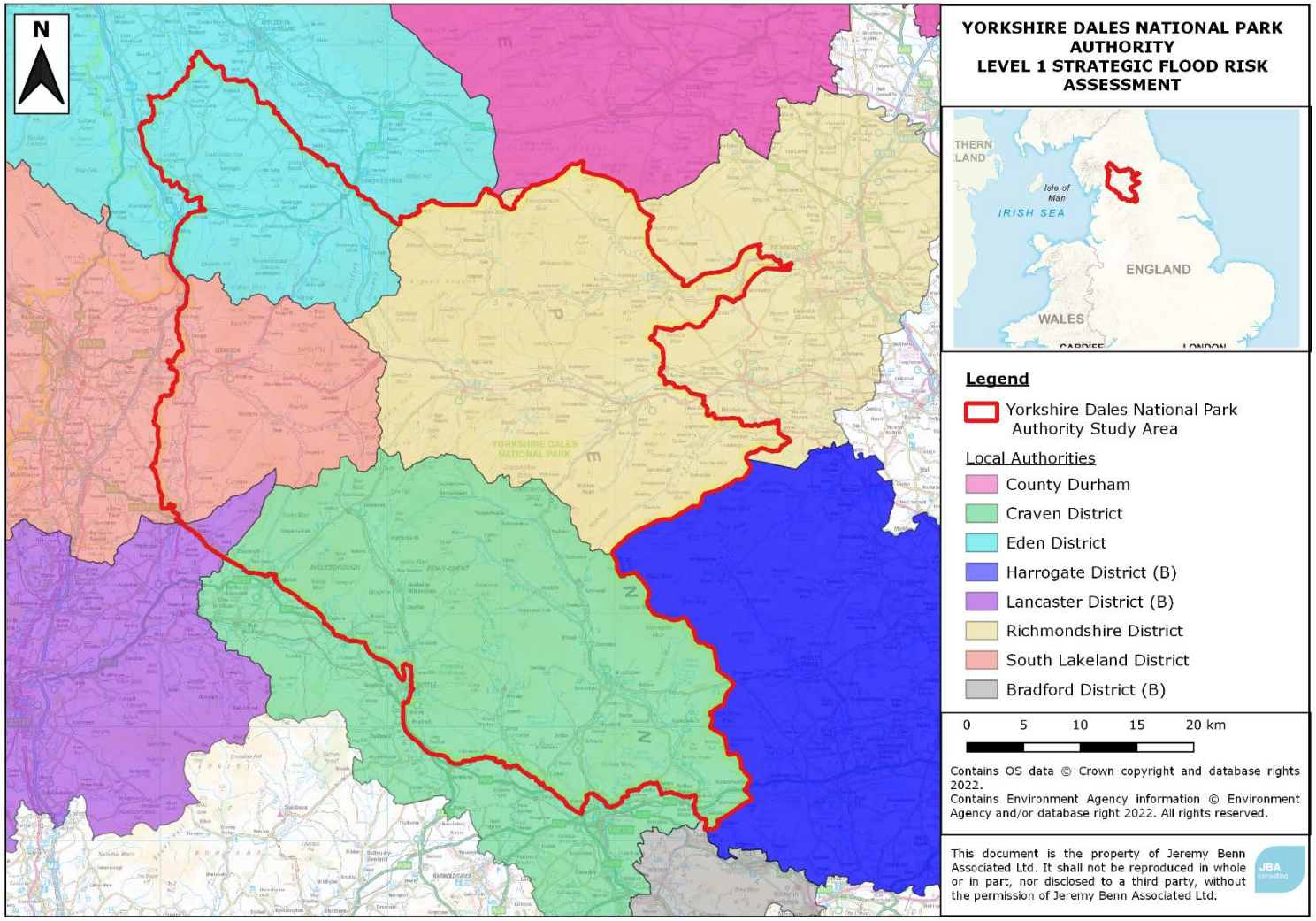


Figure 1.2: Neighbouring local authorities

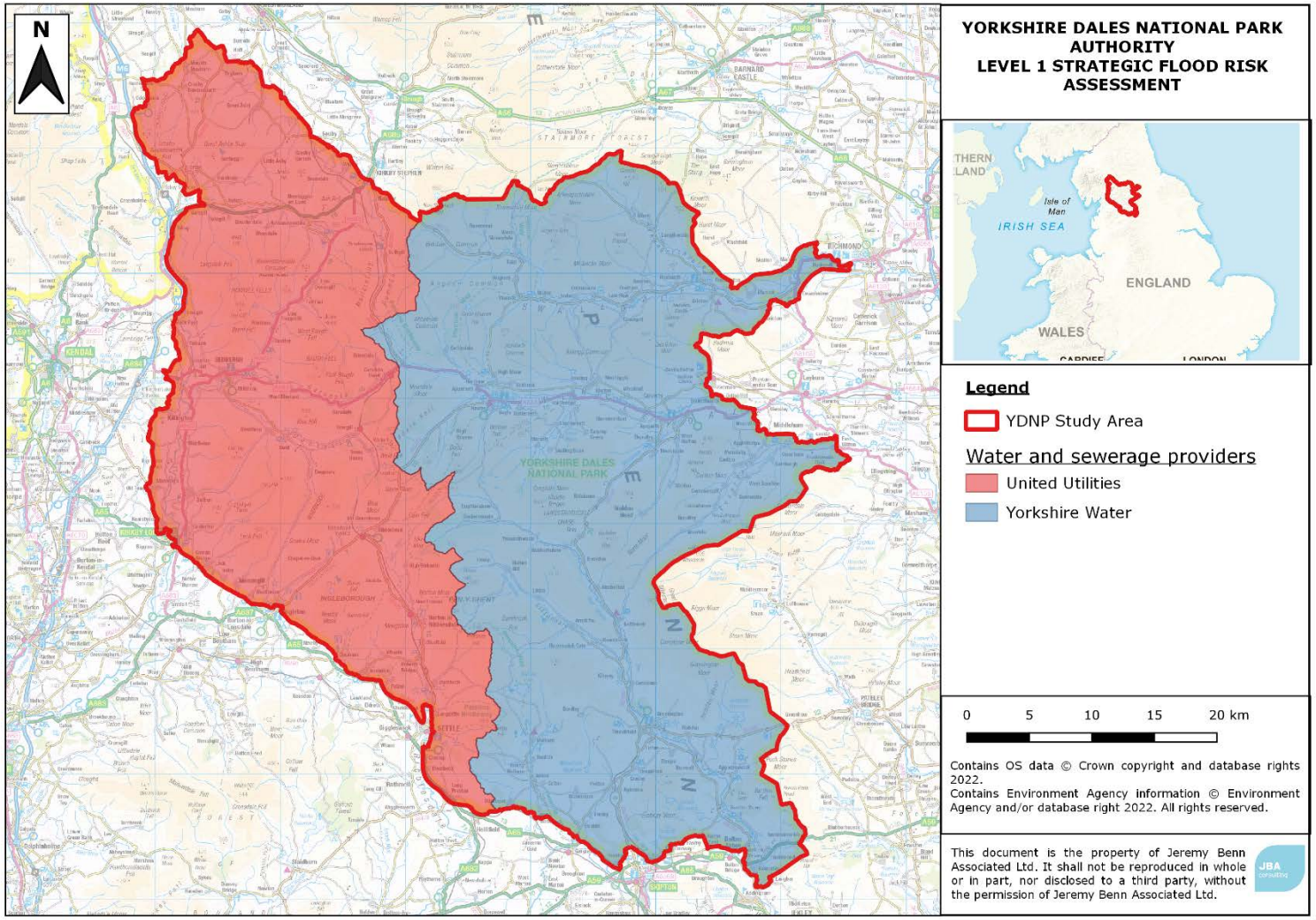


Figure 1.3: Water and sewerage providers

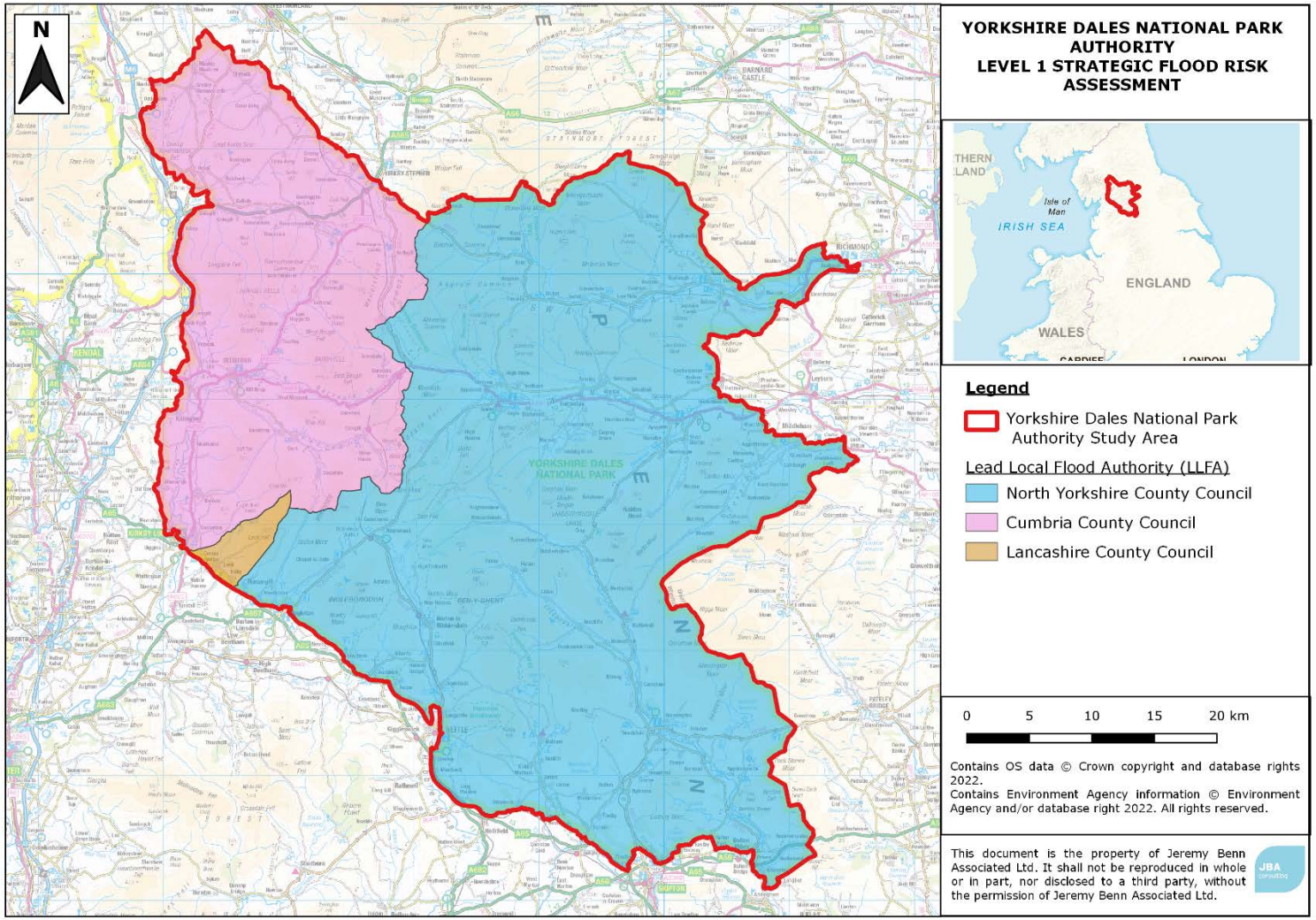


Figure 1.4: Lead Local Flood Authorities (LLFAs)

The Yorkshire Dales National Park is an upland area with high rainfall levels and as such forms the headwaters and catchments of many major rivers which flow out of the National Park in different directions. The principal watercourses flowing through the Yorkshire Dales National Park are:

- River Ribble
- River Lune
- River Eden
- River Swale
- River Ure
- River Wharfe
- River Aire

The Rivers from the National Park flow in two main directions: south or southeast towards the River Ouse and eventually the Humber Estuary into the North Sea, or west towards the Irish Sea.

The Rivers Swale, Ure, Wharfe and Aire all flow in an east and southeast direction and eventually join the River Ouse. The River Swale forms at the confluence of Birkdale Beck and Great Sleddale Beck and then flows eastward, leaving the National Park by Richmond.

The River Lune flows west from its source at Newbiggin-on-Lune and then flows south along the western boundary of the National Park and is joined by several other watercourses, including the River Dee and the River Rawthey. The River Lune then continues in a southwest direction and joins the Irish Sea at Sunderland Point. The River Ribble originates at the confluence of Gayle Beck and Battywife Beck and flows in a southward direction, leaving the National Park north of Settle. It then flows in a predominantly westward direction and joins the Irish Sea to the west of Preston. The River Eden originates in Black Fell Moss, Mallerstang and flows north, leaving the National Park at Kirkby Stephen. It then flows in a north-westerly direction and enters the Irish Sea at Solway Firth.

Figure 1.5 shows a map of the key watercourses within the Yorkshire Dales National Park.

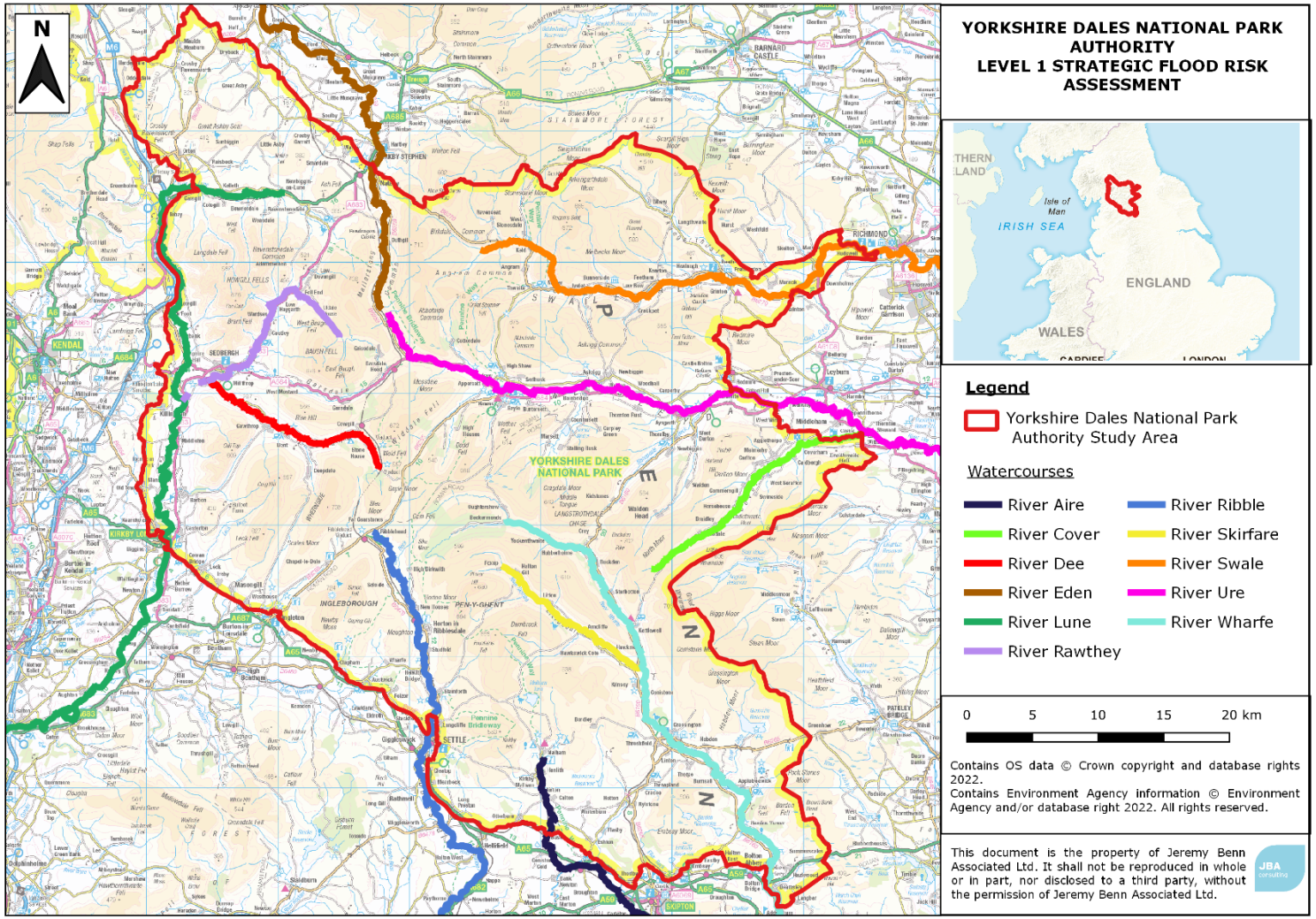


Figure 1.5: Map of the principal rivers and other watercourses within and around the Yorkshire Dales National Park

1.6 Consultation

The following parties (external to the Yorkshire Dales National Park Authority) were consulted to inform the SFRA:

- North Yorkshire County Council
- Cumbria County Council
- Lancashire County Council
- Environment Agency
- Yorkshire Water
- United Utilities
- North Yorkshire Fire and Rescue Service
- Cumbria Fire and Rescue Service
- Neighbouring authorities:
    - Craven District Council
    - Eden District Council
    - Lancaster City Council
    - Richmondshire District Council
    - South Lakeland District Council

1.7 Use of SFRA data

Level 1 SFRAs are high-level strategic documents and do not go into detail on an individual site-specific basis. The primary purpose is to provide an evidence base to inform the preparation of Local Plans and any future flood risk policies.

Developers will still be required to undertake site-specific Flood Risk Assessments to support Planning Applications. Developers will be able to use the information in the SFRA to scope out the sources of flood risk that will need to be explored in more detail at site level.

Appendix C presents a SFRA User Guide, further explaining how SFRA data should be used, including reference to relevant sections of the SFRA, how to consider different sources of flood risk and recommendations and advice for Sequential and Exception Tests.

Key reference material such as external guidance documents/ websites are provided in **green** throughout the SFRA, with the weblink in brackets afterwards.

Advice to users has been highlighted in **amber boxes** throughout the document.

On the date of publication, the SFRA contains the latest available flood risk information. Over time, new information will become available to inform planning decisions, such as updated hydraulic models (which then update the Flood Map for Planning), updated information on other sources of flood risk or evidence showing future flood risks, new flood event information, new defence schemes and updates to policy, legislation and guidance. Developers

should check the online **Flood Map for Planning** (https://flood-map-for-planning.service.gov.uk/) in the first instance to identify any major changes to the Flood Zones.

1.8 Structure of this report

Section	Contents	How to use
Executive Summary	Focuses on how the SFRA can be used by planners, developers and neighbourhood planners	Summarises the Level 1 findings and recommendations.
1. Introduction	Provides a background to the study, the Local Plan stage the SFRA informs, the study area, the roles and responsibilities for the organisations involved in flood management and how they were involved in the SFRA Provides a short introduction to how flood risk is assessed and the importance of considering all sources Includes this table of the contents of the SFRA	For general information and context.
2. Flood risk policy and strategy	Sets out the relevant legislation, policy and strategy for flood risk management at a national, regional and local level.	Users should refer to this section for any relevant policy which may underpin strategic or site-specific assessments.
3. Planning policy for flood risk management	Provides an overview of both national and existing Local Plan policy on flood risk management This includes the Flood Zones, application of the Sequential Approach and Sequential/Exception Test process. Provides guidance for the National Park Authority and Developers on the application of the Sequential and Exception Test for both allocations and windfall sites, at allocation and planning application stages.	Users should use this section to understand and follow the steps required for the Sequential and Exception Tests.
4. Impact of climate change	Outlines the latest climate change guidance published by the Environment Agency and how this was applied to the SFRA Sets out how developers should apply the guidance to inform site specific Flood Risk Assessments	This section should be used to understand the climate change allowances for a range of epochs and conditions, linked to the vulnerability of a development.
5. Understanding flood risk in the Yorkshire Dales National Park	Provides an overview of the characteristics of flooding affecting the study area and key risks including historical flooding incidents, flood risk from all sources and flood warning arrangements.	This section should be used to understand all sources of flood risk in the National Park, including where has flooded historically. This section may also help identify any data gaps, in conjunction with Appendix B.
6. Flood	Provides a summary of current flood defences and asset management and	This section should be used to understand if there are

Section	Contents	How to use
alleviation schemes and assets	future planned schemes. Introduces actual and residual flood risk.	any defences or flood schemes in a particular area, for further detailed assessment at site-specific stage.
7. Cumulative impact of development and strategic solutions	This section provides an introduction to the cumulative impact assessment (CIA).	Planners should use this section to help develop policy recommendations for the cumulative impact of development.
8. Flood risk management for developers	Guidance for developers on Flood Risk Assessments, considering flood risk from all sources	Developers should use this section to understand requirements for FRAs and what conditions/ guidance documents should be followed, as well as mitigation options.
9. Surface water management and Sustainable Drainage Systems	An overview of Sustainable Drainage Systems, Guidance for developers on Surface Water Drainage Strategies, considering any specific local standards and guidance for Sustainable Drainage Systems (SuDS) from the Lead Local Flood Authority.	Developers should use this section to understand what national, regional and local SuDS standards are applicable. Hyperlinks are provided.
10. Summary and recommendations	Summarises sources of flood risk in the study area and outlines planning policy recommendations	Developers and planners should use this as a summary of the SFRA. Developers should refer to the Level 1 SFRA recommendations when considering requirements for site-specific assessments.
Appendices	• Appendix A: Interactive flood risk maps • Appendix B: Data sources used in the SFRA • Appendix C: SFRA User Guide • Appendix D: Flood Alert and Flood Warning Areas • Appendix E: Summary of flood risk across the district • Appendix F: Cumulative Impact Assessment (CIA)	Planners should use these appendices to understand what data has been used in the SFRA, to inform the application of the Sequential and Exception Tests, as relevant, and to use these maps and tabulated summaries of flood risk to understand the nature and location of flood risk.

1.9 Understanding flood risk

This section provides useful background information on how flooding arises and how flood risk is determined.

1.9.1 Sources of flooding

Flooding is a natural process and can happen at any time in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when people and human or environmental assets are present in the area that floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and environmental and cultural heritage. Flooding can occur from many different and combined sources and in many different ways, as illustrated in Figure 1.6. Major sources of flooding that could potentially affect the National Park area include:

- Fluvial (rivers) - inundation of floodplains from rivers and watercourses; inundation of areas outside the floodplain due to influence of bridges, embankments and other features that artificially raise water levels; overtopping or breaching of defences; blockages of culverts; blockages of flood channels/corridors.
- Surface water - surface water flooding covers two main sources including direct run-off from adjacent land (pluvial) and surcharging of piped drainage systems (public sewers, highway drains, etc.).
- Groundwater - water table rising after prolonged rainfall to emerge above ground level remote from a watercourse; most likely to occur in low-lying areas underlain by permeable rock (aquifers); groundwater recovery after pumping for mining or industry has ceased.
- Infrastructure failure - reservoirs; canals; industrial processes; burst water mains; blocked sewers or failed pumping stations.

Different types and forms of flooding present a range of different risks and the flood hazards of speed of inundation, depth and duration of flooding can vary greatly. With climate change, the frequency, pattern and severity of flooding are expected to change and become more damaging.

