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Cotswold Level 1 Strategic Flood Risk Assessment

Appendix F - Catchment-level assessment of the cumulative impacts of development on flood risk

Final

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Abbreviations

ACDP	Areas with Critical Drainage Problems
AEP	Annual Exceedance Probability
EA	Environment Agency
FRA	Flood Risk Assessment
GCC	Gloucestershire County Council
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LPU	Local Plan Update
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NRD	National Receptor Dataset
OS	Ordnance Survey
RAG	Red-Amber-Green
RFO	Recorded Flood Outline
RMA	Risk Management Authority
RoFSW	Risk of Flooding from Surface Water
SuDS	Sustainable drainage systems
WFD	Water Framework Directive

1 Introduction

Cumulative impacts are defined as the effects of past, current and future activities on the environment. The below assessment is a catchment based approach, which indicates potential cumulative impacts on the Cotswold District Council (the Council) authority area. These cumulative impacts may be negative, such as development leading to an increase in the existing level of flood risk within a catchment. They may also be positive, such as effective surface water management within a development site helping to alleviate existing flooding issues within a catchment.

The cumulative impact of development should be considered at both the Local Plan making stage and the planning application and development design stages. Paragraph 171 of the National Planning Policy Framework (NPPF, 2025) states:

'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.'

To understand the impact of future development on flood risk in the Council area, flood risk data has been compared with potential changes in developed area within each river catchment defined within the Water Framework Directive (WFD). This identifies the catchments where development may have the greatest impact on flood risk, and therefore where further assessment would be required within a site-specific Flood Risk Assessment (FRA).

Where catchments have been identified as sensitive to the cumulative impact of development, the assessment concludes with potential strategic planning policy suggestions to manage the risk.

2 Cumulative Impact Assessment Methodology

2.1 Cumulative impact of development and flood risk

2.1.1 Introduction

The cumulative impact of development is assessed in two parts. These comprise an evaluation of future development pressures within each WFD river waterbody catchment and an assessment of historical and predicted future flood risk. The approach to understanding the catchments most influenced by the cumulative impact of development is conceptualised in Figure 2-1.

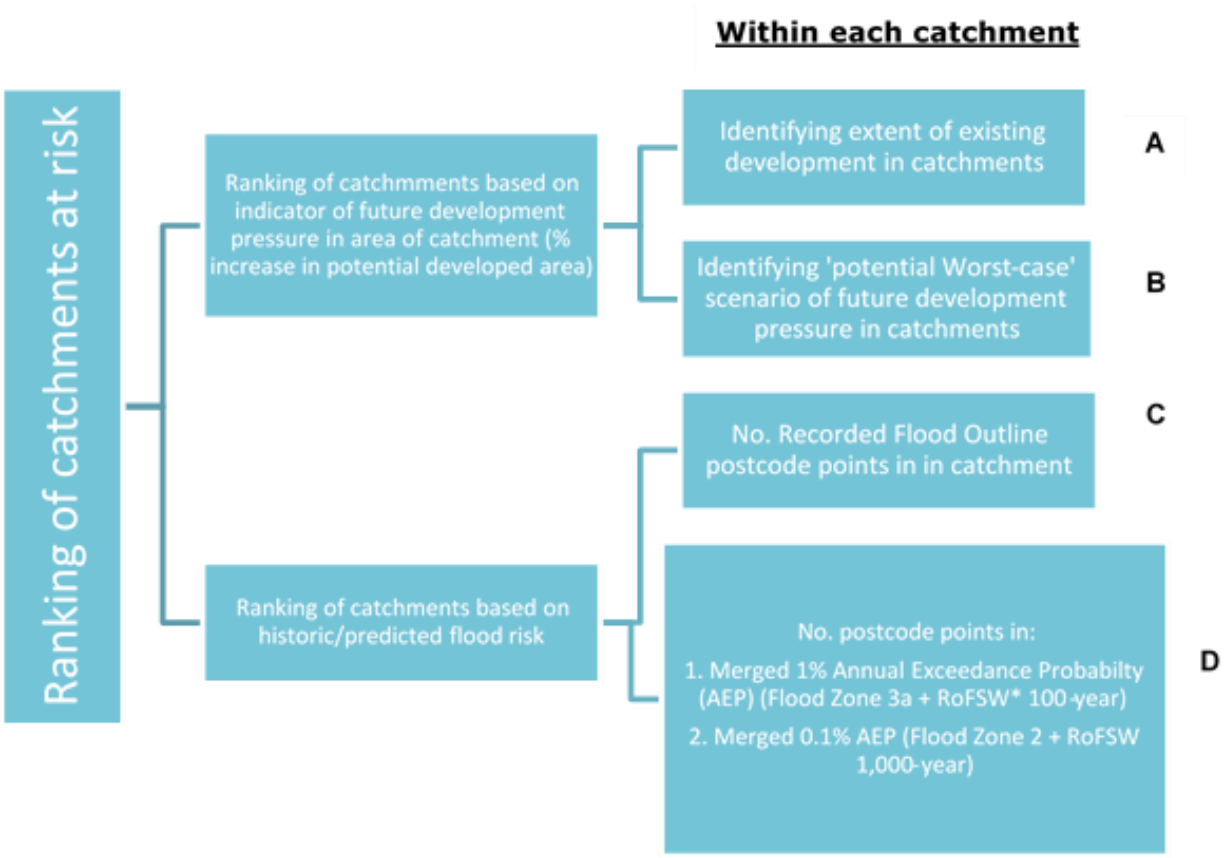

Figure 2-1: Overview of the method used in the cumulative impact assessment

**Risk of Flooding from Surface Water (RoFSW)*

2.1.2 Assessing existing and future development scenarios

To ensure that the strategic policies of the Local Plan Update (LPU) consider the impact of any future development on areas susceptible to flooding, the potential development pressures during the LPU period need to be considered. The impact of development is assessed by establishing a growth scenario of development already committed to prior to the preparation of the LPU, as well as the potential future development pressures during the active Local Plan period.

The assessment is undertaken on a river catchment scale, using catchments defined by the WFD. Several of the WFD river waterbody catchments assessed within the cumulative impact assessment cross administrative boundaries into neighbouring districts. To account for this in the study, all councils that share a WFD river waterbody catchment with Cotswold were contacted to provide information of future development within their administrative area. These councils are:

- Cheltenham Borough Council
- South Gloucestershire Council
- South Oxfordshire District Council
- Stratford-on-Avon District Council
- Stroud District Council
- Swindon Borough Council
- Tewkesbury Borough Council
- West Oxfordshire District Council
- Wiltshire Council
- Wychavon District Council
- Vale of White Horse District Council

The site allocation information provided by these neighbouring authorities was combined with that of the Council's to understand the risk to each WFD river waterbody catchment, based upon potential future growth.

It should be noted that the inclusion of potential future development pressures in neighbouring authorities makes the scoring method sensitive to future change, should any larger sites be removed, or additional sites come forward. However, it provides the best possible indication of development pressure across the Council area and catchments that feed into it. Potential future development information for the following neighbouring authorities, as either no allocation was provided or data was not provided in a spatial format suitable for consideration:

- Cheltenham Borough Council
- Stratford-on-Avon District Council
- Swindon Borough Council
- Tewkesbury Borough Council
- West Oxfordshire District Council
- Wychavon District Council

2.1.2.1 Existing development scenario (Part A - Figure 2-1)

To understand the level of existing development within the study area, the Ordnance Survey (OS) Open Codepoint dataset covering the Council area and neighbouring authority areas was used to establish the baseline growth scenario. This dataset provides postcode locations for Great Britain.

2.1.2.2 Indicator of development pressure (Part B - Figure 2-1)

To understand which catchments within the Council area are likely to experience the greatest pressure of future growth, all potential development sites within Cotswold, as well as the sites provided by the neighbouring authorities, were analysed. This analysis serves as an indicator of areas likely to be subject to the greatest development pressure in the future. At the time of preparing the assessment, this is the only spatial data indicator available, as definitive development areas have not yet been allocated within all the Local Plans of the neighbouring authorities.

This data allows calculation of the overall area of sites within each catchment that are either proposed or submitted to the relevant Local Planning Authority (LPA) for consideration to allocate within their Local Plans, illustrating the relative pressures on the catchments. The percentage total proposed area of development is calculated and ranked, with the catchment with the highest proportion of growth ranked as '1'.

2.1.3 Datasets used to assess future development pressures

Table 2-1 provides an overview of the datasets considered within the future development section of the cumulative impact assessment.

Table 2-1: Data considered within the development assessment and their purpose

Dataset	Coverage	Source of data	Purpose
Catchment boundaries	Cotswold District Council authority area	WFD river waterbody catchments (Environment Agency)	To identify and map catchments that will determine the study area extent
Existing development data	Catchments covering the Cotswold District Council authority area	Open Codepoint (Ordnance Survey)	To provide the existing development scenario
Local Plan potential future development sites	Catchments covering the Cotswold District Council authority area	Neighbouring authorities to Cotswold District	To provide an indicator of relative future development pressures within the study area

2.1.4 Assessing the sensitivity to flood risk

In addition to the assessment of future development pressures, a composite flood risk score is derived for each catchment. This is calculated by taking an average ranking of both recorded flood risk (historic incidents) and modelled (predicted) fluvial and surface water risk. To understand the relative flood risk within each catchment, a ranking system is adopted, with the worst-case flood risk numbered as '1'.