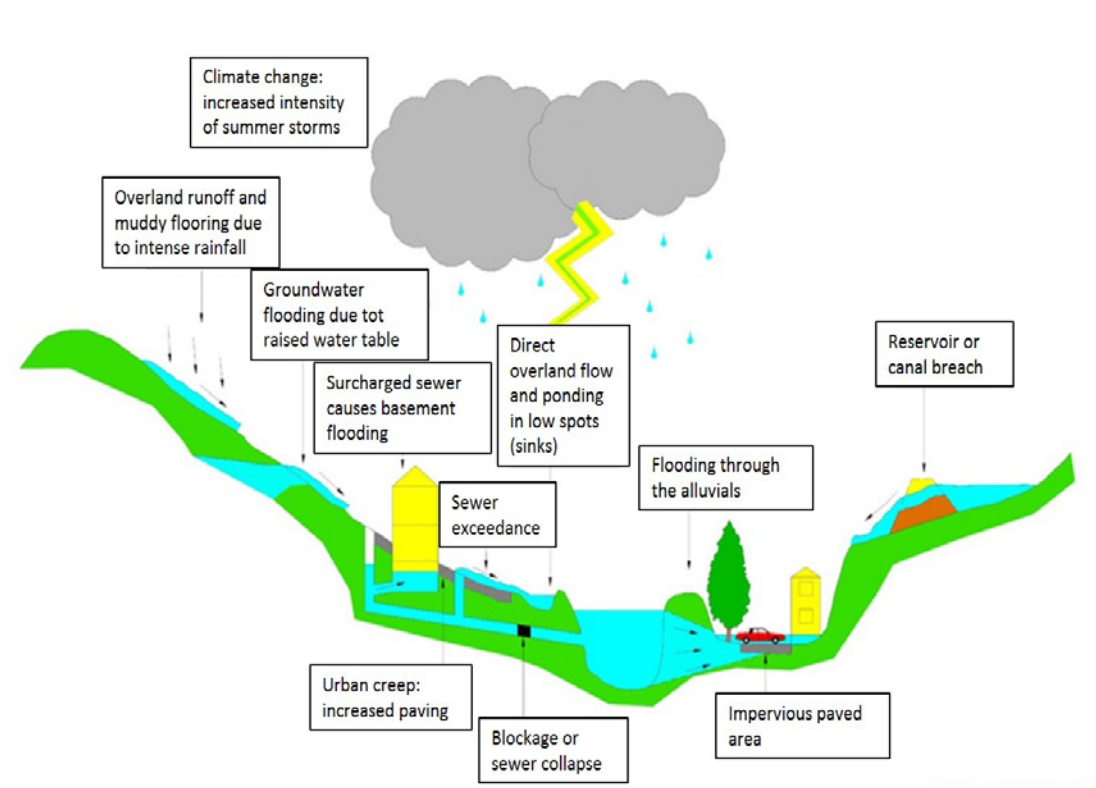


Figure 1.6: Flooding from all sources

1.10 Likelihood and consequence

Flood risk is a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the source – pathway – receptor model as shown in Figure 1.7. This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. However, it should be remembered that flooding could occur from many different sources and pathways, and not simply those shown in the illustration below.

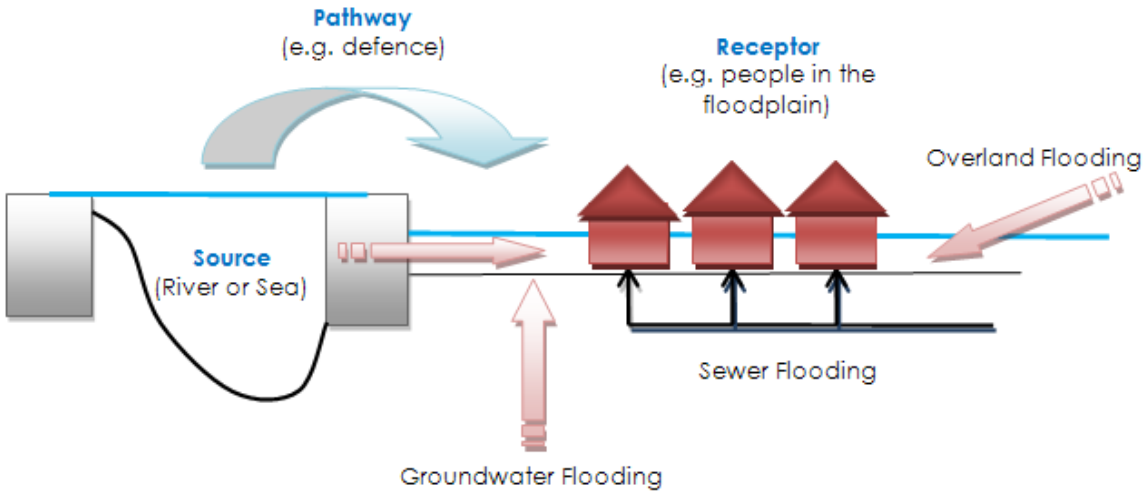


Figure 1.7: Source-Pathway-Receptor Model

The principal sources affecting the study area are rainfall and rivers; the most common pathways are rivers themselves, drains, sewers, overland flows, floodplains and defence assets (for example through overtopping or breach). Receptors can include people, their property and the environment. All these elements must be present for flood risk to arise. Mitigation measures have little or no effect on the magnitude of the sources that cause flooding, but they can block or impede pathways, remove receptors or increase the resilience of receptors.

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

1.11 Likelihood

Likelihood of flooding is expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates there is a 1 in 100 chance every year of the predicted flood level being experienced at a particular location i.e. it has a 1% chance of occurring in any one year, not that it will occur once every hundred years.

Considered over the lifetime of development, such an apparently low frequency or rare flood has a significant probability of occurring. For example, a 1% (1 in 100) flood:

- has a 26% (1 in 4) chance of occurring at least once in a 30-year period - the period of a typical residential mortgage; and
- a 49% (1 in 2) chance of occurring in a 70-year period - a typical human lifetime

1.12 Consequence

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

Flood risk = Probability of flooding x Consequences of flooding

1.13 Risk

Flood risk is not static; it cannot be described simply as a fixed water level that will occur if a river overtops its banks or from a high spring tide that coincides with a storm surge. It is therefore important to consider the continuum of risk carefully. Risk varies depending on the severity of the event, the source of the water, the pathways of flooding (such as the condition of flood defences) and the vulnerability of receptors as mentioned above.

2 Flood risk policy and strategy

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

2.1 Roles and responsibilities for Flood Risk Management in the Yorkshire Dales National Park

There are different organisations that cover the Yorkshire Dales National Park that have responsibilities for flood risk management, known as Risk Management Authorities (RMAs). These are shown on Table 2-1, with a summary of their responsibilities.

It is important to note that land and property owners are responsible for the maintenance of watercourses either on or next to their properties. Property owners are also responsible for the protection of their properties from flooding as well as other management activities, for example by maintaining riverbeds/ banks, controlling invasive species and allowing the flow of water to pass without obstruction. More information can be found in the Environment Agency publication **'Owning a Watercourse' (2018)** (https://www.gov.uk/guidance/owning-a-watercourse).

When it comes to undertaking works to reduce flood risk, the Environment Agency and North Yorkshire County Council, Cumbria County Council and Lancashire County Council as LLFA's have permissive powers and limited resources are prioritised and targeted to where they can have the greatest effect. Permissive powers mean that Risk Management Authorities are permitted to undertake works on watercourses but are not obliged.

Table 2-1: Roles and responsibilities for Risk Management Authorities

Risk Management Authority	Strategic Level	Operational Level	Planning role
Environment Agency	• Strategic overview for all sources of flooding • National Strategy • Reporting and general supervision	• Main rivers (e.g. River Wharfe) • Reservoirs	• Statutory consultee for development in Flood Zones 2 and 3
North Yorkshire County Council as Lead Local Flood Authority (LLFA)	• Preliminary Flood Risk Assessment • Local Flood Risk Management Strategy	• Surface Water • Groundwater • Ordinary Watercourses (consenting and enforcement) • Ordinary watercourses (works)	• Statutory consultee for major developments
Cumbria County Council as Lead Local Flood Authority (LLFA)	• Preliminary Flood Risk Assessment • Local Flood Risk Management Strategy	• Surface Water • Groundwater • Ordinary Watercourses (consenting and enforcement)	• Statutory consultee for major developments

		• Ordinary watercourses (works)	
Lancashire County Council as Lead Local Flood Authority (LLFA)	• Preliminary Flood Risk Assessment • Local Flood Risk Management Strategy	• Surface Water • Groundwater • Ordinary Watercourses (consenting and enforcement) • Ordinary watercourses (works)	• Statutory consultee for major developments
Yorkshire Dales National Park Authority as Local Planning Authority	• Local Plans as Local Planning Authorities	• Determination of Planning Applications as Local Planning Authorities • Managing open spaces under National Park Authority ownership • Ordinary watercourses (works)	• As left
Yorkshire Water	• Asset Management Plans, supported by Periodic Reviews (business cases) • Develop Drainage and Wastewater management plans	• Public sewers	• Non-statutory consultee
United Utilities	• Asset Management Plans, supported by Periodic Reviews (business cases) • Develop Drainage and Wastewater management plans	• Public sewers	• Non-statutory consultee
Internal Drainage Board (Airedale Drainage Commissioners)	• Develop water and drainage management plans • Flood risk management	• Watercourse and drainage management under IDB districts	• Non-statutory consultee
Highways Authorities *Highways England (motorways and trunk roads)* *North Yorkshire County Council/Cumbria County Council/Lancashire County Council (for non-trunk roads)*	• Highway drainage policy and planning	• Highway drainage	• Statutory consultee regarding highways design standards and adoptions

2.2 Relevant legislation

The following legislation is relevant to development and flood risk in the Yorkshire Dales National Park:

- **Flood Risk Regulations (2009)** (http://www.legislation.gov.uk/uksi/2009/3042/pdfs/uksi_20093042_en.pdf) - These transpose the European Floods Directive (2000) into law and require the Environment Agency and LLFAs to produce Preliminary Flood Risk Assessments and identify where there are nationally significant Flood Risk Areas. For the Flood Risk Areas, detailed flood maps and a Flood Risk Management Plan is produced; this is done in a six-year cycle.
- **Town and Country Planning Act (1990)** (https://www.legislation.gov.uk/ukpga/1990/8/contents), **Water Industry Act (1991)** (https://www.legislation.gov.uk/ukpga/1991/56/contents), **Land Drainage Act (1991)** (https://www.legislation.gov.uk/ukpga/1991/59/contents), **Environment Act (1995)** (http://www.legislation.gov.uk/ukpga/1995/25/contents), **Flood and Water Management Act (2010)** (https://www.legislation.gov.uk/ukpga/2010/29/contents) – as amended and implemented via secondary legislation. These set out the roles and responsibilities for organisations that have a role in FRM.
- The **Land Drainage Act (1991, as amended)** (https://www.legislation.gov.uk/ukpga/1991/59/contents) and **Environmental Permitting Regulations (2018)** (http://www.legislation.gov.uk/uksi/2018/110/contents/made) also set out where developers will need to apply for additional permission (as well as planning permission) to undertake works to an Ordinary Watercourse, Main River, or within an **IDB district** (https://www.ada.org.uk/idb-map/). Local Land Drainage Bylaws are also applicable within IDB areas.
- The **Water Environment Regulations (2017)** (http://www.legislation.gov.uk/uksi/2017/407/contents/made) – these transpose the European Water Framework Directive (2000) into law and require the Environment Agency to produce River Basin Management Plans (RBMPs). These aim to ensure that the water quality of aquatic ecosystems, riparian ecosystems and wetlands reaches 'good' status.
- Other environmental legislation such as the Habitats Directive (1992), Environmental Impact Assessment Directive (2014) and Strategic Environmental Assessment Directive (2001) also apply as appropriate to strategic and site-specific developments to guard against environmental damage.

2.3 Relevant flood risk policy and strategy documents

Table 2-2 summarises relevant national, regional and local flood risk policy and strategy documents and how these apply to development and flood risk. Hyperlinks are provided to external documents. These documents may:

- Provide useful and specific local information to inform Flood Risk Assessments within the local area.

- Set the strategic policy and direction for Flood Risk Management (FRM) and drainage – they may contain policies and action plans that set out what future flood mitigation and climate change adaptation plans may affect a development site. A developer should seek to contribute in all instances to the strategic vision for FRM and drainage in the district.
- Provide guidance and/or standards that informs how a developer should assess flood risk and/or design flood mitigation and SuDS.

Table 2-2: National, regional and local flood risk policy and strategy documents

Scale	Document, lead author and date	Information	Policy and measures	Development design requirements	Next update due
National	**National Flood and Coastal Erosion Risk Management Strategy** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/920944/023_15482_Environment_agency_digitalAW_Strategy.pdf) (see section 2.5.1) (Environment Agency) 2020	No	Yes	No	Due to be reviewed in 2026
National	**National Planning Policy Framework** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf) (MHCLG) 2021) (see section 3) and **Planning practice guidance** (https://www.gov.uk/government/collections/planning-practice-guidance#full-publication-update-history).	No	Yes	Yes	-
National	**Building Regulations Part H** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/442889/BR_PDF_AD_H_2015.pdf) (MHCLG) 2010 (see section 2.5.9)	No	No	Yes	-
Regional	**Humber River Basin District River Basin Management Plan** (https://assets.	Yes	Yes	No	2021 (draft available,

Scale	Document, lead author and date	Information	Policy and measures	Development design requirements	Next update due
	publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718328/Humber_RBD_Part_1_river_basin_management_plan.pdf) (Environment Agency) 2015				currently under public consultation)
Regional	**Humber River Basin District Flood Risk Management Plan: Sub Areas** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/507117/LIT_10206_HUMBER_FRMP_PART_B.pdf) (Environment Agency) (2015)	Yes	Yes	No	2021 (draft available, currently under public consultation)
Regional	**Humber River Basin District Draft Flood Risk Management Plan 2021 to 2027** (https://consult.environment-agency.gov.uk/fcrm/draft-second-cycle-flood-risk-management-plans/supporting_documents/Humber_FRMP_20212027WM.pdf) (Environment Agency) (2021)	Yes	Yes	No	2027
Regional	**North West River Basin District River Basin Management Plan** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718335/North_West_RBD_Part_1_river_basin_management_plan.pdf) (Environment Agency) (2015)	Yes	Yes	No	2021 (draft available, currently under public consultation)
Regional	**North West River Basin District Flood Risk Management Plan: Sub Areas** (https://assets.publishing.service.gov.uk/g	Yes	Yes	No	2021 (draft available, currently under

Scale	Document, lead author and date	Information	Policy and measures	Development design requirements	Next update due
	overnment/uploads/system/uploads/attachment_data/file/507122/LIT_10210_NORTH_WEST_FRMP_PART_B.pdf) (Environment Agency) (2015)				public consultation)
Regional	**North West River Basin District Draft Flood Risk Management Plan 2021 to 2027** (https://consult.environment-agency.gov.uk/fcrm/draft-second-cycle-flood-risk-management-plans/supporting_documents/North_West_FRMP_20212027WM.pdf) (Environment Agency) (2021)	Yes	Yes	No	2027
Regional	**Solway Tweed River Basin District River Basin Management Plan** (https://www.sepa.org.uk/media/594087/211221-final-rbmp3-solway-tweed.pdf) (Environment Agency and Scottish Environment Protection Agency) (2015)	Yes	Yes	No	2021 (draft available, currently under public consultation)
Regional	**Solway Tweed River Basin District Flood Risk Management Plan: Sub Areas** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/507132/LIT_10218_SOLWAY_TWEED_FRMP_PART_B.pdf) (Environment Agency) (2015)	Yes	Yes	No	2021 (draft available, currently under public consultation)
Regional	**Solway Tweed River Basin District Draft Flood Risk Management Plan 2021 to 2027** (https://consult.environment-agency.	Yes	Yes	No	2027

Scale	Document, lead author and date	Information	Policy and measures	Development design requirements	Next update due
	gov.uk/fcrm/draft-second-cycle-flood-risk-management-plans/supporting_documents/Solway_Tweed_FRMP_20212027WM.pdf) (Environment Agency) (2021)				
Regional	**Drainage and Wastewater Management Plan** (https://www.yorkshirewater.com/media/sa5hlo40/appendix-15c-drainage-and-wastewater-management-plan.pdf) (Yorkshire Water)	Yes	Yes	Yes	-
Regional	**Drainage and Wastewater Management Plan** (https://www.unitedutilities.com/globalassets/documents/pdf/9140-dwmp-strategic-context-final-document.acc21.pdf) (United Utilities)	Yes	Yes	Yes	-
Regional	**Climate Change guidance for development and flood risk** (https://www.gov.uk/guidance/flood-and-coastal-risk-projects-schemes-and-strategies-climate-change-allowances) (Environment Agency) 2021	No	No	Yes	-
Regional	**Spatial Framework** (https://www.northyorks.gov.uk/sites/default/files/fileroot/About%20the%20council/Strategies,%20plans%20and%20policies/Spatial%20Framework%20Core%20Approach%20Dec%202019.pdf) (York, North Yorkshire, East Riding and Hull)	Yes	No	No	-

Scale	Document, lead author and date	Information	Policy and measures	Development design requirements	Next update due
Local	**Supplementary Planning Document for Sustainable Drainage Systems** (https://www.northyorks.gov.uk/sites/default/files/fileroot/Environment%20and%20waste/Flooding/NYCC%20SuDS%20Design%20Guidance%202018%20Update.pdf) (NYCC) 2018	No	No	Yes	-
Local	**North Yorkshire Local Flood Risk Strategy: Action Plan** (https://www.northyorks.gov.uk/sites/default/files/fileroot/Environment%20and%20waste/Flooding/BES1014_Local_flood_risk_strategy_-_section_2.pdf) (NYCC)	Yes	Yes	No	-
Local	**North Yorkshire Local Flood Risk Strategy: Flooding and Land Drainage Legislation and Guidance** (https://www.northyorks.gov.uk/sites/default/files/fileroot/Environment%20and%20waste/Flooding/BES1014_Local_flood_risk_strategy_-_section_5.pdf) (NYCC)	Yes	No	Yes	-
Local	**North Yorkshire Local Flood Risk Strategy: Roles and Responsibilities** (https://www.northyorks.gov.uk/sites/default/files/fileroot/Environment%20and%20waste/Flooding/BES1014_Local_flood_risk_strategy_-_section_6.pdf) (NYCC)	Yes	No	Yes	-
Local	**Cumbria Local Flood Risk Strategy** (https://cumbria.gov.uk/elibrary/Content/I	Yes	Yes	No	2021

Scale	Document, lead author and date	Information	Policy and measures	Development design requirements	Next update due
	nternet/544/3887/5894/4212914154.PDF) (CCC)				
Local	**Cumbria Local Flood Risk Strategy: Action Plan** (https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/5894/4212914313.PDF) (CCC)	Yes	Yes	No	2021
Local	**Cumbria Local Flood Risk Strategy: Governance and partnership arrangements** (https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/5894/4212914219.PDF) (CCC)	Yes	No	Yes	2021
Local	**Local Flood Risk Management Strategy for Lancashire 2021-2027** (https://www.lancashire.gov.uk/media/928565/lancashire-flood-risk-management-strategy-2021-2027-final-v2.pdf) (LCC)	Yes	Yes	No	2027

2.4 Key legislation for flood and water management

2.4.1 Flood Risk Regulations (2009)

The **Flood Risk Regulations (2009)** (https://www.legislation.gov.uk/uksi/2009/3042/pdfs/uksi_20093042_en.pdf) translate the EU Floods Directive into UK law. The EU requires Member States to complete an assessment of flood risk (known as a Preliminary Flood Risk Assessment (PFRA)) and then use this information to identify areas where there is a significant risk of flooding. For these Flood Risk Areas, States must then undertake Flood Risk and Hazard Mapping and produce Flood Risk Management Plans.

The Flood Risk Regulations direct the Environment Agency to do this work for river, sea and reservoir flooding. LLFAs must do this work for surface water, Ordinary Watercourse and Groundwater flooding. This is performed over a six-year cycle and the second cycle started in 2017.

The **North Yorkshire County Council PFRA** (https://webarchive.nationalarchives.gov.uk/ukgwa/20140328094437/http:/www.environment-agency.gov.uk/research/planning/135526.aspx#16) was published in 2011 with an addendum in 2017 with updated flood risk data and information. This greater understanding of flood risk from the LLFA has been updated to include all significant flood events since 2011. There was no new evidence to suggest that the risk of flooding in North Yorkshire has changed since 2011.

Key outputs of the 2011 PFRA include:

- Properties in Craven District and Richmondshire District are most at risk from Surface Water flooding.
- No past floods with significant consequences were identified, although this is likely due to a lack of robust evidence.
- Overall flood risk is expected to increase as a result of climate change, particularly relating to winter storms (12% increase in winter precipitation from 2011 to 2050). Peak flows are also expected to increase between 8 and 14%.
- No Flood Risk Areas (areas of significant risk) have been identified in Craven District or Richmondshire District.

The **Cumbria County Council PFRA** (https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/43221161446.PDF) was published in 2011 with an addendum in 2017 with updated flood risk data and information. This greater understanding of flood risk from the LLFA data has been updated to include all significant flood events since 2011. No new Flood Risk Areas (areas of significant risk) were identified. Several areas were found to show notable increases in people at risk with climate change but none of these areas fall within the Yorkshire Dales National Park.

Key outputs of the 2011 PFRA include:

- Eden District, which partly covers the Yorkshire Dales National Park, has the most caravan and camping sites at risk from Surface Water flooding.
- No past floods with significant consequences were identified, although this is likely due to a lack of robust evidence.

- In the North West River Basin District overall flood risk is expected to increase as a result of climate change, particularly relating to winter storms (14% increase in winter precipitation from 2011 to 2050). Peak flows are also expected to increase between 11 and 18%.
- In the Solway River Basin District overall flood risk is expected to increase as a result of climate change, particularly relating to winter storms (11-13% increase in winter precipitation from 2011 to 2050). Peak flows are also expected to increase between 9 and 18%.
- No Flood Risk Areas (areas of significant risk) have been identified in the study area.

The **Lancashire County Council PFRA** (https://webarchive.nationalarchives.gov.uk/ukgwa/20140328094439/http:/www.environment-agency.gov.uk/research/planning/135532.aspx#10) was published in 2011 with an addendum in 2017 with updated flood risk data and information. This greater understanding of flood risk from the LLFA data has been updated to include all significant flood events since 2011. No new Flood Risk Areas (areas of significant risk) were identified.

Key outputs of the 2011 PFRA include:

- Several past floods with significant consequences were identified but none of these were found to impact on the Yorkshire Dales National Park.
- Overall flood risk is expected to increase as a result of climate change, particularly relating to winter storms (14% increase in winter precipitation from 2011 to 2050). Peak flows are also expected to increase between 11 and 18%.
- No Flood Risk Areas (areas of significant risk) have been identified in the study area.

The **English PFRA (2018)** (https://www.gov.uk/government/publications/preliminary-flood-risk-assessment-for-england) provides information on significant past and future flood risk from river and sea flooding across all of England, including the Yorkshire Dales National Park. The Humber River Basin District (RBD) has been identified as the district where flood risk to the economy and human health is highest. The Solway Tweed RBD is the district where flood risk to the economy and human health is the lowest. The North West RBD has the largest area of Special Areas of Conservation (SACs) at high risk of being flooded. The Humber RBD has the highest number of Flood Risk Areas in England with 40 identified. Eight were identified in the North West RBD and no nationally significant Flood Risk Areas were identified in the Solway Tweed RBD.

2.4.2 Flood and Water Management Act (FWMA) 2010

The Flood and Water Management Act (FWMA) was passed in April 2010. It aims to improve both flood risk management and the way water resources are managed.

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for LAs, as LLFAs, designed to manage local flood risk (from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA.

The content and implications of the FWMA provide considerable opportunities for improved and integrated land use planning and flood risk management by LAs and other key partners. The integration and synergy of strategies and plans at national, regional, and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth.

2.4.3 Water Framework Directive & Water Environment Regulations

The purpose of the Water Framework Directive (WFD), which was transposed into English Law by the Water Environment Regulations (2003), is to deliver improvements across Europe in the management of water quality and water resources through a series of plans called River Basin Management Plans (RBMP), which were last published in 2015 and are currently being updated. Draft updates were published in 2021 and are currently undergoing public consultation.

The Yorkshire Dales National Park lies across the Humber River Basin District, the North West River Basin District and the Solway Tweed River Basin District.

2.5 Key national, regional, and local policy documents and strategies

2.5.1 The National Flood and Coastal Erosion Risk Management Strategy for England (2020)

The **National Flood and Coastal Erosion Risk Management Strategy** (FCERM) (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/899498/National_FCERM_strategy_for_England.pdf) for England provides the overarching framework for future action by all risk management authorities to tackle flooding and coastal erosion in England. The new Strategy has been in preparation since 2018. The Environment Agency brought together a wide range of stakeholders to develop the strategy collaboratively. The Strategy is much more ambitious than the previous one from 2011 and looks ahead to 2100 and the action needed to address the challenge of climate change.

The Strategy has been split to describe three high level ambitions: climate resilient places, today's growth and infrastructure resilient in tomorrow's climate and a nation ready to respond and adapt to flooding and coastal change. Measures include updating the national river, coastal and surface water flood risk mapping and the understanding of long term investment needs for flood and coastal infrastructure, trialling new and innovative funding models, flood resilience pilot studies, developing an adaptive approach to the impacts of climate change, seeking nature based solutions towards flooding and erosion issues, integrating natural flood management (NFM) into the new Environmental Land Management scheme, considering long term adaptive approaches in Local Plans, maximising the opportunities for flood and coastal resilience as part of contributing to environmental net gain for development proposals, investing in flood risk infrastructure that supports sustainable growth, aligning long term strategic planning cycles for flood and coastal work between stakeholders, mainstreaming property flood resilience measures and 'building back better' after flooding, consistent approaches to asset management and record keeping, updating guidance on managing high risk reservoirs in light of climate change, critical infrastructure

resilience, education, skills and capacity building, research, innovation and sharing of best practise, supporting communities to plan for flood events, develop world leading ways of reducing the carbon and environmental impact from the construction and operation of flood and coastal defences, development of digital tools to communicate flood risk and transforming the flood warning service and increasing flood response and recovery support.

The Strategy was laid before parliament in July 2020 for formal adoption and published alongside a new **National Policy Statement for Flood and Coastal Erosion Risk Management** (https://www.gov.uk/government/publications/flood-and-coastal-erosion-risk-management-policy-statement). The statement sets out five key commitments which will accelerate progress to better protect and better prepare the country for the coming years:

1. Upgrading and expanding flood defences and infrastructure across the country,
2. Managing the flow of water to both reduce flood risk and manage drought,
3. Harnessing the power of nature to not only reduce flood risk, but deliver benefits for the environment, nature, and communities,
4. Better preparing communities for when flooding and erosion does occur, and
5. Ensuring every area of England has a comprehensive local plan for dealing with flooding and coastal erosion.

2.5.2 Updated Strategic Flood Risk Assessment guidance

There was an update to the **'How to prepare a Strategic Flood Risk Assessment guidance'** (https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment) in August 2019 , which had some key additions to both Level 1 and Level 2 assessments. There were also minor updates to the guidance in September 2020. The Level 1 assessment is undertaken in accordance with this guidance.

2.5.3 River Basin Management Plans

River Basin Management Plans (RBMPs) are used to protect and improve the quality of our water environment. They support the government's framework for the 25-year environment plan and allow local communities to find more cost-effective ways to further improve our water environments. Water quality and flood risk can go hand in hand in that flood risk management activities can help to deliver habitat restoration techniques. The EA manages the RBMPs and must review and update them every six years. The Solway Tweed River Basin District falls in both England and Scotland. SEPA lead on the review and updates of this RBMP and publish in on their **Water Environment Hub** (https://informatics.sepa.org.uk/RBMP3/).

The Yorkshire Dales National Park lies across three River Basin Districts (RBDs): Humber, North West and Solway Tweed.

The first cycle of RBMPs were published in 2009 and then updated in 2015, which are the current version. The draft RBMPs for 2021 are currently undergoing public consultation from 22 October 2021 to 22 April 2022. There is a **guide** (https://www.gov.uk/government/publications/guide-to-the-draft-river-basin-management-plans/guide-to-the-draft-river-basin-management-

plans) available to the draft river basin management plans and the data for individual catchments is available on the **Catchment Data Explorer** (https://environment.data.gov.uk/catchment-planning/v/c3-draft-plan).

2.5.4 Flood Risk Management Plans

Flood Risk Management Plans (FRMPs) are part of the six-year cycle of assessment, mapping and planning required under the Flood Risk Regulations. The first FRMPs were published in 2016 and they describe actions to manage flood risk across England between 2015 to 2021.

The draft FRMPs for 2021 to 2027 underwent a 3-month public consultation from 22 October 2021 to 21 January 2022 and the comments are currently being reviewed with a summary of responses expected to be published in early summer 2022.

The Yorkshire Dales National Park falls across three FRMP areas, namely: **Humber** (https://consult.environment-agency.gov.uk/fcrm/draft-second-cycle-flood-risk-management-plans/supporting_documents/Humber_FRMP_20212027WM.pdf), **North West** (https://consult.environment-agency.gov.uk/fcrm/draft-second-cycle-flood-risk-management-plans/supporting_documents/North_West_FRMP_20212027WM.pdf) and **Solway Tweed** (https://consult.environment-agency.gov.uk/fcrm/draft-second-cycle-flood-risk-management-plans/supporting_documents/Solway_Tweed_FRMP_20212027WM.pdf). The Solway Tweed area falls across the England-Scotland border and the FRMP for this report only includes the English Catchments.

The Environment Agency led the development of the FRMPs with the draft plans for 2021 to 2027 published in October 2021. The FRMPs summarise the flooding affecting the area and describes the measures to be taken to address the risk in accordance with the Flood Risk Regulations.

2.5.5 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMPs) are a high-level strategic plan providing an overview of flood risk across each river catchment. The Environment Agency use CFMPs to work with other key-decision makers to identify and agree long-term policies for sustainable flood risk management.

The Yorkshire Dales National Park is situated across five Catchment Flood Management Plan areas (Eden, Lune, Ribble, Aire and Ouse).

The northwest corner of the Yorkshire Dales National Park sits within the **Eden Catchment Flood Management Plan (CFMP)** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/289422/Eden_Catchment_Flood_Management_Plan.pdf) and is part of the following sub-area:

- **Sub-area 1 (Upper and Middle Eden)** – this sub-area is rural with small, scattered settlements and the flood risk to property is low, with small effects from climate change on the number of properties at risk. The catchment responds rapidly to rainfall and there are limited options to store floodwaters. Management is focused on cost-effective ways of managing the risk in the sub-area, maximising the benefits from existing defences and considering the impacts of further management on the Sites of Special Scientific Interest (SSSI). There is also a focus on preparing the community to manage the effects of flooding and working with the local authority to prepare emergency response plans.

The west side of the Yorkshire Dales National Park sits within the **Lune Catchment Flood Management Plan (CFMP)** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/293698/Lune_Catchment_Flood_Management_Plan.pdf) and is part of the following sub-areas:

- **Sub-area 1 (Rural Lune)** – this sub-area covers the rural areas of the River Lune catchment, with the flood risk mainly to a few isolated properties but there is also critical infrastructure at flood risk, including electricity sub-stations and sewage treatment works. The number of properties at a risk of flooding is shown to increase considerably with climate change. There are no significant flood defences in the sub-area and the preferred management option is for little intervention and to allow the catchment to continue to function in a natural way.
- **Sub-area 9 (Wenning sub-catchment)** - the north-east part of this sub-catchment lies within the Yorkshire Dales National Park. The main flood risk in this sub-area is from the River Wenning which is a rural tributary of the River Lune draining from the western slopes of the Yorkshire Dales. The speed of the floodwater through this sub-area causes serious hazard. However, the villages within this catchment where several properties are identified to be at a risk of flooding do not lie within the Yorkshire Dales National Park.

There is a stretch of the Yorkshire Dales National Park from the centre of the southern boundary to the centre of the park which sits within the **Ribble Catchment Flood Management Plan (CFMP)** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/293727/Ribble_Catchment_Flood_Management_Plan.pdf) and is part of the following sub-areas:

- **Sub-area 1 (Upper Ribble and Hodder)** – this sub-area is predominantly rural and sparsely populated, with natural rivers and no flood defences. Properties at risk of flooding are dispersed across the sub-area. Management in this sub-area is focused on resilience measures within the properties at risk, which is likely to be more economical than any major engineering works. There are also options to increase flood storage and enhance natural habitats.
- **Sub-area 2 (Rural Ribble)** - a small area of the Yorkshire Dales National Park around Long Preston falls within this sub-area. This sub-area is predominantly rural with a high nature conservation value. There is a low risk of flooding to properties, which is not forecast to increase due to climate change. Therefore, management in this sub-area is focused on increasing flow storage options whilst enhancing natural habitats.
- **Sub-area 3 (Settle)** - the main flood risk in this sub-area is from the River Ribble with the number of properties currently at risk forecast to double due to climate change over the next 100 years. There is also a risk of sewer flooding. Management in this area is focused on the implementation of sustainable drainage systems (SuDS) and restricting development in floodplains as major hard engineering works in the form of flood defences are unlikely to be economic.

To the east of the Ribble CFMP there is an area of the Yorkshire Dales National Park which sits within the **Aire Catchment Flood Management Plan (CFMP)** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/289346/River_Aire_Catchment_Flood_Management_Plan.pdf) and is part of the following sub-areas:

- **Sub-area 1 (Headwaters)** – this sub-area is predominantly rural with the main communities at flood risk located outside of the Yorkshire Dales National Park. Flood risk in the sub-area comes from the watercourses (The River, Eshton, Earby and Broughton Beck) as well as the Leeds and Liverpool canal and surface water runoff. Management in this sub-area is focused on improving the condition and function of the uplands to reduce runoff rates.
- **Sub-area 2 (Skipton)** - the north most part of this sub-area falls within the Yorkshire Dales National Park. The main flood risk is from Eller Beck from its source through to Skipton, which lies to the south of the National Park. In this sub-area there are many properties at risk of fluvial flooding as well as flooding from the Leeds and Liverpool canal, sewer flooding and surface water runoff. However the majority of these properties will fall outside the Yorkshire Dales National Park.

The east side of the Yorkshire Dales National Park sits within the **Ouse Catchment Flood Management Plan (CFMP)** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/289228/River_Ouse_Catchment_Flood_Management_Plan.pdf) and is part of the following sub-area:

- **Sub-area 1 (The Uplands)** – this sub-area is largely rural although there are properties at both fluvial and surface water flood risk. The steepness of the catchment results in short lead times and fast flowing flood waters. Dispersed flood risk to property means that it is not feasible to defence all local properties. Therefore, management is mainly focused on working with landowners to change the way the land is managed to reduce run off from the upland areas and seeking potential for flood storage areas, although acknowledging the limitations of this due to the topography of the sub-area.

2.5.6 North Yorkshire Local Flood Risk Management Strategy

The **North Yorkshire Local Flood Risk Management Strategy** (NYLFRMS) (https://www.northyorks.gov.uk/sites/default/files/fileroot/Environment%20and%20waste/Flooding/BES1014_Local_flood_risk_strategy_-_section_1.pdf) sets out how North Yorkshire County Council (NYCC) will manage flood risk from surface water runoff, groundwater and ordinary watercourses for which they have a responsibility as LLFA and the work that other Risk Management Authorities are doing to manage flood risk. Other duties of NYCC include investigating incidences of flooding, maintain a register of structures which have an effect on flood risk, operate an approval body for SuDS and coordinate activities of relevant agencies.

The Strategy has six objectives, which are to:

- **Greater Role for Communities** – creating a greater role for communities and businesses in managing flood risk, for example monitoring

- **Improve Understanding and Awareness –** Develop a greater knowledge and understanding of flood risk and management responsibilities within NYCC and amongst partners, stakeholders, communities and the media
- **Sustainable Management -** appropriate development utilising sustainable drainage where possible
- **Improved Knowledge** – create an overall better understanding of the watercourse network and drainage infrastructure
- **Multiple Benefits** - management measures that deliver social, economic and environmental benefits
- **Cost-Effective** – efficient use of all potential funding opportunities to deliver flood risk management measures

To meet these objectives, the NYCC has split the Strategy under the following elements:

- **Action plan** – captures the tasks and activities associated with developing and setting up Flood Risk Management functions
- **Protocol** – reviewing and investigating flooding incidents to establish the scale of the issue and response options
- **Flood risk in North Yorkshire** – summary of the key factors influencing overall flood risk and from different sources
- **Relevant legislation** – summary of flooding and land drainage legislation and guidance
- **Roles and responsibilities** – overview of the flood risk management duties and responsibilities of organisations, businesses and individuals
- **Financing management** – overview of funding options (national, regional and local) for flood risk reduction and management
- **Strategic environmental assessment** – describes the requirements for environmental considerations and the links to flood risk management

2.5.7 Cumbria Local Flood Risk Management Strategy

The **Cumbria Local Flood Risk Management Strategy** (CLFRMS) (https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/5894/4212914154.PDF) sets out how Cumbria County Council (CCC) will manage flood risk from surface water runoff, groundwater and ordinary watercourses for which they have a responsibility as LLFA and the work that other Risk Management Authorities are doing to manage flood risk. Other duties of CCC include investigating incidences of flooding, maintain a register of structures which have an effect on flood risk, operate an approval body for SuDS and coordinate activities of relevant agencies.

The Strategy has five objectives, which are to:

- **Reduce flood risk** – reduce local flood risk as far as possible by effectively coordinating the resources available in the different Risk management Authorities (RMAs), maintaining existing assets and involving local communities in the flood mitigation process.
- **Improve understanding and awareness of flooding –** develop greater knowledge and understanding of flood risk across Cumbria,

including improved data on historic flooding and predicted flood risk which is made available to all RMAs.

- **Integrate flood risk management within the planning process –** enable increased resilience and sustainable development and ensure development in areas at risk of flooding is justified and sensitive to the flood risk.
- **Facilitate close partnership working –** develop the opportunities for increased partnership working between the RMAs in Cumbria.
- **Improve community resilience –** promote the formation and development of Flood Action Groups (FAGs) and promote a two-way dialogue between CCC and the FAGs to share local knowledge, increase community involvement and community funding for future flood mitigation schemes and develop community preparedness.

2.5.8 Lancashire Local Flood Risk Management Strategy

The **Lancashire Local Flood Risk Management Strategy** (LLFRMS) (https://www.lancashire.gov.uk/media/928565/lancashire-flood-risk-management-strategy-2021-2027-final-v2.pdf) sets out how Lancashire County Council (LCC) will manage flood risk from surface water runoff, groundwater and ordinary watercourses for which they have a responsibility as LLFA and the work that other Risk Management Authorities are doing to manage flood risk. Other duties of LCC include investigating incidences of flooding, maintain a register of structures which have an effect on flood risk, operate an approval body for SuDS and coordinate activities of relevant agencies.

The Strategy has six key themes, which are to:

- **Deliver effective flood risk management locally** – review and update policies and procedures to comply with the most up-to-date legislation, national policies, standards and guidance and well as working with partners to raise awareness and support of local flood issues.
- **Understand local risk and challenges –** work with partner organisations and communities to build further understanding of the local flood risks.
- **Support sustainable flood resilient development –** work with the LPAs to ensure Local Plans and other relevant documents take account of managing flood risk both now and into the future, ensure the principles of sustainable development are applied and continue to advise the use of high-quality SuDS where possible.
- **Improve engagement with their flood family** – continue to improve collaborative working with private and public sector partners, charitable trusts, landowners, communities and businesses whilst increasing public awareness on the implications of climate change on local flood risk, encouraging local actions such as increasing property resilience.
- **Maximise investment opportunities to better protect businesses and communities** – build, maintain and improve local flood infrastructure where this is financially viable and cost-beneficial.

- **Contribute towards a climate resilient Lancashire** – support and assist those responsible for improving the detection, forecasting and issue of warnings of flooding and plan and co-ordinate response to flood emergencies, promoting faster recover, as well as raising awareness of climate change and encouraging collective social responsibility.

2.5.9 LLFAs, surface water and SuDS

The 2019 NPPF states that: 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Para 169). When considering planning applications, local planning authorities should consult the relevant LLFA on the management of surface water in order to satisfy that:

- The proposed minimum standards of operation are appropriate
- Through the use of planning conditions or planning obligations there are clear arrangements for on-going maintenance over the development's lifetime

North Yorkshire Council's and Cumbria County Council's requirements for new developers on SuDS are set out on their website, alongside supporting documents. Lancashire County Council also provide signposts on their website to SuDS guidance for major developments. At the time of writing this SFRA, documents and policies relevant to SuDS and surface water in the Yorkshire Dales National Park are:

- **Flood and Water Management** (https://www.northyorks.gov.uk/flood-and-water-management) (NYCC)
- **Flooding and Development Management** (https://cumbria.gov.uk/planning-environment/flooding/default.asp) (CCC)
- **North Yorkshire County Council – Guidance Notes: Developers and Drainage Engineers** (https://www.northyorks.gov.uk/sites/default/files/fileroot/Environment%20and%20waste/Flooding/NYCC%20SuDS%20Design%20Guidance%202018%20Update.pdf)
- **Cumbria County Council – Development Design Guide: SuDS Components** (https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/43115151648.PDF)
- **Lancashire County Council – Sustainable drainage systems and the planning process** (https://www.lancashire.gov.uk/council/planning/sustainable-drainage-systems/)
- **SuDS Manual (C753)** (https://www.ciria.org/ItemDetail?iProductCode=C753F&Category=FREEPUBS), published in 2007, updated in 2015
- **DEFRA Non-statutory technical standards for sustainable drainage systems, 2015** (https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards)

- **DEFRA National Standards for sustainable drainage systems Designing, constructing (including LASOO best practice guidance), operating and maintaining drainage for surface runoff, 2011**
  (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82421/suds-consult-annexa-national-standards-111221.pdf)
- **Building Regulations Part H (MHCLG) 2010**
  (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/442889/BR_PDF_AD_H_2015.pdf)

The 2021 NPPF states that flood risk should be managed 'using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding' (Para 161). As such, although incorporating SuDS is only a requirement for major development, it is best practice for all development.

2.5.10 Surface Water Management Plans

A Surface Water Management Plan (SWMP) is a study to understand the flood risks that arise from local flooding, which is defined by the Flood and Water Management Act 2010 as flooding from risk from surface runoff, groundwater, and ordinary watercourses. SWMPs are led by a partnership of flood risk management authorities who have responsibilities for aspects of local flooding, including the LLFA, Local Authority, Sewerage Undertaker and other relevant authorities. The purpose of a SWMP is to identify what the local flood risk issues are, what options there may be to prevent them or the damage they cause and who should take these options forward. This is then presented in an Action Plan that the stakeholders and partners agree.

JBA Consulting prepared a **Cumbria Surface Water Management Plan** (https://cumbria.gov.uk/elibrary/Content/Internet/538/755/1929/17716/17717/42117104122.PDF) on behalf of Cumbria County Council in 2012. This plan covers the northwest area of the Yorkshire Dales National Park. This SWMP was undertaken in three stages:

- Phase 1: Strategic Risk Assessment
  - This study aimed to assess surface water flood risk across the whole area to identify potential flood risk locations. 46 locations were identified as being at risk of surface water flooding which were then reviewed in Phase 2. One of these locations (Crosby Ravensworth) falls within the Yorkshire Dales National Park.
- Phase 2 – Intermediate Risk Assessment
  - Phase 2a – the 46 locations identified in Phase 1 were reviewed in more detail and recommendations for next steps were made. The flood risk in Crosby Ravensworth was identified to be primarily a Main River issue with some other minor local issues and the recommendation was for the Making Space for Water group monitoring to continue. This location was therefore not considered further in the SWMP.
  - Phase 2b – 16 sites were identified in Phase 2a as requiring a more detailed assessment. This phase involved consultation

with stakeholders to determine if detailed modelling would benefit each location.

- Phase 3: Options and Action Plans
    - Six locations were taken forward to an options appraisal.

Jacobs prepared a SWMP for Lancaster (Rural) in August 2013 on behalf of Lancashire County Council, with a draft version provided for this SFRA. This covers the area of the Yorkshire Dales National Park which lies within the LCC boundary. One potential Risk Area in the Strategic Review lies within the National Park (LR01 Ireby). However, the risk was summarised as localised highway ponding and considered a low risk, so no further investigation was recommended.

North Yorkshire do not have a SWMP.

3 Planning policy for flood risk management

This section summarises national planning policy for development and flood risk.

3.1 National Planning Policy Framework and Guidance

The revised **National Planning Policy Framework (NPPF)** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/733637/National_Planning_Policy_Framework_web_accessible_version.pdf) was published in July 2021, replacing the 2019 version. The NPPF sets out Government's planning policies for England. It must be considered in the preparation of local plans and is a material consideration in planning decisions. The NPPF defines Flood Zones, how these should be used to allocate land and flood risk assessment requirements. The NPPF states that:

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

Planning Practice Guidance (https://www.gov.uk/government/collections/planning-practice-guidance) on flood risk was published in August 2021 and sets out how the policy should be implemented. **Diagram 1 in the NPPG** (https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-risk-in-local-plans) sets out how flood risk should be considered in the preparation of Local Plans.

3.2 The risk-based approach

The NPPF takes a risk-based approach to development in flood risk areas. The Sequential Test has always been applied for fluvial and coastal flooding but since July 2021 the Sequential Test (as defined in Para 162 of the NPPF) requires that all sources of flood risk are now included in the consideration. At the time of preparation of this 2022 SFRA no updated guidance has been published to describe how the approach to the Sequential Test should be modified. The requirement has been addressed by adopting the following approach:

- The test will continue to be based on the use of the fluvial flood Zones describing river flood risk.
- Surface Water flood Zones will be prepared based on the available surface water flood mapping (two Zones will be described, namely "A" and "B").
- As there is no available risk mapping for other sources of risk that is comparable with that for the rivers and surface water it is not considered appropriate to seek to include such information in the performance of the Sequential Test (in summary there is no formal risk mapping for reservoir flood risk, sewer flooding or groundwater flood risk and thus including the available risk information would compromise the results obtained from the test and so invalidate the logical basis for the testing approach).

3.2.1 Flood Zones – river risk

The definition of the fluvial Flood Zones is provided below. The fluvial Flood Zones do not take into account defences. This is important for planning long-term developments as long-term policy and funding for maintaining flood defences over the lifetime of a development may change over time.

The fluvial Flood Zones do not take into account surface water, sewer or groundwater flooding or the impacts of canal or reservoir failure. They do not consider climate change. Hence there could still be a risk of flooding from other sources and that the level of flood risk will change over time during the lifetime of a development.

The fluvial Flood Zones are:

- **Flood Zone 1 – Low probability:** less than a 0.1% chance of river flooding in any given year.
- **Flood Zone 2 – Medium probability:** between a 1% and 0.1% chance of river flooding in any given year.
- **Flood Zone 3a – High probability:** greater or equal to a 1% chance of river flooding in any given year. Excludes Flood Zone 3b.
- **Flood Zone 3b – Functional Floodplain:** land where water has to flow or be stored in times of flood. SFRAs identify this fluvial Flood Zone in discussion with the LPA and the Environment Agency. The identification of the functional floodplain takes account of local circumstances. Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes.

Important note on fluvial Flood Zone information in this SFRA

The fluvial Flood Zones (Flood Zones 2 and 3a) in the Appendix A Geo-PDFs are shown from the online Environment Agency's **'Flood Map for Planning'** The majority of the mapping of flood risk is derived from generic modelled data at a low resolution. The mapping incorporates more detailed hydraulic modelled data where available. All of the models used for this SFRA have been fully incorporated into the EA fluvial Flood Zones. However, the models across the National Park only cover small areas. For the purposes of a Level 1 SFRA it would not be practicable or proportionate to seek to increase coverage of more up to date modelling. Detailed modelling to support a site-specific Flood Risk Assessment is recommended for development in areas with no hydraulic modelling coverage.

The Environment Agency fluvial Flood Zones do not cover all catchments or ordinary watercourses with areas <3km^2. As a result, whilst the Environment Agency fluvial Flood Zones may show an area is in Flood Zone 1, there may be a flood risk from smaller watercourses not shown in the Flood Zones.

Functional floodplain (Flood Zone 3b) is identified as land which would flood with an annual probability of 1 in 20 years, where detailed hydraulic modelling exists. The 1 in 20-year or 1 in 25-year defended modelled flood extents have been used to represent Flood Zone 3b, where available from the Environment Agency. These models include watercourse in the areas of Ravenstonedale, Clapham, Crosby Ravensworth, Great Asby, Hawes, Kettlewell, Settle, Stainforth and Eshton. Figure B-1 in Appendix B shows the exact locations of these models in the National Park.

However, for the rest of the National Park, no detailed model coverage is available and so Flood Zone 3a has to be used as a conservative indication. This may lead to an overestimation of the area that would naturally flood therefore further work should be undertaken as part of a detailed site-specific Flood Risk Assessment to define the extent of Flood Zone 3b where no detailed modelling exists.

It should also be noted that Flood Storage Areas would be considered Flood Zone 3b and Safeguarded Land may also fall into this category. There are currently no Flood Storage Areas within the Yorkshire Dales National Park but awareness may facilitate the identification of future flood storage, floodplain compensation, SuDS, or other flood infrastructure.

Owing to the limitations associated with using Flood Zone 3a as a proxy for Flood Zone 3b, the following guidance could be used by developers, the LPA and consultees where it is felt a challenge to the flood risk mapping is required:

- Undertake site-specific Flood Risk Assessments to refine the extent of Flood Zone 3b. This should include consideration of future flood risk through the application of climate change uplifts (the details for the management catchments in the Yorkshire Dales are provided in Section 4).
- Flood Zone 3b may further be refined by considering whether there is infrastructure or solid buildings because areas which would naturally flood, but which are prevented from doing so by existing defences and

infrastructure or solid buildings, will not normally be identified as functional floodplain.

- Engage in pre-application conversations and/or evidence review procedures to encourage the uptake of dialogue prior to statutory consultations.
- Development close to rivers should consider improving, restoring and enhancing the river environment, which can reduce flood risk.
- Where sites have successfully been removed from Flood Zone 3b, they are still likely to be within Flood Zone 3a, therefore there will still be a requirement to show how subsequent development can be made safe without increasing risk elsewhere.

3.2.2 Flood Zones – surface water risk

To address the requirement that flood risk from all sources is included in the Sequential Test a further set of surface water Zone maps has been prepared.

The surface water Zone maps describe two zones that describe locations at either low or high risk of surface water flood risk based on the extent of the 1 in 1000-year surface water modelling described in the Environment Agency Risk of Flooding from Surface Water mapping (RoFSW).

The surface water Flood Zones are:

- Flood Zone B – high risk: each year the area has greater than a 1 in 1000 chance of flooding.
- Flood Zone A – low risk: each year the area has less than a 1 in 1000 chance of flooding.

The reason for this approach is that normally the proportionate extent of surface water flood risk is less than can be the case for river flooding. Surface water flood risk can also be of much shallower depth and is not normally experienced for such extensive durations as river flooding. However, the safety implications of placing proposed development at locations where there is surface water flood risk together with the potential effects on third parties is a material consideration and thus if it is proposed to place development in a Zone of high surface water flood risk then consideration should be given to the demonstrating that part “b” of the Exception Test (outlined in section 3.2.5) can be satisfied (with the presumption that part “a” was satisfied if the land was allocated in the Local Plan).

3.2.3 Flood Zones – other sources of flooding

It is not possible to prepare zone maps for reservoir flood risk, sewer flood risk or groundwater flood risk as the appropriate analyses and data is not available. The existing risk information on reservoirs, sewer flooding and groundwater is used in the sequential approach to development at a site in accordance with paragraph 161 of the NPPF.

3.2.4 The Sequential Test

Firstly, land at the lowest risk of flooding from river and surface water should be considered for development. The test performed is called the ‘Sequential Test’. This is a stepwise process, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement. The

process must be documented, and evidence used to support decisions recorded.

The LPA will apply the Sequential Test to strategic allocations. The Sequential Test does not apply to minor developments and change of use (except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site), however a site-specific Flood Risk Assessment would be required if the development would introduce a more vulnerable use. For all other developments, developers must supply evidence to the LPA, with a Planning Application, that the development has passed the test. Whether any further work is needed to decide if the land is suitable for development will depend on both the vulnerability of the development and the Flood Zone it is proposed for.

The LPA should work with the Environment Agency to define a suitable area of search for the consideration of alternative sites in the Sequential Test. The Sequential Test can be undertaken as part of a Local Plan Sustainability Appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of Strategic Housing Land or Employment Land Availability Assessments.

The SFRA User Guide in Appendix C shows where the Sequential and Exception Test may be required for the datasets assessed in the SFRA, and how to interpret different levels of concern with the datasets, recommending what development might be appropriate in what situations.

The following section outlines the application of the different forms of flood risk in the Sequential Test:

- **Fluvial flood risk** - Figure 3.1 summarises the approach with respect to using the available Zone mapping for rivers and sea.

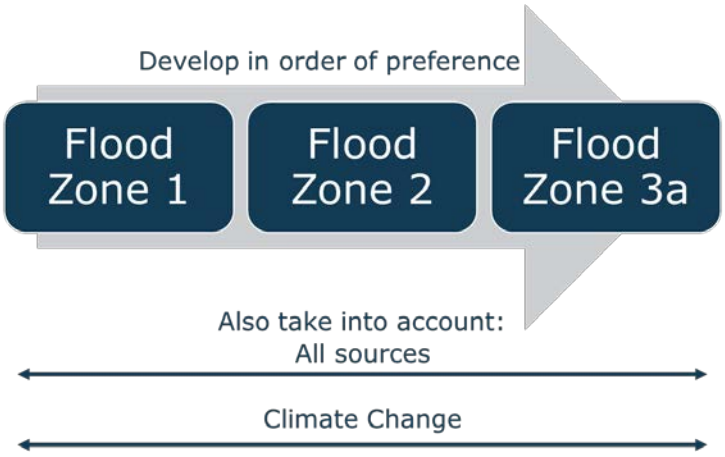


Figure 3.1: The Sequential Test

Annex 3 of the NPPF (https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification) defines the vulnerability of different development types to flooding with respect to river flood risk and Table 3 of the NPPG (shown in Figure 3.2) indicates whether, having applied the Sequential Test first, that vulnerability of development is suitable for that Flood Zone and where further work is needed.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

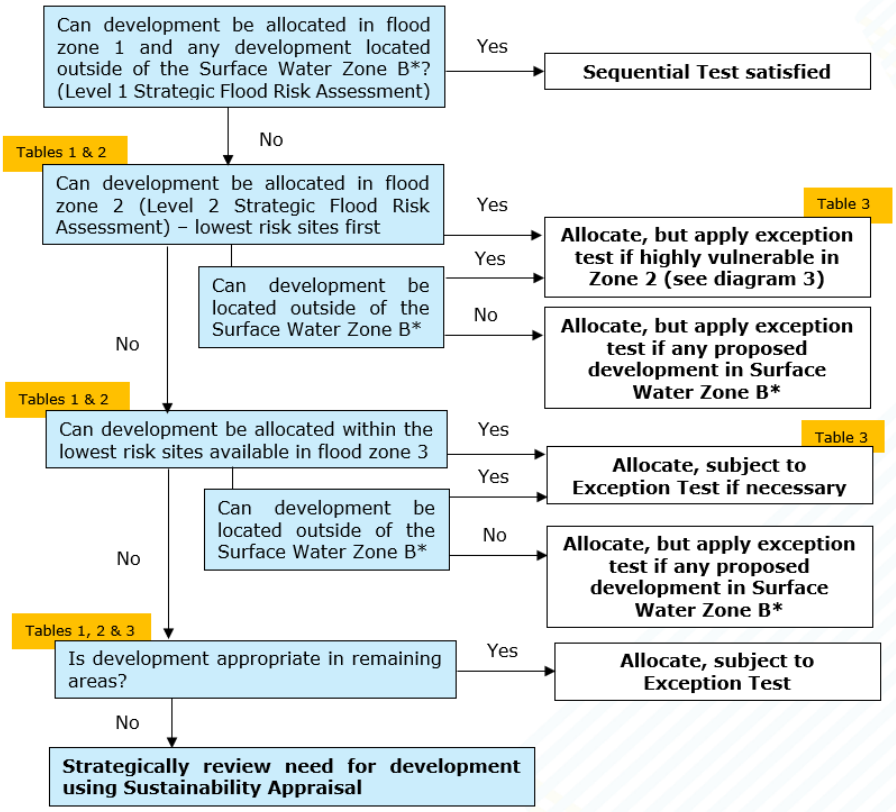
Key:

✓ Development is appropriate

✗ Development should not be permitted.

Figure 3.2: Table 3 of the NPPG

- **Surface water flood risk -** The test should also address the sequence for surface water flooding. This approach is described in Figure 3.3 which is a modification of Diagram 2 in the Planning Practice Guidance that has been adjusted so the Test accommodates the Sequential Testing of surface water risk. This illustrates the Sequential and Exception Tests as a process flow diagram using the information contained in this SFRA to assess potential development sites against surface water Zones and the EA's Flood Map for Planning fluvial flood zones and development vulnerability compatibilities. This will help determine whether sites are likely to require a Level 2 SFRA before being allocated. For surface water Zones it should be considered that all categories of development could be appropriate subject to meeting the requirements of part "b" of the Exception Test.



Note - other sources of flood risk should also be considered, as per the 2021 update to NPPF but formal zone mapping is not available (Surface Water Zones "A" and "B" used to define risk sequentially)*

Figure 3.3: Local Plan sequential approach to site allocation (Table 3 is shown in Figure 3.2 and Tables 1 and 2 can be found in the planning practice guidance: https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-1-Flood-Zones)

- **Other sources of flood risk -** The latest NPPF also states that the risk of flooding from other sources and the impact of climate change must be considered when considering which sites are suitable to allocate. The mapping available for reservoirs, groundwater and sewers is not deemed to be appropriate to apply in the Sequential Test for one or more of the following reasons: the levels of risk are not defined, the information is not of appropriate resolution or format, certain data do not provide the confidence or certainty required. However, the available information can be used to consider potential flood risk from reservoirs, groundwater and sewers.

Additionally, Section 4 provides details on considering climate change.

3.2.5 The Exception Test

It will not always be possible for new development to be allocated on land that is not at risk from flooding. To further inform whether land should be allocated, or Planning Permission granted, a greater understanding of the scale and nature of the flood risks is required (the actual risk and how this is predicted to change over the lifetime of the development). In these instances, the Exception Test will be required.

The Exception Test should only be applied following the application of the Sequential Test. It applies in the following instances:

- More vulnerable uses in river Flood Zone 3a
- Essential infrastructure in river Flood Zone 3a or 3b
- Highly vulnerable uses in river Flood Zone 2 (this is NOT permitted in river Flood Zone 3a or 3b)
- Any development in Surface Water Zone "B"

Figure 3.4 summarises the Exception Test.

For sites allocated within the Local Plan, the Local Planning Authority should use the information in this SFRA and additionally a Level 2 SFRA to inform the Exception Test. At planning application stage, the Developer must design the site such that it is appropriately flood resistant and resilient in line with the recommendations in National and Local Planning Policy and supporting guidance and those set out in this SFRA. This should demonstrate that the site will still pass the flood risk element of the Exception Test based on the detailed site level analysis.

For developments that have not been allocated in the Local Plan, developers must undertake the Exception Test and present this information to the Local Planning Authority for approval. The Level 1 SFRA can be used to scope the flooding issues that a site-specific FRA should look into in more detail to inform the Exception Test for windfall sites.

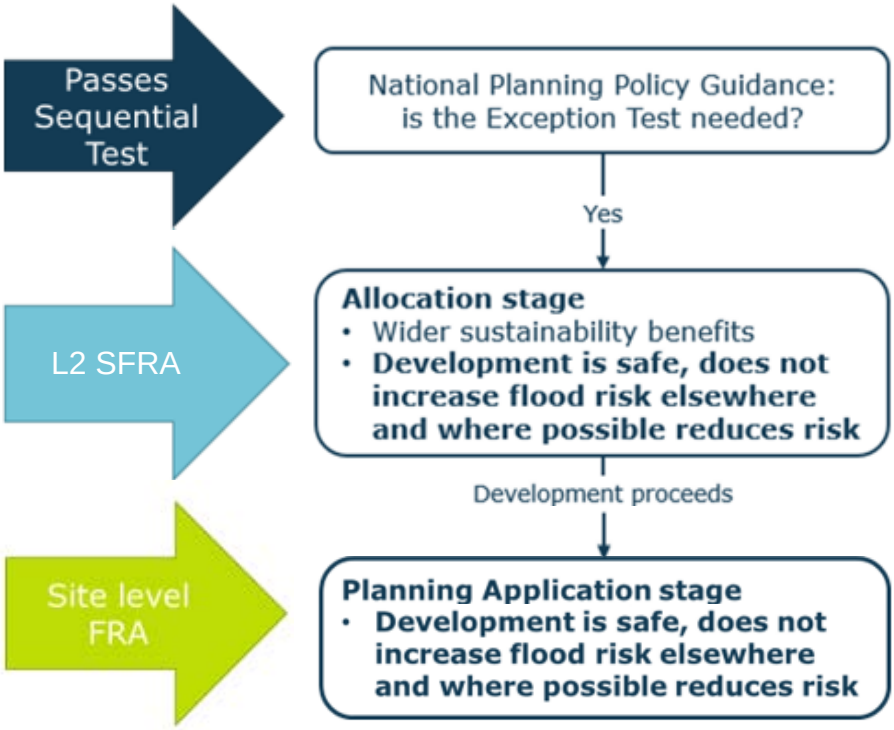


Figure 3.4: The Exception Test

There are two parts to demonstrating a development passes the Exception Test:

Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk

Local planning authorities will need to consider what criteria they will use to assess whether this part of the Exception Test has been satisfied and give advice to enable applicants to provide evidence to demonstrate that it has been passed. If the application fails to prove this, the Local Planning Authority should consider whether the use of planning conditions and / or planning obligations could allow it to pass. If this is not possible, this part of the Exception Test has not been passed and planning permission should be refused.

At the stage of allocating development sites, Local Planning Authorities should consider wider sustainability objectives, such as those set out in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.

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

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

In circumstances where the potential effects of proposed development are material a Level 2 SFRA is likely to be needed to inform the Exception Test in these circumstances for strategic allocations to provide evidence that the principle of development can be supported. At Planning Application stage, a site-specific Flood Risk Assessment will be needed. Both would need to consider the actual and residual risk and how this will be managed over the lifetime of the development:

- The actual risk is the risk to the site considering existing flood mitigation measures. The fluvial 1% chance flood in any year event is a key event to consider because the National Planning Practice Guidance refers to this as the 'design flood' against which the suitability of a proposed development should be assessed and mitigation measures, if any, are designed.
- Safe access and egress should be available during the design flood event. Firstly, this should seek to avoid areas of a site at flood risk. If that is not possible then access routes should be located above the design flood event levels. Where that is not possible, access through shallow and slow flowing water that poses a low flood hazard may be acceptable.
- Residual risk is the risk that remains after the effects of flood defences have been taken into account and/ or from a more severe flood event than the design event. The residual risk can be:

- The effects of an extreme 0.1% chance flood in any year event. Where there are defences, this could cause them to overtop, which may lead to failure if this causes them to erode; and/or
- Structural failure of any flood defences, such as breaches in embankments or walls.
- Examples of other residual risks include blockage of a surface water conveyance system, overtopping of an upstream storage area, failure of a pumped drainage system and/or failure of a reservoir.

Flood resistance and resilience measures should be considered to manage any residual flood risk by keeping water out of properties and seeking to reduce the damage it does, should water enter a property. Emergency plans should also account for residual risk, e.g. through the provision of flood warnings and a flood evacuation plan where appropriate.

In line with the NPPF, the impacts of climate change over the lifetime of the development should be taken into account when considering actual and residual flood risk.

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

3.3.1 Sequential Test

The Yorkshire Dales National Park Authority, with advice from the Environment Agency, are responsible for considering the extent to which Sequential Test considerations have been satisfied.

Developers are required to undertake the Sequential Test to all development sites, unless the site is either:

- A strategic allocation and the test has already been carried out by the LPA;
- A change of use (except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate);
- A minor development (householder development, small non-residential extensions with a footprint of less than 250m^2); or
- A development in Flood Zone 1, unless there are other flooding issues in the area of the development (i.e. surface water, ground water, sewer flooding).

Even if the Sequential Test is not required, a site-specific Flood Risk Assessment will still be required for most developments located in a risk zone or greater than one hectare.

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

Local circumstances must be used to define the area of application of the Sequential Test (within which it is appropriate to identify reasonably available alternatives). The criteria used to determine the appropriate search area relate to the catchment area for the type of development being proposed. For some sites this may be clear e.g. school catchments, in other cases it

may be identified by other Local Plan policies. For some sites e.g. regional distribution sites, it may be suitable to widen the search area beyond LPA administrative boundaries.

The sources of information on reasonably available sites may include:

- Site allocations in Local Plans
- Site with Planning Permission but not yet built out
- Strategic Housing and Economic Land Availability Assessments (SHELAAs)/ five-year land supply/ annual monitoring reports
- Locally listed sites for sale

It may be that a number of smaller sites or part of a larger site at lower flood risk form a suitable alternative to a development site at high flood risk.

Ownership or landowner agreement in itself is not acceptable as a reason not to consider alternatives, although clearly the individual circumstances of locationally-specific enterprises (e.g. rural land-based businesses) will have a limiting effect on the range of alternatives that can reasonably be considered.

The SFRA User Guide in Appendix C shows where the Sequential and Exception Test may be required for the datasets assessed in the SFRA, and how to interpret different levels of concern with the datasets, recommending what development might be appropriate in what situations.

3.3.2 The Exception Test

If, following application of the Sequential Test it is not possible for the development to be located in areas with a lower probability of flooding the Exception Test must then be applied if required (as set out in Table 3 of the NPPG). Developers are required to apply the Exception Test to all applicable sites (including strategic allocations).

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

- Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk, where not already satisfied at site allocation stage.

  Applicants should refer to wider sustainability objectives in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.

  Applicants should detail the sustainability issues the development will address and how doing it will outweigh the flood risk concerns for the site e.g. by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.

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

  The site-specific Flood Risk Assessment (FRA) should demonstrate that the site will be safe, and the people will not be exposed to hazardous flooding from any source. The FRA should consider actual and residual risk and how this will be managed over the lifetime of the development, including:

- The design of any flood defence infrastructure
- Access and egress
- Operation and maintenance
- Design of the development to manage and reduce flood risk wherever possible
- Resident awareness
- Flood warning and evacuation procedures, including whether the developer would increase the pressure on emergency services to rescue people during a flood event; and
- Any funding arrangements required for implementing measures.

4 Impact of climate change

Climate change projections show an increased chance of warmer, wetter winters and hotter, drier summers with a higher likelihood of more frequent and intense rainfall. This is likely to make severe flooding happen more often.

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

4.1 Revised Climate Change Guidance

The Climate Change Act 2008 creates a legal requirement for the UK to put in place measures to adapt to climate change and to reduce carbon emissions by at least 80% below 1990 levels by 2050.

In 2018, the government published new UK Climate Projections (UKCP18). The Environment Agency used these projections to update their climate change guidance for new developments with regards to updated fluvial and rainfall allowances which were released in July 2021.

The Environment Agency published **updated climate change guidance** (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances) for fluvial risk in July 2021 on how allowances for climate change should be included in both strategic and site-specific FRAs. The guidance adopts a risk-based approach considering the vulnerability of the development and considers risk allowances on a management catchment level, rather than a river basin level. The same approach was then adopted for rainfall allowances in May 2022.

Developers should check the government website for the latest guidance before undertaking a detailed Flood Risk Assessment.

4.2 Applying the climate change guidance

To apply the climate change guidance, the following information needs to be known:

- The vulnerability of the development – see the **NPPF** (https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification)
- The likely lifetime of the development – in general 75 years is used for commercial development and 100 for residential, but this needs to be confirmed in an FRA
- The River Basin and Management Catchment that the site is in – the Yorkshire Dales National Park lies across the Humber, North West and Solway Tweed River Basin Districts. The study area falls within six Management Catchments (Eden and Esk, Lune, Ribble, Aire and Calder, Wharfe and Lower Ouse, and Swale, Ure, Nidd and Upper Ouse).
- Likely depth, speed and extent of flooding for each allowance of climate change over time considering the allowances for the relevant epoch (2020s, 2050s and 2080s)
- The 'built in' resilience measures used, for example, raised floor levels

- The capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach.

4.3 Relevant allowances for the Yorkshire Dales National Park

Table 4-1 shows the updated peak river flow allowances that apply in the Yorkshire Dales National Park for fluvial flood risk for the different Management Catchments (last updated in July 2021). These allowances supersede the previous allowances by River Basin District. In agreement with the Environment Agency, the previous climate allowances can still be used where they lie within +/- 10% of the updated guidance.

Table 4-1 shows the peak rainfall intensity allowances that apply for small catchments (less than 5km^2) and urban catchments for surface water flood risk. Catchments which are larger than 5km^2 or are rural should use Table 4-1 for peak rainfall intensity. Both the central and higher central allowances should be considered to understand the range of impact.

Table 4-2 shows the updated rainfall intensity allowances that apply in the Yorkshire Dales National Park for pluvial flood risk for the different Management Catchments (as of May 2022). These allowances supersede the previous country wide allowances.

Table 4-1: Peak river flow allowances for the Management Catchments in the Yorkshire Dales National Park

Management Catchment	Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Eden and Esk	Higher central	22%	35%	61%
	Central	18%	27%	47%
Lune	High central	24%	38%	61%
	Central	20%	30%	49%
Ribble	Higher central	19%	29%	46%
	Central	16%	23%	36%
Aire and Calder	Higher central	15%	18%	31%
	Central	11%	13%	23%
Wharfe and Lower Ouse	Higher central	14%	18%	31%
	Central	11%	13%	23%
Swale, Ure, Nidd and Upper Ouse	Higher central	15%	20%	34%
	Central	11%	14%	25%

Table 4-2: Peak rainfall intensity allowances for small and urban catchments by Management Catchment in the Yorkshire Dales National Park

Management Catchment	Allowance Category	Total potential change anticipated for the '2050s' (2022 to 2060)		Total potential change anticipated for the '2070s' (2061 to 2125)	
		30-year return period	100-year return period	30-year return period	100-year return period
Eden and Esk	Upper end	35%	40%	45%	50%
	Central	25%	25%	30%	35%
Lune	Upper end	35%	45%	45%	50%
	Central	25%	25%	35%	35%
Ribble	Upper end	35%	40%	40%	50%
	Central	25%	25%	30%	35%
Aire and Calder	Upper end	35%	40%	40%	45%
	Central	20%	25%	25%	30%
Wharfe and Lower Ouse	Upper end	35%	40%	40%	40%
	Central	20%	25%	25%	30%
Swale, Ure, Nidd and Upper Ouse	Upper end	35%	40%	40%	45%
	Central	20%	25%	25%	30%

4.4 Representing climate change in the Level 1 SFRA

4.4.1 Areas covered by hydraulic modelling

Representation of climate change within the SFRA was discussed with the EA. Where previous climate change runs were within +/- 10% of the updated climate change allowances, these were able to be used. The following models were provided with suitable climate change runs for the 2080s central and/or higher central estimates:

- Eshton Beck
- Settle
- Stainforth

The following models were run with the latest climate change allowances for the 2080's central and/or higher central estimates as required:

- Hawes
- Clapham Beck
- Crosby Ravensworth
- Great Asby

- Settle – using the critical storm duration for the River Ribble (13.25 hours)
- Stainforth

The following models were not provided with suitable climate change runs for the 2080s central and/or higher central estimates and were unable to be run for the latest climate change allowances:

- Kettlewell Beck
- Settle – for the extended Tems Beck with the critical storm duration for the Tems Beck (5.25 hours)
- Ravenstonedale

Appendix B provides further details of the models used in this assessment.

4.4.2 Areas outside hydraulic modelling coverage

For any sites not covered by the EA's detailed modelling or not able to be run for appropriate climate change allowances, Flood Zone 2 was used as an indicative climate change extent. Flood Zone 2 is used because this extent is often similar to the Upper End allowance extent for climate change. Due to the limited model availability across the Yorkshire Dales, the use of Flood Zone 2 as a proxy for climate change applies to the majority of the National Park.

The 1 in 1000-year surface water extent can be used as an indication of surface water risk, and risk to smaller watercourses, which are too small to be covered by the EA's Flood Zones.

Developers will need to undertake a more detailed assessment of climate change as part of the planning application process when preparing Flood Risk Assessments, using the percentage increases which relate to the proposed lifetime and the vulnerability classification of the development. In areas where no modelling is present, this may require development of a 'detailed' hydraulic model, using channel topographic survey. The EA should be consulted to provide further advice for developers on how best to apply the new climate change guidance.

4.4.3 Climate change mapping

Climate change mapping has been provided in Appendix A: GeoPDFs for areas where there are detailed hydraulic models. The climate change outputs have been presented under:

- 'Climate Change Extent' including central and higher central

For areas not covered by detailed hydraulic models, Flood Zone 2 is used to provide a conservative indicator for the impacts of climate change.

It is important to note that although the flood extent may not increase noticeably on some watercourses, the flood depth, velocity and hazard may increase compared to the 1 in 100 current-day event.

When undertaking a site-specific Flood Risk Assessment, developers should:

- Confirm which national guidance on climate change and new development applies by visiting **GOV.uk** (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances).

- Apply this guidance when deciding the allowances to be made for climate change, having considered the potential sources of flood risk to the site (using this SFRA), the vulnerability of the development to flooding and the proposed lifetime of the development. If the site is just outside the indicative climate change extents in this SFRA, the impact of climate change should still be considered because these may get affected should the more extreme climate change scenarios materialise.
- Refer to Section 8 which provides further details on climate change for developers, as part of the FRA guidance, and the SFRA User Guide in Appendix C.

4.5 Impact of climate change on flood risk

This section explores which areas of the Yorkshire Dales National Park are most sensitive to increases in flood risk due to climate change. It should be noted that areas that are already at high risk will also become at increasing risk in future and the frequency of flooding will increase in such areas.

It is recommended that the Yorkshire Dales National Park Authority work with other Risk Management Authorities to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the National Park.

4.5.1 Impact of climate change on fluvial flood risk

Climate change modelled flood extents (or Flood Zone 2 where no modelling exists) can be compared to the 1 in 100 flood extent (Flood Zone 3a) for an indication of areas most sensitive to climate change.

Areas in the Yorkshire Dales National Park most sensitive to fluvial impacts of climate change, based on flood extents and the number of properties at risk of flooding, are:

- Crosby Ravensworth, Great Asby, Maulds Meaburn, and Ravenstonedale in the Eden catchment area
- Stainforth in the Ribble catchment area
- Embsay, Flasby and Malham in the Aire catchment area
- Linton and Starbotton in the Wharfe catchment area
- Appersett, Askrigg, Gayle and Hawes in the Ure catchment area
- Fremington and Reeth in the Swale catchment area

4.5.2 Impact of climate change on surface water flood risk

In the absence of modelling surface water risk with climate change uplifts, the 1 in 1000 surface water flood extent can be used as an indication of climate change (as well as for smaller watercourses; some of which are not included in the Flood Zones).

Areas in the Yorkshire Dales National Park most sensitive to changes between the 1 in 100 and 1 in 1000 surface water extents are:

- Crosby Ravensworth and Great Asby in the Eden catchment area
- Dent, Gawthrop, Holme, Ingleton, Ireby and Sedbergh in the Lune catchment area
- Stainforth and Selside in the Ribble catchment area

- Airton, Embsay, Otterburn and Rylstone in the Aire catchment area
- Appletreewick, Arncliffe, Grassington and Kettlewell in the Wharfe catchment area
- Askrigg, Carlton, Gayle, Newbiggin, West Scrafton and West Witton in the Ure catchment area
- Grinton, Keld and Low Row in the Swale catchment area

4.5.3 Impact of climate change on groundwater flood risk

There is no technical modelling data available to assess climate change impacts on groundwater. It would depend on the flooding mechanism, historic evidence of known flooding and geological characteristics, for example prolonged rainfall in a chalk catchment. Flood risk could increase when groundwater is already high or emerged, causing additional overland flow paths or areas of still ponding.

A high likelihood of groundwater flooding may mean infiltration SuDS are not appropriate and groundwater monitoring may be recommended.

4.6 Adapting to climate change

The **NPPG Climate Change guidance** (https://www.gov.uk/guidance/climate-change) contains information and guidance for how to identify suitable mitigation and adaptation measure in the planning process to address the impacts of climate change. Examples of adapting to climate change include:

- Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime.
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development.
- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality.
- Promoting adaptation approaches in design policies for developments and the public realm for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses; and
- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as green infrastructure that improves adaptation, biodiversity and amenity, for example by leaving areas shown to be at risk of flooding as public open space.
- Considering the standard of protection of defences and sites for future development, in relation to sensitivity to climate change. The Yorkshire Dales National Park Authority and developers will need to work with RMAs and use the SFRA datasets to understand whether development is affordable or deliverable. Locating development in such areas of risk may not be a sustainable long-term option, such as at the defence locations mentioned in Section 6.

- It is recommended that the differences in flood extents from climate change are compared by the Yorkshire Dales National Park Authority when allocating sites, to understand how much additional risk there could be, where this risk is in the site, whether the increase is marginal or activates new flow paths, whether it affects access/ egress and how much land could still be developable overall. Recommendations for development are made for the levels of risk in the SFRA User Guide in Appendix C.

5 Understanding flood risk in the Yorkshire Dales National Park

This section explores the key sources of flooding in the Yorkshire Dales National Park and the factors that affect flooding including topography, soils and geology. The main sources of flooding are from watercourses, surface water and sewers.

This is a strategic summary of the risk in the Yorkshire Dales National Park. Developers should use this section to scope out the flood risk issues they need to consider in greater detail in a site-specific Flood Risk Assessment to support a Planning Application.

Appendix B contains a list of the sources of data used in the SFRA and the approach to using hydraulic model data to inform the mapping.

5.1 Historical flooding

North Yorkshire County Council (LLFA) and Cumbria County Council (LLFA) Section 19 reports include recorded historical flood events within the Yorkshire Dales National Park. Lancashire County Council (LLFA) did not have any Section 19 reports which include records of flooding within the area covered by the National Park. The Environment Agency were unable to provide 'communities at risk' datasets for the area. This dataset is not currently used or available to be distributed to external parties.

There is a history of documented flood events, with the main sources being fluvial and surface water. Table 5-1 highlights the historic flood events recorded by the LLFA's within their Section 19 reports.

North Yorkshire County Council also provided a list of locations where they have investigated flooding within the National Park. There were incidents recorded in Malham, Ingleton, Kettlewell, Airton, Hawes, Whaw, West Witton, West Burton, Bainbridge, Low Row and Askrigg, however, no details about the flood mechanisms or dates of these flood events were available.

North Yorkshire Fire and Rescue Service provided records of flooding incidents attended across the National Park over the past five years. These are recorded in Table 5-2. Please note that these could only be refined by incidents either in the open or inside premises. Therefore, the inside premises data will include any incidents attended for burst pipes, household issues and evacuations.

Lancashire County Council provided a record of flooding reports over the last five years. These are recorded in Table 5-3.

Table 5-1: Historic flooding incidents held by North Yorkshire County Council and Cumbria County Council

Location	Date	Additional information recorded
Giggleswick, Settle and Horton in Ribblesdale	February 2020	Prolonged and persistent rainfall throughout the month and three significant rainfall events led to the overtopping of watercourses. The recorded flooding issues in this area relate to Storm Ciara on the 8th-9th February where floodwaters surrounded Horton in Ribblesdale with road and property flooding around Giggleswick and Settle.
Arkengarthdale, High and Low Fremington, Grinton and Reeth	30th July 2019	Flooding of properties and roads following a short period of intense localised rainfall. Flooding was a combination of fluvial flooding due to overtopping of the ordinary watercourses, some exacerbated by debris reducing channel capacity, and surface water runoff from the surrounding hills.
Sedbergh	5-6th December 2015	Approximately five properties flooded due to a prolonged period of heavy rainfall and blockages causing the ordinary watercourses to overtop. This event was related to Storm Desmond, followed by Storm Eva later in the month, which caused extensive damage and disruption across the UK including the Yorkshire Dales.
Swaledale and Arkengarthdale	Summer 1986	Hurricane Charley brought heavy rainfall resulting in flooding across Swaledale and Arkengarthdale, considered to be the largest flood in recent memory to affect these areas.

Table 5-2: Flooding incidents attended from 2017 – 2021 by North Yorkshire Fire and Rescue Service

Year	Flooding – In Open	Flooding – Inside Premises	Total Incidences Attended
2017	3	10	13
2018	2	16	18
2019	11	60	71
2020	9	47	56
2021	3	14	17

Table 5-3: Flooding incidents recorded by Lancashire County Council over the last five years

Location	Details of incident
Long Level Road	10 reports of blocked gullies causing flooding to the highway 1 report of a blocked gulley causing external flooding 1 report of a burst water main causing the highway to flood and ice over
Woodman Lane	2 reports of a blocked gulley causing flooding to the highway 1 report of flooding to the highway lasting over three hours
Longlands Lane	1 report of flooding to the highway lasting over three hours
Todgill Road	1 report of blocked gullies causing flooding to the highway on Todgill Road 1 report of a blocked culvert causing flooding to the highway on Todgill Road 2 further reports of flooding (cause not specified) to the highway

In addition, the EA's **Historic Flood Map (HFM)** (https://data.gov.uk/dataset/76292bec-7d8b-43e8-9c98-02734fd89c81/historic-flood-map) shows areas of land that have been previously subject to fluvial flooding in the area. This includes flooding from rivers, the sea and groundwater springs but excludes surface water. The Historic Flood Map outlines for the Yorkshire Dales National Park are shown in Figure 5.1 and summarised in Appendix E.

Please note this does not include all recorded flood events, such as those from other sources, which the Yorkshire Dales National Park Authority and LLFA's have recorded. Some of the historic extents may refer to older historic flood events, prior to flood defence improvements. It is recommended that the HFM is viewed alongside the **Recorded Flood Outline** (https://data.gov.uk/dataset/16e32c53-35a6-4d54-a111-ca09031eaaaf/recorded-flood-outlines) dataset, in Appendix A mapping.

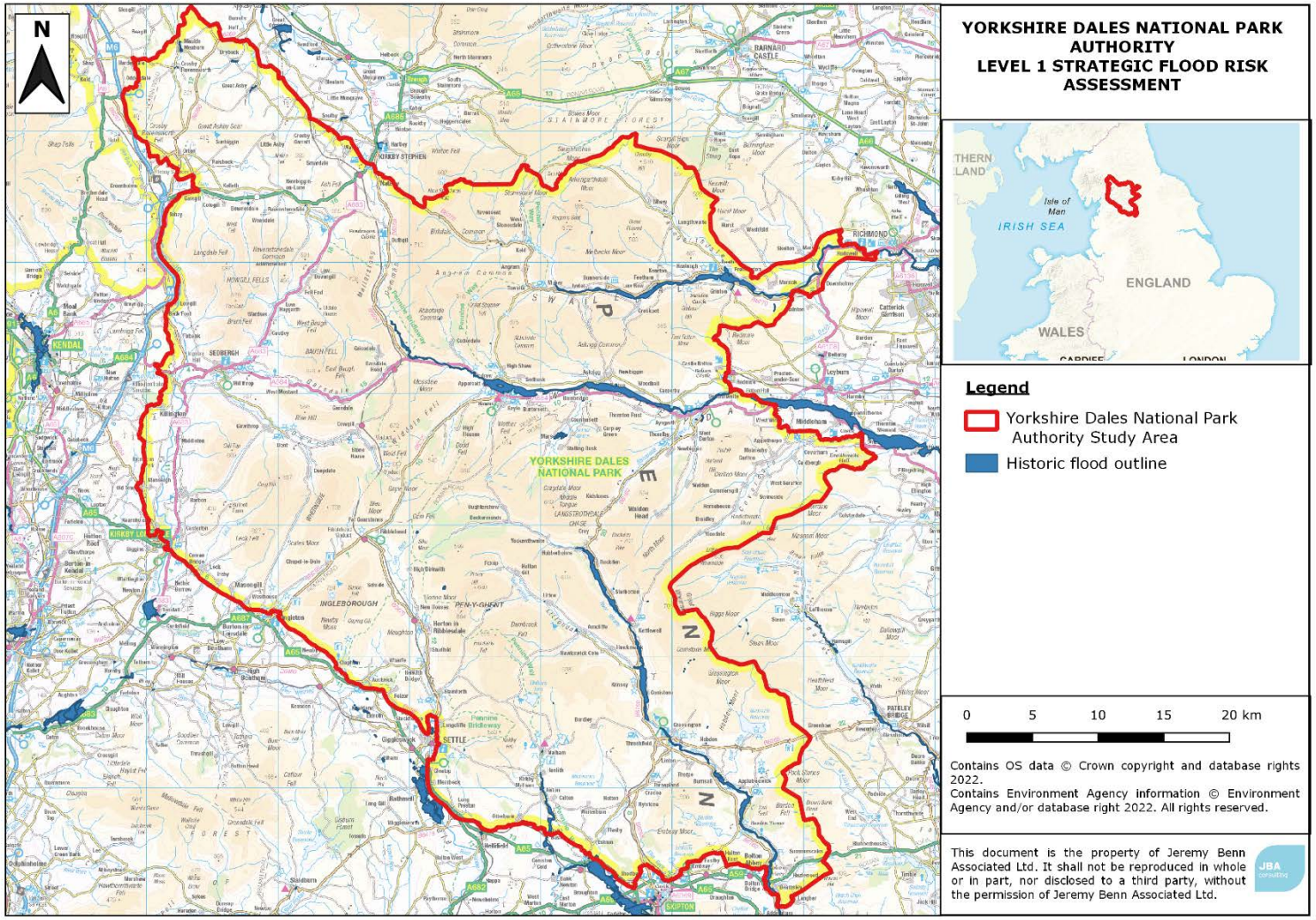


Figure 5.1: Yorkshire Dales National Park historic flood outlines from the EA's Historic Flood Map

5.2 Topography, geology, soils and hydrology

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

5.2.1 Topography

The Yorkshire Dales National Park is predominantly an upland area consisting of steeply sloping hills with wide u-shaped valleys between them. The steep sloping nature of the National Park means that flooding in the area is typically flashy in nature and mostly confined to narrow floodplains however there is increased flood risk at the confluences of watercourses.

The topography slopes downhill towards the eastern boundary of the national park in three main areas: where the River Swale flows out of the area at Richmond to the north, where the River Ure flows out of the area slightly further south to the east of Leyburn and where the River Cover flows out of the area to the south of Leyburn.

The topography slopes downhill to the south in three main areas: where the River Ribble leaves the area at Settle, where the River Aire leaves the area to the northwest of Gargrave and where the River Wharfe leaves the area to the north of Addingham.

The topography also slopes downhill towards the west of the area where the River Rawthey and River Dee flow east and join the River Lune which flows south within the western area of the National Park. The topography also slopes downhill at the north of the area where the River Eden leaves the area to the south of Kirkby Stephen and in the northwest where there are several smaller watercourses, including Lyvennet Beck and Hoff Beck, which flow north out of the area.

The topography of the study area is shown in Figure 5.2.

5.2.2 Geology

The geology of the catchment can be an important influencing factor in the way that water runs off the ground surface. This is primarily due to variations in the permeability of the surface material and bedrock stratigraphy.

The underlying geology in the Yorkshire Dales National Park is predominantly Yoredale Group and undifferentiated Dinantian Rocks. These are limestone with subordinate sandstone and argillaceous rocks.

The higher elevation areas, particularly to the northeast and south of the National Park, are comprised of Millstone Grit Group (mudstone, siltstone and sandstone) and Yoredale Group (limestone, sandstone, siltstone and mudstone).

In the west of the National Park there are areas of undifferentiated Wenlock Rocks (sandstone and conglomerate) and undifferentiated Silurian Rocks (mudstone, siltstone and sandstone).

To the northeast of the National Park there is a small area of undifferentiated Permian Rocks (sandstone and conglomerate) where the River Eden leaves the National Park.

It is likely that these areas of mixed geology will exhibit different catchment responses depending on the local geology. Where the area is dominated by limestone and sandstone formations, it is expected that the areas will have a slower catchment response compared with those areas dominated by mudstone and siltstone deposits.

The bedrock geology of the study area is shown in Figure 5.3.

The superficial geology across the higher elevation areas in the National Park is predominantly peat, although there are also large areas where information on superficial deposits is not available.

The lower elevation areas in the National Park are predominantly till (diamicton) with areas of alluvium (clay, silt and sand) and undifferentiated River Terrace Deposits (sand and gravel).

The superficial geology of the study area is shown in Figure 5.4.

5.2.3 Soils

Higher elevation areas in the Yorkshire Dales National Park are predominantly covered in slowly permeable wet very acid upland soils with a peaty surface, very acid loamy upland soils with a wet peaty surface and blanket bog peat soils.

Along the River Ure in the east of the National Park there are loamy and clayey floodplain soils with naturally high groundwater surrounded by freely draining slightly acid loamy soils and freely draining slightly acid but base-rich soils. There are also loamy and clayey floodplain soils with naturally high groundwater along other watercourses in the National Park.

In the northwest of the National Park, at the Howgill Fells, there are shallow very acid peaty soils over rock and freely draining acid loamy soils over rock.

Around Airton and Winterburn there are areas of slightly acid loamy and clayey soils with impeded drainage

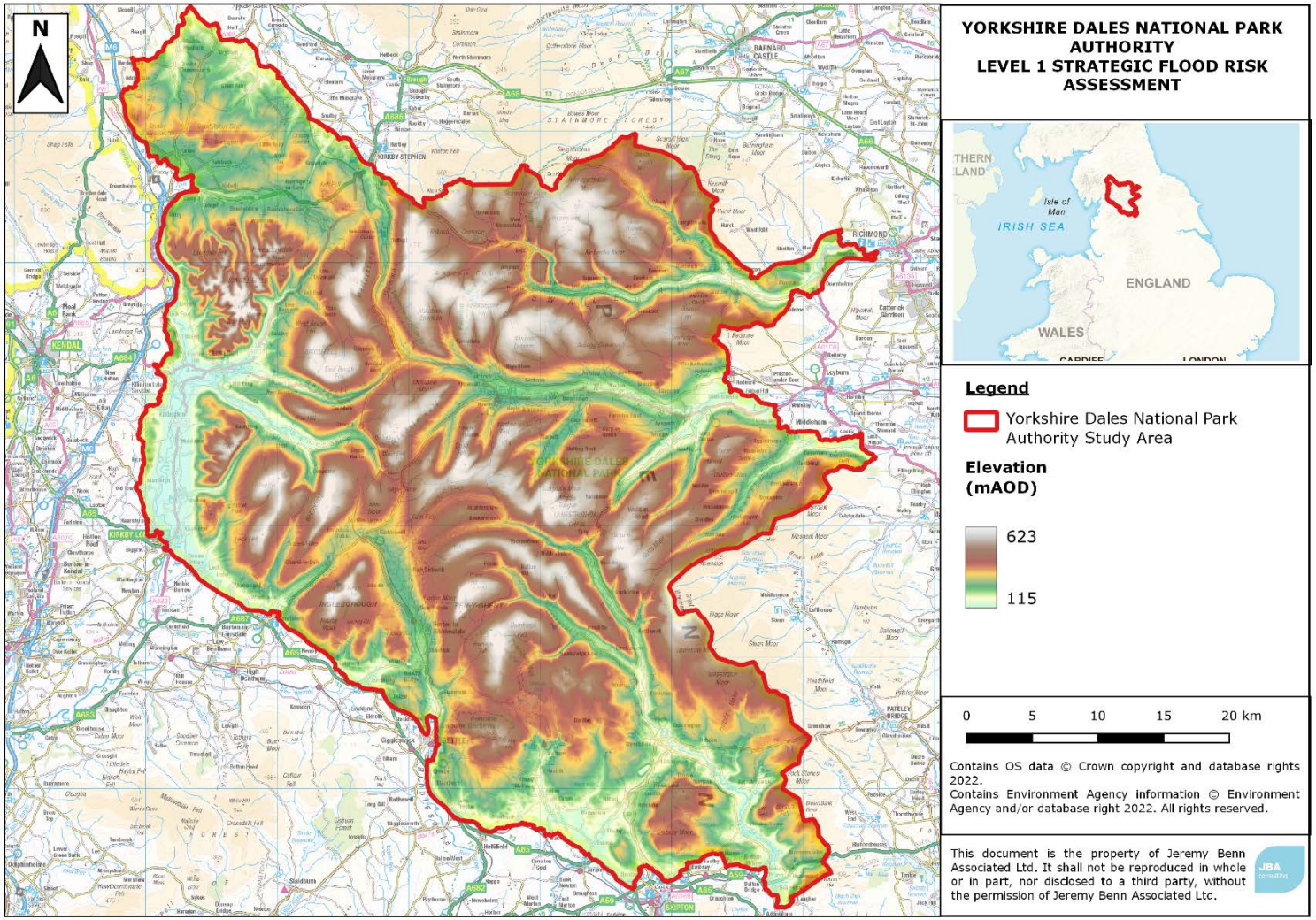


Figure 5.2: Topography of the study area

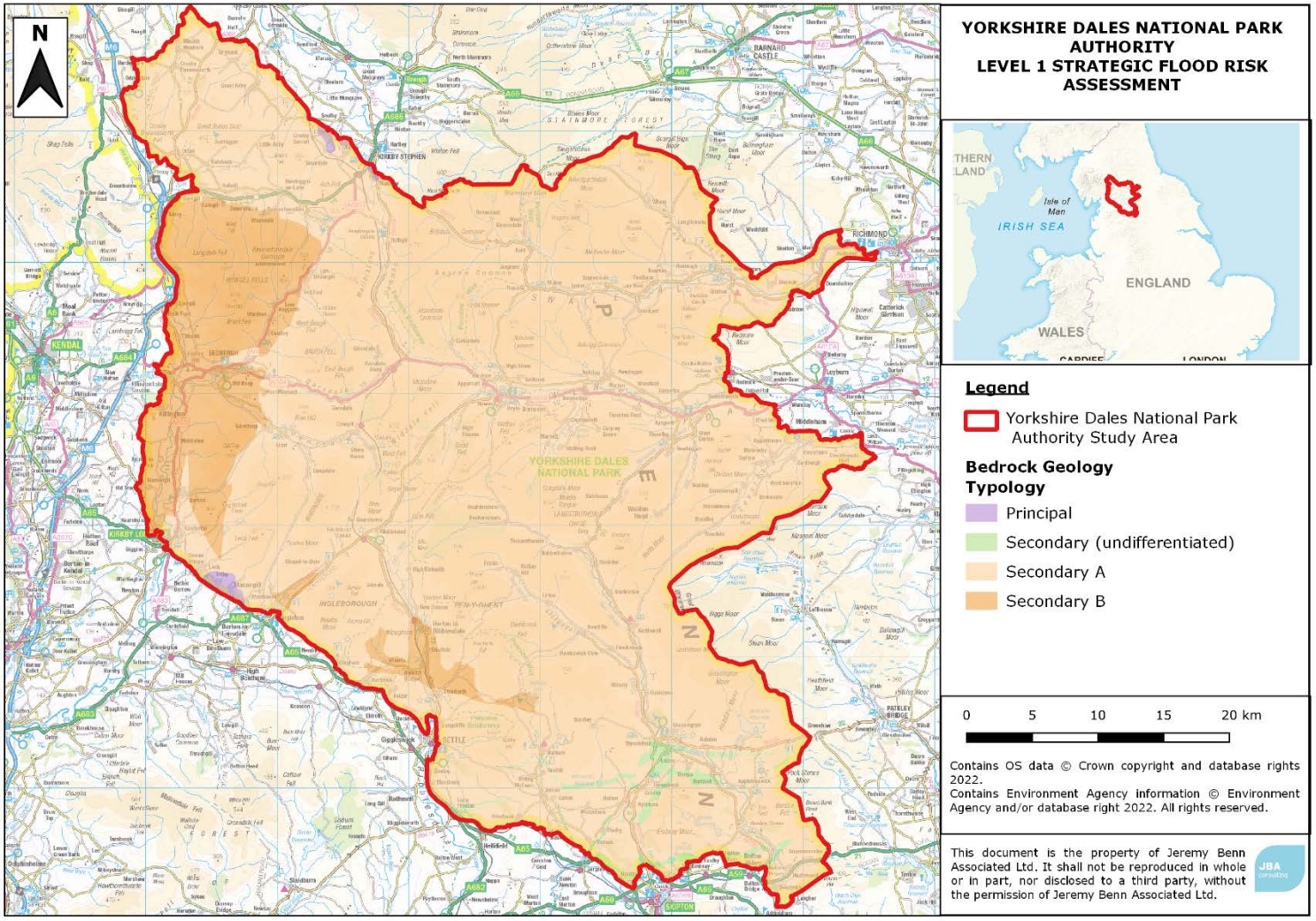


Figure 5.3: Bedrock geology of the Yorkshire Dales National Park

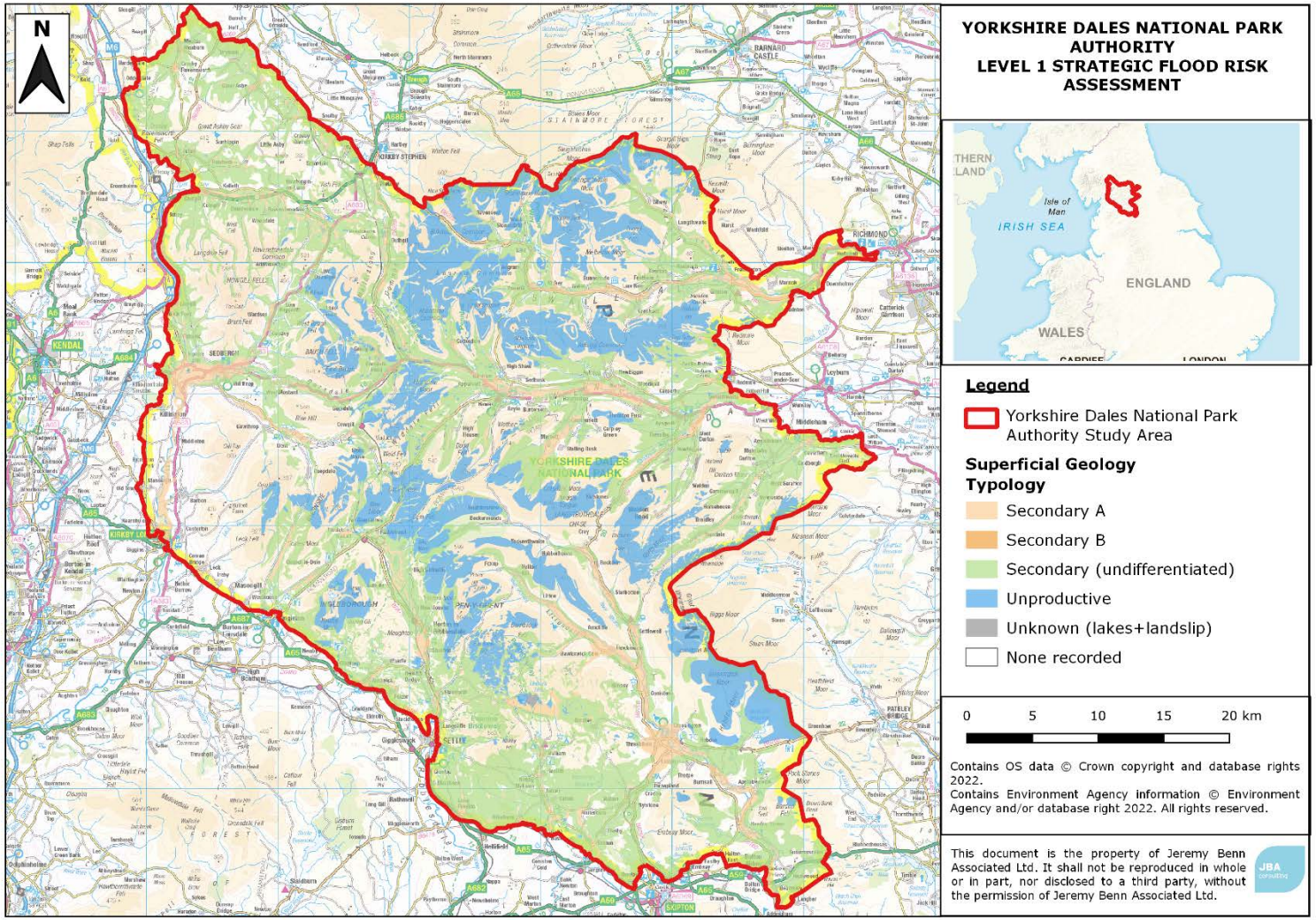


Figure 5.4: Superficial geology of the Yorkshire Dales National Park

5.3 Hydrology

The principal watercourses flowing through the Yorkshire Dales National Park are:

- River Swale
- River Ure
- River Wharfe
- River Aire
- River Ribble
- River Lune
- River Eden

There are a number of smaller watercourses and tributaries, including the River Cover, River Dee, River Rawthey. There are also several tarns and lakes within the study area. A map of the key watercourses is included in Figure 1.5 and Geo-PDF mapping in Appendix A.

5.4 Fluvial flood risk

The Yorkshire Dales National Park forms the catchments and headwaters of several major rivers (Swale, Ure, Wharfe, Aire, Ribble, Lune and Eden). These Rivers flow west/southwest and north out of the National Park and eventually into the Irish Sea, or they flow east/southeast and join the River Ouse which eventually flows into the North Sea at the Humber Estuary.

The steep sloping nature of the National Park means that flood risk across the area is mostly confined to narrow floodplains however there is increased flood risk at the confluences of watercourses.

The National Park is predominantly rural, however, there are several settlements throughout the National Park where there is a risk of fluvial flooding to properties and local roads.

In addition to flood risk shown by the flood risk mapping, there are a number of small watercourses and field drains which may pose a risk to development. Flood Zone mapping (where more detailed modelling investigations are not available) has only been prepared for watercourses with a catchment greater than 3km^2. Therefore, whilst these smaller watercourses may not be shown as having flood risk on the flood risk mapping, it does not necessarily mean that there is no flood risk. As part of a site-specific Flood Risk Assessment, the potential flood risk and extent of Flood Zones should be refined for these smaller watercourses and this information used as appropriate to perform the Sequential and Exception Tests. The Risk of Flooding from Surface Water (RoFSW) does also depict small watercourses and so can be used to indicate where this is likely to be an issue.

5.5 Surface water flooding

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

The Environment Agency Risk of Flooding from Surface Water mapping (RoFSW) shows that a number of communities are at risk of surface water flooding. The mapping shows that surface water predominantly follows topographical flow paths of existing watercourses or dry valleys and can pond in low-lying areas. Whilst in the majority of cases the risk is confined to roads, there are notable prominent run-off flow routes around properties, e.g. properties situated at the foot of surrounding hills. The RoFSW mapping for the Yorkshire Dales National Park can be found on the Geo-PDF mapping in Appendix A.

5.6 Sewer flooding

Sewer flooding occurs when intense rainfall/river flooding overloads sewer capacity (surface water, foul or combined), and/or when sewers cannot discharge to watercourses due to high water levels.

Sewer flooding can also be caused by blockages, collapses, equipment failure or groundwater leaking into sewer pipes.

Since 1980, the Sewers for Adoption guidelines mean that new surface water sewers have been designed to have capacity for a rainfall event with a 1 in 30 chance of occurring in any given year, although until recently this did not apply to smaller private systems. This means that sewers will be overwhelmed in larger rainfall and flood events. Existing sewers can also become overloaded as new development adds to the surface water discharge to their catchment, or due to incremental increases in roofed and paved surfaces at the individual property scale (urban creep). Sewer flooding is therefore a problem that could occur in many locations across the study area.

Yorkshire Water is the water company responsible for the management of the drainage networks across the east of the National Park and United Utilities is responsible for the management of the drainage networks across the west of the National Park.

5.6.1 United Utilities (UU) supplied historic drainage events

UU provided shapefiles showing historic drainage incidents, both internal and external. These are shown in Figure 5.5.

The incidents are from 2009 to 2022; the incident data relates to incidents at property level which cannot be shown in detail on the Appendix A maps and thus are shown in smaller scale below.

5.6.2 Yorkshire Water (YW) supplied historic drainage events

Historical incidents of flooding are detailed by Yorkshire Water through their Hydraulic Flood Risk Register (HFRR). This database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding. For confidentiality, this data has

been supplied on a 5-digit postcode basis. Data covers all reported incidences from April 2008 through to June 2022. The HFRR register is shown in Table 5-4.

These outputs indicate areas that may be affected from surface water and sewer flooding, should sewers exceed their capacity and discharge (particularly if this happens due to intense rainfall overwhelming the system). It will also help to identify flooding hotspots, where there is limited capacity, and help inform future schemes and mitigation.

Table 5-4: HFRR recorded incidents

Postcode	Recorded Flood Incidents		
	Internal	External	Total
BD23 3	0	1	1
BD23 4	0	12	12
BD23 5	3	65	68
BD23 6	4	82	86
DL11 6	1	45	46
DL8 3	4	34	38
DL8 4	3	52	55

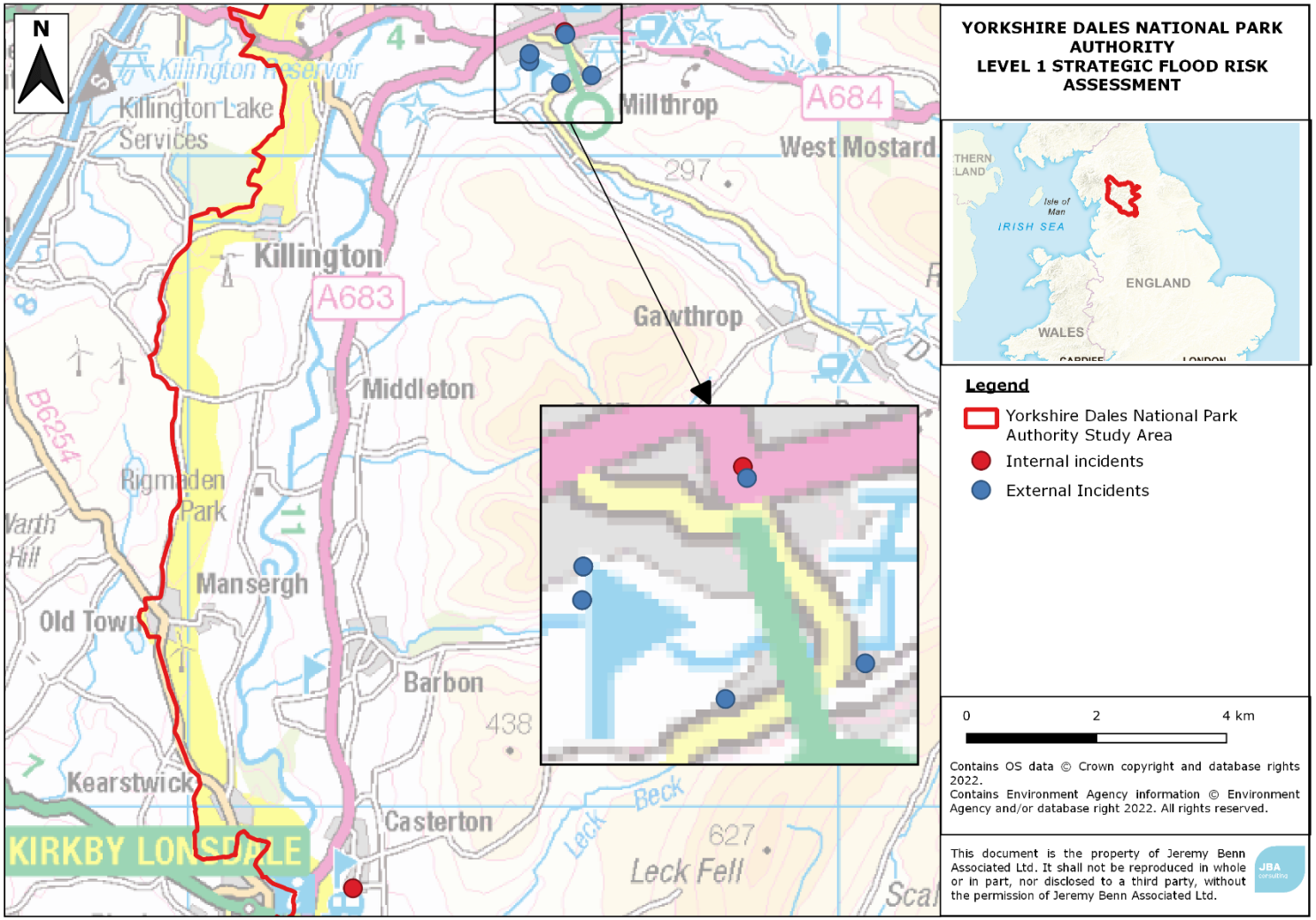


Figure 5.5: UU historical drainage events

5.7 Groundwater flooding

In general, less is known about groundwater flooding than other sources. 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

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

Areas Susceptible to Groundwater Flooding (AStGWF) mapping for the Yorkshire Dales National Park has been provided in the Geo-PDFs in Appendix A. The JBA Groundwater flood risk map for the Yorkshire Dales National Park is also provided in Appendix A. In high-risk areas, a site-specific risk assessment for groundwater flooding may be required to fully inform the likelihood of flooding.

5.8 Flooding from canals

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 only canal located in the Yorkshire Dales National Park is the Leeds and Liverpool Canal. This canal covers a short stretch of the southern boundary of the National Park by Gargrave.

5.9 Flooding from reservoirs

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the **Reservoir Act 1975** (https://www.legislation.gov.uk/ukpga/1975/23) and are on a register held by the Environment Agency. The level and standard of inspection and maintenance required by a Supervising Panel of Engineers under the Act means that the risk of flooding from reservoirs is very low.

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

The Environment Agency hold mapping showing what might happen if reservoirs fail. Developers and planners should check the **Long-Term Risk of Flooding website** (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=504825&northing=249317&address=100081210838&map=RiversOrSea) before using the reservoir data shown in this SFRA to make sure they are using the most up to date mapping. Existing or new hydraulic models in locations where there are reservoirs should represent the effect of reservoirs, for example the attenuation effect on flood response, which will either be represented in the hydrology or as part of the model itself.

The Environment Agency provide two flooding scenarios for the reservoir flood maps: a 'dry-day' and a 'wet-day'. The 'dry-day' scenario shows the predicted flooding which would occur if the dam or reservoir fails when rivers are at normal levels. The 'wet-day' scenario shows the predicted worsening of the flooding which would be expected if a river is already experiencing an extreme natural flood.

The current mapping shows that there are seven reservoirs located within the Yorkshire Dales National Park and one reservoir located outside the National Park that could cause flooding within the National Park during the 'dry-day' scenario. A further three reservoirs located outside the National Park could cause flooding within the National Park during the 'wet-day' scenario. Section 8.5.3 provides further considerations for developing in the vicinity of reservoirs. The reservoir flood mapping for both the 'dry-day' and 'wet-day' scenarios in the Yorkshire Dales National Park has been provided in the Geo-PDFs in Appendix A.

Table 5-5: Reservoirs with potential risk to the Yorkshire Dales National Park

Reservoir	Northings and eastings	Reservoir owner	Local Authority Area	Is the reservoir within the study area?	Does the reservoir impact the study area in the 'dry-day' scenario?
Barden Lower	456733 403566	Yorkshire Water Services Ltd	North Yorkshire County Council	Yes	Yes
Barden Upper	457916 401325	Yorkshire Water Services Ltd	North Yorkshire County Council	Yes	Yes
Chelker	451562 405635	Yorkshire Water Services Ltd	North Yorkshire County Council	No	Yes
Coniston Hall Lake	455602 389579	Mr and Mrs Bannister	North Yorkshire County Council	No	No
Embsay	454606 399860	Yorkshire Water Services Ltd	North Yorkshire County Council	Yes	Yes
Grimwith	464608 405946	Yorkshire Water Services Ltd	North Yorkshire County Council	Yes	Yes
Malham Tarn	466757 389306	The National Trust	North Yorkshire County Council	Yes	Yes
The Lake (Ingleborough Estate)	469601 374846	Ingleborough Estate (Executors of Dr J A Farrer)	North Yorkshire County Council	Yes	Yes
Thornton Steward	488048 418119	Yorkshire Water Services Ltd	North Yorkshire County Council	No	No
Winterburn	460387 394505	Canal & River Trust	North Yorkshire County Council	Yes	Yes
Wyndha-mmere	485055 359168	Mrs Elizabeth MacKinnon	Cumbria County Council	No	No

5.10 Flood Alert and Flood Warnings

The Environment Agency is the lead organisation for providing warnings of river flooding. Flood Warnings are supplied via the Flood Warning System (FWS) service, to homes and business within Flood Zones 2 and 3.

There are currently nine Flood Alert Areas (FAA) and seven Flood Warning Areas (FWAs) covering the Yorkshire Dales National Park. Flood Alerts are issued when there is water out of bank for the first time anywhere in the catchment, signalling that 'flooding is possible', and therefore Flood Alert Areas usually cover the majority of Main River reaches. Flood Warnings are issued to designated Flood Warning Areas (i.e. properties within the extreme flood extent which are at risk of flooding), when the river level hits a certain threshold; this is correlated between the FWA and the gauge, with a lead time to warn that 'flooding is expected'.

A list of the Flood Alert and Flood Warning Areas is available in Appendix D. A map of the Flood Alert Areas and Flood Warning Areas is included in the Geo-PDF mapping in Appendix A.

5.11 Summary of flood risk in the Yorkshire Dales National Park

A table summarising all sources of flood risk to key settlements the Yorkshire Dales National Park can be found in Appendix E.

6 Flood alleviation schemes and assets

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

6.1 Asset management

- Risk Management Authorities hold databases of flood risk management and drainage assets:
- The Environment Agency holds a national database that is updated by local teams
- The LLFA holds a database of significant local flood risk assets, required under Section 21 of the Flood and Water Management Act (2010)
- Highways Authorities hold databases of highways drainage assets, such as gullies and connecting pipes
- Water Companies hold records of public surface water, foul and combined sewers, the records may also include information on culverted watercourses.
- The databases include assets RMAs directly maintain and third-party assets. The drainage network is extensive and will have been modified over time. It is unlikely that any RMA contains full information on the location, condition and ownership of all the assets in their area. They take a prioritised approach to collecting asset information, which will continue to refine the understanding of flood risk over time.
- Developers should collect the available asset information and undertake further survey as necessary to present an understanding of current flood risk and the existing drainage network in a site-specific Flood Risk Assessment.

6.2 Standards of Protection

- Flood defences are designed to give a specific Standard of Protection (SoP), reducing the risk of flooding to people and property in flood prone areas. For example, a flood defence with a 100-year SoP means that the flood risk in the defended area is reduced to at least a 1% chance of flooding in any given year.
- Over time the actual SoP provided by the defence may decrease, for example due to deterioration in condition or increases in flood risk due to climate change. The understanding of SoP may also change over time as RMAs undertake more detailed surveys and flood modelling studies.
- It should be noted that the Environment Agency's on-going hydraulic modelling programme may revise flood risk datasets and, as a consequence, the standard of protection offered by flood defences in the area may differ from those discussed in this report.
- Developers should consider the SoP provided by defences and residual risk as part of a detailed FRA.

6.3 Maintenance

- The Environment Agency and local authorities have permissive powers to maintain and improve Main Rivers and Ordinary Watercourses, respectively. There is no legal duty to maintain watercourses, defences or assets and maintenance and improvements are prioritised based on flood risk. The ultimate responsibility for maintaining watercourses rests with the landowner.
- Highway's authorities have a duty to maintain public roads, making sure they are safe, passable and the impacts of severe weather have been considered. Water companies have a duty to effectually drain their area. What this means in practise is that assets are maintained to common standards and improvements are prioritised for the parts of the network that do not meet this standard e.g. where there is frequent highway or sewer flooding. North Yorkshire County Council, Cumbria County Council and Lancashire County Council as LLFA's have permissive powers and limited resources are prioritised and targeted to where they can have the greatest effect.
- There is potential for the risk of flooding to increase in areas where flood alleviation measures are not maintained regularly. Breaches in raised flood defences are most likely to occur where the condition of a flood defences has degraded over time. Drainage networks in urban areas can also frequently become blocked with debris and this can lead to blockages at culverts or bridges.
- Developers should not assume that any defence, asset or watercourse is being or will continue to be maintained throughout the lifetime of a development. They should contact the relevant RMA about current and likely future maintenance arrangements and ensure future users of the development are aware of their obligations to maintain watercourses.
- Formal structural defences are given a rating based on a grading system for their condition. A summary of the grading system used by the Environment Agency for condition is provided in Table 6-1.

Table 6-1: Grading system used by the Environment Agency to assess flood defence condition

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

Source: Condition Assessment Manual – Environment Agency 2006

6.4 Major flood risk management assets in the Yorkshire Dales National Park

- The Flood Map for Planning contains information on 'Areas Benefiting from Defences' (ABD). This shows areas that benefit from the defences that provide a SoP of at least a 100-year river flood event. It does not show areas that benefit from protection for more frequent events.
- There is one area in the Yorkshire Dales National Park benefiting from defences in the Environment Agency's 'ABD' mapping. This area is along the south bank of Widdale Beck in the northern end of Appersett. This area is at a maximum of just under 30m from the Beck.
- The Environment Agency's ABD dataset should not be used in isolation as it may be removed or replaced in the near future and at the time of this SFRA is not being routinely updated. Any intended reliance on this dataset should also allow for site-specific FRAs to demonstrate whether a site benefits from defences, and the nature of that benefit.
- North Yorkshire County Council also provided their asset register which does not contain any records within the Yorkshire Dales National Park.
- The Environment Agency 'AIMS' flood defence dataset gives further information on all flood defence assets within the district. The following locations benefit from flood defences at a lower (or unknown) standard of protection in the Yorkshire Dales National Park.

Table 6-2: Locations shown in the 'EA AIMS' data set

Watercourse	Location	Type	Design SOP	Condition Rating
Crosby Garrett Beck	Both banks of the Beck from St Andrews Church at the north of Crosby Garrett to the railway line to the south	Embankment, Natural High Ground and Wall	20 years	Unknown
River Dee	Most of the northern River bank length from Foulsyke Farm in the east to Graggs Farm in the west	Embankment	70 years	Unknown
River Dee	Approximately a 500m length along the southern bank of the River to the east of Dent	Embankment	70 years	Unknown
Barbon Beck	A small section south of the Beck at Barbon where Beckgate Road crosses the watercourse	Wall	70 years	Unknown
River Lune	East bank of the River, runs north from the bridge crossing north of Kearstwick for approximately 300m	Embankment	70 years	Unknown
River Ribble	South bank of the River where it heads west away from the B6479 north of Studfold	Embankment	70 years	Unknown
River Swale	Both banks of the River from Gunning Lane to where the River Swale leaves the area at Richmond	Embankment and Natural High Ground	Unknown	Unknown
Widdale Beck	Both banks of the Beck from south of Appersett to its confluence with the River Ure (approximately 575m in length)	Embankment, Natural High Ground and Engineered High Ground	Unknown	Unknown

6.5 Actual and residual flood risk

A Level 2 SFRA (for strategic allocations) or developer site-specific Flood Risk Assessment will need to consider the actual and residual flood risk due to the presence of flood and drainage assets in greater detail.

6.5.1 Actual flood risk

This is the risk to the site considering existing flood mitigation measures and any planned to be provided through new development. Note that it is not likely to be acceptable to allocate developments in existing undefended areas on the basis that they will be protected by developer works, unless there is a wider community benefit that can be demonstrated.

The assessment of the actual risk should take into account that:

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated.
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is a conflict between the proposed level of commitment and the future needs to support growth, then it will be a priority for this to be reviewed.
- The standard of safety must be maintained for the intended lifetime of the development. Over time the effects of climate change will erode the present-day standard of protection afforded by defences and so commitment is needed to invest in the maintenance and upgrade of defences if the present-day levels of protection are to be maintained and where necessary, land secured and safe-guarded that is required for affordable future flood risk management measures.
- By understanding the depth, velocity, speed of onset and rate of rise of floodwater it is possible to assess the level of hazard posed by flood events from the respective sources.

6.5.2 Residual risk

Residual risk is the risk that remains after the effects of flood risk infrastructure have been taken into account. It is important that these risks are quantified to confirm that the consequences can be safely managed. The residual risk can be:

- The effects of a larger flood than defences were designed to alleviate (the 'design flood'). This can cause overtopping of flood banks, failure of flood gates to cope with the level of flow or failure of pumping systems to cope with the incoming amount of water.
- Failure of the defences or flood risk management measures, such as breaches in embankments or walls, failure of flood gates to open or close or failure of pumping stations.

It is the responsibility of the developer to fully assess flood risk, propose measures to mitigate it and demonstrate that any residual risks can be safely managed.

This SFRA does not assess the probability of failure other than noting that such events are very rare. However, in accordance with NPPF, all sources of

flooding need to be considered. If a breach or overtopping event were to occur, then the consequences to people and property could be high. Developers should be aware that any site that is at or below defence level, may be subject to flooding if an event occurs that exceeds the design capacity of the defences, or the defences fail, and this should be considered in a detailed Flood Risk Assessment.

The assessment of residual risk should take into account:

- The flood hazard, depth and velocity that would result from overtopping or breach of defences. Flood gate or pumping station failure and/ or culvert blockage (as appropriate). The Environment Agency can provide advice at site-specific development level for advice on breach/ overtopping parameters for flood models.
- The design of the development to take account of the highest risk parts of the site e.g. allowing for flood storage on parts of the site and considering the design of the development to keep people safe e.g. sleeping accommodation above the flood level.
- A system of warning and a safe means of access and egress from the site in the event of a flood for users of the site and emergency services.
- Climate change and/ or policy-dependent residual risks (such as those that may be created if necessary, future defence improvements are required, or those associated with any managed adaptive strategies).

6.5.3 Overtopping

The risk from overtopping of defences is based on the relative heights of property or defence, the distance from the defence level and the height of water above the crest level of the defence. The Defra and Environment Agency **Flood risk assessment guidance for new development** (https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/flood-risk-assessment-guidance-for-new-development) guidance document provides standard flood hazard ratings based on the distance from the defence and the level of overtopping.

Any sites located next to defences or perched ponds/ reservoirs, may need overtopping modelling or assessments at the site-specific FRA stage, and climate change needs to be taken in to account.

6.5.4 Defence breach

A breach of a defence occurs when there is a failure in the structure and a subsequent ingress of flood water.

Where defences are present, risk of breach events should be considered as part of the site-specific FRA. Flood flows from breach events can be associated with significant depths and flow velocities in the immediate vicinity of the breach location and so FRAs must include assessment of the hazards that might be present so that the safety of people and structural stability of properties and infrastructure can be appropriately taken into account. The Defra and Environment Agency **Flood risk assessment guidance for new development** (https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/flood-risk-assessment-guidance-for-new-development) guidance document provides standard flood hazard ratings based on the distance from the defence and the level of the breach. Whilst the area in the immediate vicinity of a breach can be subject to high flows, the whole flood risk area associated with a breach must also be considered as there may be areas remote from the breach that might, due to topography, involve increased depth hazards.

Considerations include the location of a breach, when it would occur and for how long, the depth of the breach (toe level), the loadings on the defence and the potential for multiple breaches. There are currently no national standards for breach assessments and there are various ways of assessing breaches using hydraulic modelling. Work is currently being undertaken by the Environment Agency to collate and standardise these methodologies. It is recommended that the Environment Agency are consulted if a development site is located near to a flood defence, to understand the level of assessment required and to agree the approach for the breach assessment.

6.6 Existing and future flood alleviation schemes

6.6.1 Upper Dales Village Project

Following publication of the Section 19 report focused on Reeth, Arkengarthdale, Leyburn and Bellerby that addressed the flood event witnessed in July 2019, North Yorkshire County Council (NYCC) secured the opportunity for work to inform potential future project delivery in the Upper Dales. It was identified that a scheme could be delivered using the growth fund.

There is £400k in total indicatively allocated in the flood risk management forward programme for schemes in the Upper Dales over the next three years. This is a projection of an appropriate level of contribution from the authority towards the works, based on the number of properties likely to benefit from the schemes and the growth opportunities the schemes may provide, rather than the overall project value.

Locations included in the studies were Reeth and Fremington, Arkengarthdale, Bellerby, Leyburn, West Witton, Bainbridge, Hawes and Gayle, Redmire and Spennithorne. Of these locations, Reeth and Fremington, Arkengarthdale, West Witton, Bainbridge and Hawes and Gayle lie within the Yorkshire Dales National Park.

NYCC Officers have identified preferred delivery options to be progressed from the feasibility studies, assessed on the following considerations:

- Timescales – prioritising options where schemes can be implemented as quick solutions in a short period.
- Partnership working – the ability a scheme offers to work in partnership with other relevant authorities, aligning projects with current national and local flood risk management strategies and projects.
- Environment benefits – options which align with NYCC policies and position statements on environmental factors such as climate change, carbon capture, increased biodiversity and habitat creation.
- Project resilience – the ability for a project to be passive, self-sufficient, fail-safe, adaptive and flexible, no regrets, self-reinforcing and diverse.
- Potential for further partnership funding opportunities – projects that align with current national and local flood risk management strategies and projects and supplement or compliment other catchment projects such as NFM works currently undertaken by other partner organisations in both the Swaledale and Wensleydale catchments.
- Cost benefit – projects that provide value for money.

Property Flood Resilience (PFR) measures were found to score highly across all locations so were considered a 'Do Minimum' option in all locations.

The points below provide a summary of the options being considered in the different locations:

- Reeth and Fremington – kerb construction and regrading a highway to divert flow, drainage grids to capture surface water runoff along road, creation of areas for water storage through bunds and an attenuation area, and the introduction of natural processes to slow/reduce the flow from the headwaters.
- Arkengarthdale – construction of a flood embankment, maintenance to clear a culvert and installation of a modern standard trash screen to reduce the likelihood of future blockages, regrading of a road to divert surface water, creation of a new drainage channel to convey surface water runoff away from buildings and land use changes in the upstream catchment to reduce runoff.
- West Witton – replacement of the pond trash screen with a modern standard trash screen and increase the current pond inlet, regrading land, waterproofing barn walls and the introduction of natural processes to slow/reduce the flow from the headwaters.
- Bainbridge – the introduction of natural process to slow/reduce the flow from the headwaters.
- Hawes and Gayle – removal of a railway bridge to reduce water levels in the watercourse, construction of embankments, re-routing of surface water runoff through collection channels, tree planting in the floodplains and land use changes in the upstream catchment to reduce runoff.

NFM measures will also be considered in all areas. These options will be further developed over the 2022-23 financial year.

Further information can be found in the **Project Update and Preferred Options Report** (https://edemocracy.northyorks.gov.uk/documents/s11013/

Upper%20Dales%20Villages%20Project%20Update%20and%20Preferred%20Options%20for%20Progression.pdf).

6.6.2 York and North Yorkshire Resilience Innovation Fund

City of York Council have been awarded funding through the DEFRA **'Flood and coastal resilience innovation programme'** (https://www.gov.uk/guidance/flood-and-coastal-resilience-innovation-programme) to implement natural catchment flood risk solutions. No specific locations for these projects have yet been identified.

6.6.3 Natural Flood Management

The **Yorkshire Dales National Park Management Plan** (https://www.yorkshiredales.org.uk/wp-content/uploads/sites/13/2021/12/NPMP-2019-24-updated-Nov-2021.pdf) for 2019-2024, last updated in November 2021, has the objective to work with farmers and landowners across the National Park to deliver landscape-scale Natural Flood Management (NFM) projects. There are several schemes that have been completed or are currently ongoing within the area:

- **'Keeping Ure rivers cool'** (https://www.ydrt.org.uk/what-we-do/projects/developing-projects/keeping-ure-rivers-cool/) – a Dales to Vale Rivers Network partnership project to plant riparian trees along the Ure catchment, funded by the Environment Agency.
- **Upper Wharfe River SSSI Project** (https://www.ydrt.org.uk/what-we-do/projects/past-projects/upper-wharfe-river-sssi-project/) – works to improve the Site of Special Scientific Interest (SSSI) including willow spilling, tree planting, retention pond creation and bank revetment.
- **Bishopdale NFM** (https://www.ydrt.org.uk/what-we-do/projects/past-projects/bishopdale-nfm/) – an NFM project aiming to reduce peak flows, slow the movement of water within the catchment and help protect local communities from isolation due to flooding. Works included tree planting, creation of ponds and scrapes to store water and working with farmers to improve soil health.
- **Arkengarthdale NFM** (https://www.ydrt.org.uk/what-we-do/projects/developing-projects/arkengarthdale-nfm/) - a project under development with plans to use NFM techniques such as leaky dams, tree and hedgerow planting, willow-spiling, scrapes and earth bunds, along Arkle Beck to slow peak flows as well as provide nature benefits.
- **Princes Countryside Fund NFM project for Wensleydale and Wharfedale** (https://www.therrc.co.uk/sites/default/files/files/Conference/2019/Presentations/3.2.2._turner_dan_taylor_marie.pdf) – a project funded by Princes Countryside Fund setting up NFM demonstration sites and providing one to one support to farmers through Natural Flood Management Farm Plans, using modelling to help prioritise the areas of work.
- **River Calder, Colne and Upper Aire NFM project** (https://www.westyorks-ca.gov.uk/projects/flood-alleviation/natural-flood-management-river-calder-colne-and-upper-aire/) – a £1.7 million Leeds City Region Growth Deal investment into the Growing Resilience Natural Flood Management programme to introduce a range of NFM

measures upstream to slow the flow of water before it reaches urban areas downstream.

There are also farmer-led NFM groups in Wensleydale, Swaledale, Wharfedale, the Lune catchment and Ribblesdale.

Further information on NFM within the Yorkshire Dales is available from the **Yorkshire Dales Rivers Trust** (https://www.ydrt.org.uk/what-we-do/nfm/) and the **Yorkshire Dales Natural Flood Management Handbook** (https://www.ydrt.org.uk/wp-content/uploads/2021/04/YDNP-NFM-handbook.pdf).

6.6.4 Other schemes

The EA's **Asset Management** (https://environment.data.gov.uk/asset-management/index.html) map provides an updated indication of schemes that are under construction or have a forecast start date. In the National Park, these include a scheme in Settle to address fluvial flooding and a scheme in Kirkby Stephen to address surface water flooding which are all currently in the development stage. However, these schemes may concern areas which lie outside the National Park.

7 Cumulative impact of development and strategic solutions

Under the NPPF, strategic policies and their supporting Strategic Flood Risk Assessments (SFRAs), are required to 'consider cumulative impacts in, or affecting, local areas susceptible to flooding' (para.160), rather than just to or from individual development sites.

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume, as well as the impact of increased flows on flood risk downstream. Whilst the loss of storage for individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe. Similarly the effect of the loss of surface water flow paths, surface ponding and infiltration can also give rise to cumulative effects and potentially exacerbate surface water flood risk.

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

Catchments within the study area that have the potential to influence existing flood risk issues in neighbouring Local Authorities were identified, as well as catchments in the study area that may be influenced by development in catchments in neighbouring Local Authorities. Historic flood incidents, the current and predicted increase in surface water flood risk to properties and cross boundary issues in each catchment were assessed to identify the catchments at greatest risk.

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

Once the proposed development had been assessed against Fluvial Flood Risk, Risk of Flooding from Surface Water, Historic Flooding Incidents, and the potential increased developed area, the CIA identified 7 High Risk catchments within, or partially within the YDNPA district. These are:

- Ribble (long Preston to Stock Beck)
- Duerley Beck from Source to River Ure
- Cowside and Stainforth Beck
- Otterburn Beck from Source to River Aire
- Ribble (Stainforth to Long Preston Beck)
- Eller Beck from Haw Beck to River Aire
- Aire from Malham Beck to Otterburn Beck

All apart from the Duerley Beck are located in the south of the district, where cross-boundary risk may be more prevalent than flood risk to catchments within the YDNA.

It is recommended that the YDNPA work closely with neighbouring local authorities to develop complementary Local Planning Policies for catchments

that drain into and out of the National Park to other local authorities in order to minimise cross boundary issues of cumulative impacts of development

The Cumulative Impact Assessment (CIA) can be found in Appendix F.

8 Flood risk management requirements for developers

This section provides guidance on site-specific Flood Risk Assessments (FRAs). These are carried out by (or on behalf of) developers to assess flood risk to and from a site. They are submitted with Planning Applications and should demonstrate how flood risk will be managed over the development's lifetime, considering climate change and vulnerability of users.

The report provides a strategic assessment of flood risk within the Yorkshire Dales National Park. Prior to the planning stage of any construction or development, site-specific assessments will need to be undertaken so all forms of flood risk and the actual and residual risk and standard of protection and safety at a site are considered in more detail. Developers should, where required, undertake more detailed hydrological and hydraulic assessments of watercourses to verify flood extents (including latest climate change allowances), to inform the sequential approach within the site and prove, if required, whether the Exception Test can be satisfied.

A detailed FRA may show that a site, windfall[1] or other, is not appropriate for development of a particular vulnerability or even at all. The Sequential and Exception Tests in the NPPF apply to all developments and an FRA should not been seen as an alternative to proving these tests have been met.

8.1 Principles for new developments

8.1.1 Apply the Sequential and Exception Tests

Developers should refer to Section 3 for more information on how to consider the Sequential and Exception Tests. For allocated sites, the Yorkshire Dales National Park Authority should use the information in this SFRA to apply the Sequential Test. For windfall sites a developer must undertake the Sequential Test, which includes considering reasonable alternative sites at lower flood risk. Only if it passes the Sequential Test should the Exception Test then be applied if required. The Sequential and Exception Tests in the NPPF apply to all developments and an FRA should not be seen as an alternative to proving these tests have been met.

Developers should also apply the sequential approach to locating development within the site. The following questions should be considered:

- can risk be avoided through substituting less vulnerable uses or by amending the site layout?
- can it be demonstrated that less vulnerable uses for the site have been considered and reasonably discounted? and
- can the site layout be varied to reduce the number of people, the flood risk vulnerability or the building units located in higher risk parts of the site?

[1] 'Windfall sites' is used to refer to those sites which become available for development unexpectedly and are therefore not included as allocated land in a planning authority's development plan.

8.1.2 Consult with statutory consultees at an early stage to understand their requirements

Developers should consult with the Environment Agency, the Yorkshire Dales National Park Authority, North Yorkshire County Council, Cumbria County Council or Lancashire County Council as LLFA and Yorkshire Water or United Utilities at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling and drainage assessment and design.

8.1.3 Consider the risk from all sources of flooding and that they are using the most up to date flood risk data and guidance

The SFRA can be used by developers to scope out what further detailed work is likely to be needed to inform a site-specific Flood Risk Assessment. At a site level, developers will need to check before commencing on a more detailed Flood Risk Assessment that they are using the latest available datasets. Developers should apply the most up-to-date **Environment Agency climate change guidance** (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances) (last updated in May 2022) and ensure the development has taken into account climate change adaptation measures.

8.1.4 Ensure that the development does not increase flood risk elsewhere

Section 9 sets out these requirements for taking a sustainable approach to surface water management. Developers should also ensure mitigation measures do not increase flood risk elsewhere and that floodplain compensation is provided where necessary. Developers should refer to the **Environment Agency climate change guidance** (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances) (last updated in May 2022) for the appropriate allowances to calculate floodplain storage compensation.

8.1.5 Ensure the development is safe for future users

Consideration should first be given to minimising risk by planning sequentially across a site. Once risk has been minimised as far as possible, only then should mitigation measures be considered. Developers should consider both the actual and residual risk of flooding to the site, as discussed in Section 3.

Further flood mitigation measures may be needed for any developments in an area protected by flood defences, where the condition of those defences is 'fair' or 'poor', and where the standard of protection is not of the required standard.

8.1.6 Enhance the natural river corridor and floodplain environment through new development

Developments should demonstrate opportunities to create, enhance and link green assets. This can provide multiple benefits across several disciplines including flood risk and biodiversity/ ecology and may provide opportunities to use the land for an amenity and recreational purposes. Development that may adversely affect green infrastructure assets should not be permitted. Where possible, developers should identify and work with partners to explore all avenues for improving the wider river corridor environment. Developers

should open up existing culverts and should not construct new culverts on site except for short lengths to allow essential infrastructure crossings.

8.1.7 Consider and contribute to wider flood mitigation strategy and measures in the district and apply the relevant local planning policy

Wherever possible, developments should seek to help reduce flood risk in the wider area e.g. by contributing to a wider community scheme or strategy for strategic measures, such as defences or NFM or by contributing in kind by mitigating wider flood risk on a development site. More information on the contribution developers are expected to make towards achieving the wider vision for FRM and sustainable drainage in the district can be found in Section 7.3. Developers must demonstrate in an FRA how they are contributing towards this vision.

8.2 Requirements for site-specific Flood Risk Assessments

8.2.1 When is an FRA required?

Site-specific FRAs are required in the following circumstances:

- Proposals of 1 hectare or greater in Flood Zone 1.
- Proposals for new development (including minor development such as non-residential extensions, alterations which do not increase the size of the building or householder developments and change of use) in Flood Zones 2 and 3.
- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the Environment Agency).
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.
- At locations where it is proposed to locate development in a high risk surface water flood zone.

An FRA may also be required for some specific situations:

- If the site may be at risk from the breach of a local defence (even if the site is actually in Flood Zone 1)
- Where evidence of historical or recent flood events have been passed to the LPA
- Land identified in an SFRA as being at increased risk in the future.

8.2.2 Objectives of 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. Site-specific FRAs should 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 the effects and risks are appropriate.

- The evidence, if necessary, for the local planning authority to apply the Sequential Test; and
- Whether, if applicable, the development will be safe and pass the Exception Test.

FRAs should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the Environment Agency and the Yorkshire Dales National Park Authority. Guidance and advice for developers on the preparation of site-specific FRAs include:

- **Standing Advice on Flood Risk** (https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities) (Environment Agency)
- **Flood Risk Assessment for Planning Applications** (https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications) (Environment Agency); and
- **Site-specific Flood Risk Assessment: CHECKLIST** (https://www.gov.uk/guidance/flood-risk-and-coastal-change#Site-Specific-Flood-Risk-Assessment-checklist-section) (NPPF PPG, Defra)

Guidance for local planning authorities for reviewing Flood Risk Assessments submitted as part of planning applications has been published by Defra in 2015 – **Flood Risk Assessment: Local Planning Authorities** (https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities).

8.3 Local requirements for mitigation measures

8.3.1 Site layout and design

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development.

The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land use away from Flood Zones to higher ground, while more flood-compatible development (e.g. vehicular parking, recreational space) can be located in higher risk areas. Whether parking in floodplains is appropriate will be based on the likely flood depths and hazard, evacuation procedures and availability of flood warning.

Waterside areas, or areas along known flow routes, can act as green infrastructure, being used for recreation, amenity and environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should ensure safe access to higher ground from these areas and avoid the creation of isolated islands as water levels rise.

8.3.2 Modification of ground levels

Any proposal for modification of ground levels will need to be assessed as part of a detailed flood risk assessment.

Modifying ground levels to raise the land above the required flood level is an effective way of reducing flood risk to a particular site in circumstances where the land does not act as conveyance for flood waters. However, care must be taken as raising land above the floodplain could reduce conveyance or flood

storage in the floodplain and could adversely impact flood risk downstream or on neighbouring land. Raising ground levels can also deflect flood flows, so analyses should be performed to demonstrate that there are no adverse effects on third party land or property.

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

Where proposed development results in a change in building footprint, the developer should ensure that it does not impact upon the ability of the floodplain to store or convey water and seek opportunities to provide floodplain betterment.

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

8.3.3 Raised floor levels

If raised floor levels are proposed, these should be agreed with the Yorkshire Dales National Park Authority and the Environment Agency. The minimum Finished Floor Level (FFL) may change dependent upon the vulnerability and flood risk to the development.

The Environment Agency advises that minimum finished floor levels should be set 600mm above the 100-year plus climate change peak flood level, where the new climate change allowances have been used (see Section 4 for the climate change allowances). Where a proxy for climate change has been used, it is recommended that a site-specific flood risk assessment is undertaken to determine the flood level above which the finished floor levels should be raised. An additional allowance may be required because of risks relating to blockages to the channel, culvert or bridge and should be considered as part of an FRA.

Allocating the ground floor of a building for less vulnerable, non-residential, use is an effective way of raising living space above flood levels. Single storey buildings such as ground floor flats or bungalows are especially vulnerable to rapid rise of water (such as that experienced during a breach). This risk can be reduced by use of multiple storey construction and raised areas that provide an escape route.

Similarly, the use of basements should be avoided. Basement dwellings within Flood Zone 3 should not be permitted, whilst basement dwellings in Flood Zone 2 will be required to pass the Exception Test. Access should be situated 300mm above the design flood level and waterproof construction techniques used.

8.3.4 Development and raised defences

Construction of localised raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will

remain. Compensatory storage must be provided where raised defences remove storage from the floodplain.

Where development is located behind, or in an area benefitting from defences, the residual risk of flooding must be considered.

8.3.5 Developer contributions

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

8.3.6 Buffer strips

The provision of a buffer strip to 'make space for water', allows additional capacity to accommodate climate change and ensure access to the watercourse, structures and defences is maintained for future maintenance purposes. It also enables the avoidance of disturbing riverbanks, adversely impacting ecology and having to construct engineered riverbank protection. A buffer strip of 8m is required from any Main River (16m if tidal influence). Where flood defences are present, these distances should be taken from the toe of the defence.

Building adjacent to riverbanks can cause problems to the structural integrity of the riverbanks and the building itself, making future maintenance of the river much more difficult. Any development in these areas will likely require a Flood Risk Permit from the Environment Agency alongside any permission. There should be no built development within these distances from main rivers / flood defences (where present).

8.3.7 Making space for water

The **PPG** (https://www.gov.uk/government/collections/planning-practice-guidance) sets out a clear aim in Flood Zone 3 to create space for flooding by restoring functional floodplain. Generally, development should be directed away from these areas.

All new development close to rivers should consider the opportunity to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

8.4 Resistance and resilience measures

The consideration of resistance and resilience measures should not be used to justify development in inappropriate locations.

Having applied planning policy, there will be instances where developments, such as those that are water compatible and essential infrastructure are permitted in high flood risk areas. The above measures should be considered

before resistance and resilience measures are replied on. The effectiveness of these forms of measures are often dependant on the availability of a reliable forecasting and warning system and the use of back up pumping to evacuate water from a property as quickly as possible. Where developments are in areas of surface water risk, passive measures should be favoured over active measures. The proposals must include details of how the temporary measures will be erected and decommissioned, responsibility for maintenance and the cost of replacement when they deteriorate. Available resistance and resilience measures are shown in Table 8-1. Developers should refer to the **CIRIA Code of practice for property flood resilience (C790)** (https://www.ciria.org/CIRIA/Resources/Free_publications/CoP_for_PFR_resource.aspx) which specifies the standards which should be achieved when delivering Property Flood Resilience (PFR).

Table 8-1: Available temporary measures

Measures	Description
Permanent barriers	Permanent barriers can include built up doorsteps, rendered brick walls and toughened glass barriers
Temporary barriers	Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale, temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.
Community resistance measures	These include demountable defences that can be deployed by local communities to reduce the risk of water ingress to a number of properties. The methods require the deployment of inflatable (usually with water) or temporary quick assembly barriers in conjunction with pumps to collect water that seeps through the systems during a flood.
Flood resilience measures	These measures aim to ensure no permanent damage is caused, the structural integrity of the building is not compromised and the clean up after the flood is easier. Interior design measures to reduce damage caused by flooding can include electrical circuitry installed at a higher level and water-resistant materials for floors, walls and fixtures.

8.5 Reducing flood risk from other sources

8.5.1 Groundwater

Groundwater flooding has a very different flood mechanism to any other and so many conventional flood mitigation methods are not suitable. The only way to fully reduce flood risk would be through building design (development form), ensuring floor levels are raised above the water levels caused by a 1 in 100-year plus climate change event. Site design would also need to preserve any flow routes followed by the groundwater overland to ensure flood risk is not increased downstream.

Infiltration SuDS can cause increased groundwater levels and subsequently may increase flood risk on or off a site. Developers should provide evidence and ensure that this will not be a significant risk.

8.5.2 Surface water and sewer flooding

Developers should discuss public sewerage capacity with the water utility company at the earliest possible stage. It is important that a Surface Water Drainage Strategy (often done as part of a Flood Risk Assessment) shows that this will not increase flood risk elsewhere, and that the drainage requirements regarding runoff rates and SuDS for new development are met.

If residual surface water flood risk remains, the likely flow routes and depths across the site should be modelled. The site should be designed so that these flow routes are preserved and building design should provide resilience against this residual risk.

When redeveloping existing buildings, the installation of some permanent or temporary floodproofing and resilience measures could protect against both surface water and sewer flooding. Non-return valves prevent water entering the property from drains and sewers. Non-return valves can be installed within gravity sewers or drains within a property's private sewer upstream of the public sewerage system. These need to be carefully installed and must be regularly maintained.

Consideration must also be given to attenuation and flow ensuring that flows during the 100-year plus climate change storm event are retained within the site if any flap valves shut. This should be demonstrated with suitable modelling techniques.

8.5.3 Reservoirs

As discussed in Section 5.9, the risk of reservoir flooding is extremely low. However, there remains a residual risk to development from reservoirs which developers should consider during the planning stage:

- Developers should contact the reservoir owner for information on:
    - the Reservoir Risk Designation
    - reservoir characteristics: type, dam height at outlet, area/volume, overflow location
    - operation: discharge rates / maximum discharge
    - discharge during emergency drawdown; and
    - inspection / maintenance regime.
- The EA online Reservoir Flood Maps contain information on the extents, depths and velocities following a reservoir breach (note: only for those reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975). Consideration should be given to the extent, depths and velocities shown in these online maps.
- The GOV.UK website on **Reservoirs: owner and operator requirements** (https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements) provides information on how to register reservoirs, appoint a panel engineer, produce a flood plan and report an incident.

- In addition, developers should consult the **'North Yorkshire Local Resilience Forum'** (https://www.emergencynorthyorks.gov.uk/), the **'Cumbria Local Resilience Forum'** (https://cumbria.gov.uk/emergencyplanning/crf.asp) or the **'Lancashire Resilience Forum'** (https://www.stayintheknow.co.uk/) about emergency plans.

Developers should use the above information to:

- Apply the sequential approach to locating development within the site.
- Consider the impact of a breach and overtopping, particularly for sites proposed to be located immediately downstream of a reservoir. This should consider whether there is sufficient time to respond, and whether in fact it is appropriate to place development immediately on the downstream side of a reservoir.
- Assess the potential hydraulic forces imposed by sudden reservoir failure event and check that that the proposed infrastructure fabric could withstand the structural loads.
- Develop site-specific Emergency Plans and/ or Off-site Plans if necessary and ensure the future users of the development are aware of these plans. This may need to consider emergency drawdown and the movement of people beforehand.

Development downstream of a reservoir can also have implications on the reservoir. Consideration should be given to the potential implications of proposed development on the risk designation of the reservoir, as it is a requirement that in particular circumstances where there could be a danger to life that a commitment is made to the hydraulic capacity and safety of the reservoir embankment and spillway. The implications of such potential obligations should be identified and understood so that it can be confirmed that these can be met if proposed new development is permitted.

8.6 Emergency planning

Emergency planning covers three phases: before, during and after a flood. Measures involve developing and maintaining arrangements to reduce, control or mitigate the impact and consequences of flooding and to improve the ability of people and property to absorb, respond to and recover from flooding. National Planning Policy takes this into account by seeking to avoid inappropriate development in areas of flood risk and considering the vulnerability of new developments to flooding.

The 2019 NPPF requires site level Flood Risk Assessments to demonstrate that

> *"d) any residual risk can be safely managed; and*
>
> *e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan."*

Certain sites will need emergency plans:

- Sites with vulnerable users, such as hospitals and care homes
- Camping and caravan sites
- Sites with transient occupants e.g. hostels and hotels

- Developments at a high residual risk of flooding from any source e.g. immediately downstream of a reservoir or behind raised flood defences
- Situations where occupants cannot be evacuated (e.g. prisons) or where it is safer to remain "in-situ" and / or move to a higher floor or safe refuge area (e.g. at risk of a breach).

Emergency Plans will need to consider:

- The characteristics of the flooding e.g. onset, depth, velocity, hazard, flood borne debris
- The vulnerability of site occupants.
- Structural safety
- The impact of the flooding on essential services e.g. electricity, drinking water
- Flood warning systems and how users will be encouraged to sign up for them
- Safe access and egress for users and emergency services
- How to manage the consequences of events that are un-foreseen or for which no warnings can be provided e.g. managing the residual risk of a breach.
- A safe place of refuge where safe access and egress and advance warning may not be possible, having discussed and agreed this first with emergency planners. Proposed new development that places an additional burden on the existing response capacity of the Yorkshire Dales National Park Authority will not normally be appropriate.

The North Yorkshire Local Resilience Forum, the Cumbria Local Resilience Forum and the Lancashire Resilience Forum provide Emergency Planning, resilience based, information that is both general and flood specific. This includes practical advice before, during and after flooding has occurred including, preparation, understanding warnings, actions to limit exposure to risk and recovery.

Further information is available from:

- **The National Planning Policy Guidance** (https://www.gov.uk/government/publications/national-planning-policy-framework--2)
- **2004 Civil Contingencies Act** (http://www.legislation.gov.uk/ukpga/2004/36/contents)
- **DEFRA (2014) National Flood Emergency Framework for England** (https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england)
- **FloodRe** (http://www.floodre.co.uk/)
- The Environment Agency and DEFRA's **Standing Advice for FRAs** (https://www.gov.uk/guidance/flood-risk-assessment-standing-advice)
- North Yorkshire County Council's **'Flooding Advice and Information'** (https://www.northyorks.gov.uk/flooding-advice-and-information)
- North Yorkshire County Council's **'Flood Recovery Advice and Guidance'** (https://www.northyorks.gov.uk/flood-recovery-advice-and-guidance)

- Cumbria County Council's **'Preparing for Emergencies'** (https://cumbria.gov.uk/emergencyplanning/default.asp)
- Cumbria County Council's **'Preparing for emergencies – flooding advice'** (https://cumbria.gov.uk/emergencyplanning/supportingpages/floodingadvice.asp)
- Lancashire County Council's **'Preparing for Emergencies'** (https://www.stayintheknow.co.uk/Documents/PreparingForEmergenciesBooklet.pdf) booklet
- Environment Agency's **'How to plan ahead for flooding'** (https://flood-warning-information.service.gov.uk/plan-ahead-for-flooding)
- Sign up for **Flood Warnings** (https://www.gov.uk/sign-up-for-flood-warnings) with the Environment Agency
- The **National Flood Forum** (https://nationalfloodforum.org.uk/)
- **GOV.UK** (https://www.gov.uk/prepare-for-flooding/future-flooding) - Make a Flood Plan guidance and templates
- **ADEPT Flood Risk Plans for new development** (https://adeptnet.org.uk/floodriskemergencyplan)

9 Surface water management and SuDS

This section provides guidance and advice on managing surface water runoff and flooding.

9.1 Role of the LLFA and Local Planning Authority in surface water management

In April 2015, North Yorkshire County Council, Cumbria County Council and Lancashire County Council as LLFA's were made a statutory planning consultee on the management of surface water. They provide technical advice on surface water drainage strategies and designs put forward for major development proposals, to ensure that onsite drainage systems are designed in accordance with the current legislation and guidance.

When considering planning applications, North Yorkshire County Council, Cumbria County Council or Lancashire County Council will provide advice to the Planning Department on the management of surface water. As an LPA, the Yorkshire Dales National Park Authority should satisfy themselves that the development's proposed minimum standards of operation are appropriate and ensure, using planning conditions or planning obligations, that there are clear arrangements for on-going maintenance over the lifetime of the development.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the master-planning stage. To further inform development proposals at the master-planning stage, pre-application submissions are accepted by the Yorkshire Dales National Park Authority, dependent on the area. This will assist with the delivery of well designed, appropriate and effective SuDS.

9.2 Sustainable Drainage Systems (SuDS)

Sustainable Drainage Systems (SuDS) are designed to maximise the opportunities and benefits that can be secured from surface water management practices.

SuDS provide a means of dealing with the quantity and quality of surface water and can also provide amenity and biodiversity benefits. Given the flexible nature of SuDS they can be used in most situations within new developments as well as being retrofitted into existing developments. SuDS can also be designed to fit into most spaces. For example, permeable paving could be used in parking spaces or rainwater gardens as part of traffic calming measures.

It is a requirement for all new major development proposals to ensure that sustainable drainage systems for management of runoff are put in place, unless there is clear evidence that this would be inappropriate (NPPF para.169). Likewise, minor developments should endeavour sustainable systems for runoff management are provided where possible. Whilst this is not required for minor developments, it is best practice. The developer is responsible for ensuring the design, construction and future/ongoing maintenance of such a scheme is carefully and clearly defined, and a clear and comprehensive understanding of the existing catchment hydrological processes and current drainage arrangements is essential.

The SuDS management train is a useful concept in the development of sustainable drainage systems, focusing on using drainage techniques in series in order to change the characteristics of runoff across a number of stages, beginning with prevention and then dealing with the runoff at source before focusing on larger downstream site and regional controls. Further information on the SuDS management train concept is available from **susdrain** (https://www.susdrain.org/delivering-suds/using-suds/suds-principles/management-train.html).

9.3 Sources of SuDS guidance

9.3.1 C753 CIRIA SuDS Manual (2015)

The C753 CIRIA SuDS Manual (2015) (https://ciria.sharefile.com/share/getinfo/s7227335a22e40b6a) provides guidance on planning, design, construction and maintenance of SuDS. The manual is divided into five sections ranging from a high-level overview of SuDS, progressing to more detailed guidance with progression through the document.

9.3.2 Non-Statutory Technical Guidance, Defra (March 2015)

Non-Statutory Technical guidance (https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards) provides non-statutory standards on the design and performance of SuDS. It outlines peak flow control, volume control, structural integrity, flood risk management and maintenance and construction considerations.

9.3.3 Non-statutory Technical Guidance for Sustainable Drainage Practice Guidance, LASOO (2016)

The Local Authority SuDS Officer Organisation produced their **practice guidance** (https://www.susdrain.org/files/resources/other-guidance/lasoo_non_statutory_suds_technical_standards_guidance_2016_.pdf) in 2016 to give further detail to the Non-statutory technical guidance.

9.3.4 Yorkshire Dales National Park Authority Planning Policy

The Yorkshire Dales National Park Authority leads consultation on planning policy for any works within the National Park. The overarching policies are those based on the **Local Plan** (https://www.yorkshiredales.org.uk/wp-content/uploads/sites/13/2019/06/Yorkshire-Dales-National-Park-Local-Plan-2015-30.pdf) and specific consultations can be made through the dedicated **Citizen Portal Planning** (https://planning.agileapplications.co.uk/yorkshiredales). Additional information on current consultation documents is also available here.

9.3.5 North Yorkshire County Council SuDS Guidance

North Yorkshire County Council published an updated **SuDS Design guidance** (https://www.northyorks.gov.uk/sites/default/files/fileroot/Environment%20and%20waste/Flooding/NYCC%20SuDS%20Design%20Guidance%202018%20Update.pdf) in 2018. This includes a summary of what SuDS is, the design principle to consider such as volume control, construction and maintenance requirements and, planning application requirements. The guidance also provides examples of drainage calculation scenarios in addition to where more information can be found.

9.3.6 Cumbria County Council SuDS Guidance

Cumbria County Council's Development Design Guide, published in November 2017, includes an appendix on **SuDS Components** (https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/43115151648.PDF). This includes examples of SuDS options to consider.

9.3.7 Lancashire County Council SuDS Guidance

Lancashire County Council do not currently have their own SuDS guidance.

9.4 Other surface water considerations

9.4.1 Groundwater Vulnerability Zones

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

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

9.4.2 Groundwater Source Protection Zones (GSPZ)

The Environment Agency also defines Groundwater Source Protection Zones (GSPZs) near groundwater abstraction points. These protect areas of groundwater used for drinking water. The GSPZ requires attenuated storage of runoff to prevent infiltration and contamination. GSPZs can be viewed on **DEFRA's Magic Map** (https://magic.defra.gov.uk/MagicMap.aspx).

There are many GSPZs across the Yorkshire Dales National Park. The largest area is between Round Hill and Lovely Seat north of Appersett.

9.4.3 Nitrate Vulnerable Zones and nutrient neutrality

Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. Nitrate levels in waterbodies are affected by surface water runoff from surrounding agricultural land entering receiving waterbodies. The level of nitrate contamination will potentially influence the choice of SuDS and should be assessed as part of the design process.

NVZs can be viewed on the **Environment Agency's website** (https://environment.data.gov.uk/farmers/). There are currently no areas designated as NVZs within the Yorkshire Dales National Park.

Nutrient neutrality means that the amount of a particular nutrient entering the water system as a result of a new development is offset by the removal of an equivalent amount of the nutrient. This is particularly important in the Eden catchment, which was recently designated as being of particular risk of additional phosphorus concentrations. This means that additional screening of development proposals is required as excessive runoff could make these problems significantly worse.

10 Summary and Recommendations

- There are numerous recorded flooding incidents across the National Park, including in western settlements such as Sedbergh, Giggleswick, Settle and Horton in Ribblesdale, and in eastern settlements including High and Low Fremington, Grinton and Reeth.
- The main rivers associated with fluvial flooding are the:
    - River Eden and its tributaries, which pose a flood risk to a number of rural settlements in the northwest of the National Park including Crosby Ravensworth, Great Asby and Ravenstonedale,
    - River Lune and its tributaries, which pose a flood risk to a number of rural settlements in the west of the National Park including Gawthrop,
    - River Ribble and its tributaries, which pose a flood risk to a number of rural settlements in the south of the National Park including Horton in Ribblesdale and Stainforth,
    - River Aire and its tributaries, which pose a flood risk to a number of rural settlements in the south of the National Park including Malham, Kirkby Malham and Embsay,
    - River Wharfe and River Skirfare and their tributaries, which pose a flood risk to a number of rural settlements in the southeast of the National Park including Hubberholme, Kettlewell, Starbotton and Threshfield,
    - River Ure and its tributaries, which pose a flood risk to a number of rural settlements in the east of the National Park including Hawes and Gayle, and
    - River Swale and its tributaries, with pose a flood risk to a number of rural settlements in the northeast of the National Park including Reeth, Fremington and Grinton.
- Surface water risk largely follows the topography of watercourses, but there are also additional flow paths and areas of ponding, for example where water is impounded at road or rail embankments. The National Park is a predominantly rural area, but there are a number of settlements where there is surface water flood risk to properties and infrastructure.
- Historic data provided by United Utilities showed 11 records of external drainage issues and two records of internal drainage issues from 2009 to 2017. Historic data provided by Yorkshire Water showed 291 records of external drainage issues and 15 records of internal drainage issues from 2008 to 2022.
- Areas at risk of flooding today are likely to become at increased risk in the future and the frequency of flooding will also increase in such areas as a result of climate change. Flood extents will increase; in some locations, this may not be by very much, but flood depth, velocity and hazard may have more of an impact due to climate change. It is recommended that the Yorkshire Dales National Park Authority work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the National Park.

- JBA's Groundwater Flood Risk map shows the areas with the shallowest groundwater levels generally follow the flow paths of the major watercourses in the National Park, particularly along the River Ure in the east, the Rivers Wharfe and Ribble in the south, and the Rivers Lune and Eden in the northwest. There are large areas across the northeast and west of the National Park, and also areas in the south, where the risk of groundwater flooding is considered to be negligible due to the nature of the local geological deposits.
- There is one canal located within the National Park, the Leeds and Liverpool Canal, which covers a short stretch of the southern boundary of the National Park by Gargrave. This has the potential to interact with other watercourses which flood in the area and become a conduit for flow paths during flood events or in a breach scenario.
- For the reservoirs located in the study area, there are no records of flooding and the level and standard of inspection and maintenance required under the Reservoirs Act 1975 means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach, and this risk should be considered in any site-specific Flood Risk Assessments (where relevant).

10.1 Recommendations

Reduction of flood risk through site allocations and appropriate site design

- To locate new development in areas of lowest risk, in line with the Sequential Test, by steering sites to river Flood Zone 1 and avoiding where possible surface water Flood Zone B. If a Sequential Test is undertaken and a site at flood risk is identified as the only appropriate site for the development, the Exception Test shall be undertaken. If development can't be avoided in a high risk surface water Zone, then part "b" of the Exception Test should be satisfied.
- After application of the Exception Test, a sequential approach to site design will be used to reduce risk. Any re-development within areas of flood risk which provide other wider sustainability benefits will provide flood risk betterment and be made resilient to flooding.
- Identification of long-term opportunities to remove development from the floodplain and safeguard the functional floodplain from future development to make space for water.
- In addition to main rivers, ordinary watercourses must also be considered during site allocation and design. For ordinary watercourses not currently afforded flood maps, these may need to be modelled to an appropriate level of detail to enable a sequential approach to the layout of the development.
- Ensure development is 'safe', dry pedestrian egress from the floodplain and emergency vehicular access should be possible for all residential development. If at risk, then an assessment should be made to detail the flood duration, depth, velocity and flood hazard rating in the 1 in 100-year plus climate change flood event, in line with FD2320.
- Raise residential and commercial finished floor levels 600mm above the 1 in 100-year plus climate change flood level. Protect and promote areas for future flood alleviation schemes.
- Identify opportunities for brownfield sites in functional floodplain to reduce risk and provide flood risk betterment.
- Identify opportunities to help fund future flood risk management through developer contributions to reduce risk for surrounding areas.
- Seek opportunities to make space for water to accommodate climate change.

Promote SuDS to mimic natural drainage routes to improve water quality

- SuDS design should demonstrate how constraints have been considered and how the design provides multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure and the enhancement of historical features.
- Planning applications for phased developments should be accompanied by a drainage strategy, which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase.

- Use of the SuDS management train to prevent and control pollutants to prevent the 'first flush' polluting the receiving waterbody.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.

Reduce Surface Water Runoff from New Developments and Agricultural Land

- Space should be provided for the inclusion of SuDS on all allocated sites, outline proposals and full planning applications.
- Promote biodiversity, habitat improvements and **Countryside Stewardship schemes** (https://www.gov.uk/government/publications/countryside-stewardship-runoff-and-soil-erosion-risk-assessment) to help prevent soil loss and to reduce runoff from agricultural land.

Enhance and Restore River Corridors and Habitat

- Assess condition of existing assets and upgrade, if required, to ensure that the infrastructure can accommodate pressures/flows for the lifetime of the development.
- Natural drainage features should be maintained and enhanced.
- Identify opportunities for river restoration/enhancement to make space for water.
- A presumption against culverting of open watercourses except where essential to allow highways and/or other infrastructure to cross, in line with CIRIA's Culvert design and operation guide, (C689) and to restrict development over culverts.
- There should be no built development within 8m from the top of a watercourse or Main River for the preservation of the watercourse corridor, wildlife habitat, flood flow conveyance and future watercourse maintenance or improvement.

Mitigate Against Risk, Improved Emergency Planning and Flood Awareness

- Work with emergency planning colleagues and stakeholders to identify areas at highest risk and locate most vulnerable receptors.
- Exceedance flows, both within and outside of the site, should be appropriately designed to minimise risks to both people and property.
- For a partial or completely pumped drainage system, an assessment should be undertaken to assess the risk of flooding due to any failure of the pumps to be assessed. The design flood level should be determined if the pumps were to fail; if the attenuation storage was full, and if a design storm occurred.
- An emergency overflow should be provided for piped and storage features above the predicted water level arising from a 100-year rainfall event, inclusive of climate change and urban creep.
- Consideration and incorporation of flood resilience measures up to the 1 in 1,000-year event.

- Ensure robust emergency (evacuation) plans are produced and implemented for major developments.
- Increase awareness and promote sign-up to the Environment Agency Flood Warnings Direct (FWD) within the Yorkshire Dales National Park.

Appendices

A Interactive Flood Risk Mapping

B Data sources used in the SFRA

C SFRA User Guide

D Flood Alerts and Flood Warnings

E Summary of flood risk across the Yorkshire Dales National Park

F Cumulative Impact Assessment (CIA)

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
Skipton
Tadcaster
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