2.1.4.1 Historic flood risk (Part C - Figure 2-1)

To understand the impact to property from historic flood incidents, the EA Recorded Flood Outline (RFO) dataset was considered. This was intersected with the Codepoints within each catchment to provide a count for the number of historically impacted properties per catchment.

2.1.4.2 Sensitivity to increases in flood flows (Part D - Figure 2-1)

To understand the sensitivity of each catchment to increases in flood flows, an assessment of both fluvial and surface water flood risk was undertaken. This assessment provides an indication of where local topography makes an area more sensitive to increases in flood risk. This may be due to any number of reasons, including climate change, new development etc. It is not an absolute figure or prediction of the impact that new development will have on flood risk. Not all sources of flood risk have been considered in this assessment. This is because the available datasets for other sources of flooding are not based on a risk-based scenario, therefore they do not provide the probability of flooding in a given year.

The present day flood risk scenario is based on the 1 in 100-year (1% Annual Exceedance Probability (AEP)) event, using a combination of the EA Flood Zone 3 and medium risk RoFSW mapping. The future flood risk scenario is based on the 1 in 1000-year (0.1% AEP) event and is determined using a combination of the EA Flood Zone 2 and low risk RoFSW mapping. The fluvial and surface water flood extents are merged to prevent double counting of properties at risk where fluvial and surface water flood risks overlap.

The present and future flood risk scenarios have been separately intersected with the Codepoint dataset to approximate the number of properties at risk within each scenario. The difference between the number of properties within the present and future flood risk scenarios has been calculated and given as a percentage of the total number of Codepoints within the catchment. This gives an indication of which catchments are most sensitive to increases in surface water runoff upstream.

2.1.4.3 Datasets used to assess the sensitivity to flood risk

Table 2-2 provides an overview of the datasets considered within the flood risk section of the cumulative impact assessment.

Table 2-2: Data considered within the flood risk assessment and their purpose

Dataset	Coverage	Source of data	Purpose
Catchment boundaries	Cotswold District Council authority area	WFD river waterbody catchments (Environment Agency)	To identify and map catchments that will determine the study area extent
Property point data	Catchments covering the Cotswold District Council authority area	Open Codepoint (Ordnance Survey)	To provide an indication of the number of properties at risk
Historic flood incidents	Catchments covering the Cotswold District Council authority area	Recorded Flood Outlines (Environment Agency)	To understand which areas have been impacted by historic flooding
Fluvial flood zones	Catchments covering the Cotswold District Council authority area	Flood Map for Planning Flood Zones 2 and 3 (Environment Agency)	To understand the present day and potential future impacts of fluvial flooding
Surface water flood zones	Catchments covering the Cotswold District Council authority area	Risk of Flooding from Surface Water - low and medium risk (Environment Agency)	To understand the present day and potential future impacts of surface water flooding

3 Results

3.1 Introduction

The results are ranked for each of the above assessments from 1 to 59. For example, the catchment with the highest percentage of property points within the recorded flood outline dataset would be ranked as '1'. The individual historic flooding, flood risk sensitivity and future development pressure ranks are summed to give an overall ranking for each catchment. The catchment with the lowest combined rank is the most sensitive to the cumulative impact of development.

3.2 Cumulative impact assessment results

A Red Amber Green (RAG) rating is applied to the catchments, with red being high sensitivity, amber being medium sensitivity and green being low sensitivity. It should be noted that this assessment provides a relative assessment of sensitivity increases in flood risk and development between catchments within the study area. Catchments with an overall rank of less than 15 have been determined as high sensitivity catchments. Catchments with an overall rank of between 15 and 30 have been determined as medium sensitivity catchments. All other catchments have been identified as low sensitivity.

The following catchments have been identified as highly sensitive to the cumulative impacts of development:

- Bretforton Bk - source to conf Broadway-Badsey Bk
- Broadway-Badsey Bk - source to conf R Avon
- Churn (Baunton to Cricklade)
- Coln (from Coln Rogers) and Thames (Coln to Leach)
- Evenlode (Source to Four Shires S) and Longborough Stream
- Knee Bk - source to conf Blockley Bk
- Swilgate - source to conf R Avon
- Swill Brook (source to Ashton Keynes)
- Tetbury Avon - unnamed trib to conf Sherston Avon
- Thames (Churn to Coln)
- Thames (Kemble to Waterhay Bridge)
- Thames (Leach to Evenlode)
- Thornhill Ditch and tributaries at Cotswolds Water Park
- Windrush (Slade Barn Stream to Dikler)

The results of the cumulative impact are shown in Figure 3-1 and Table 3-1.

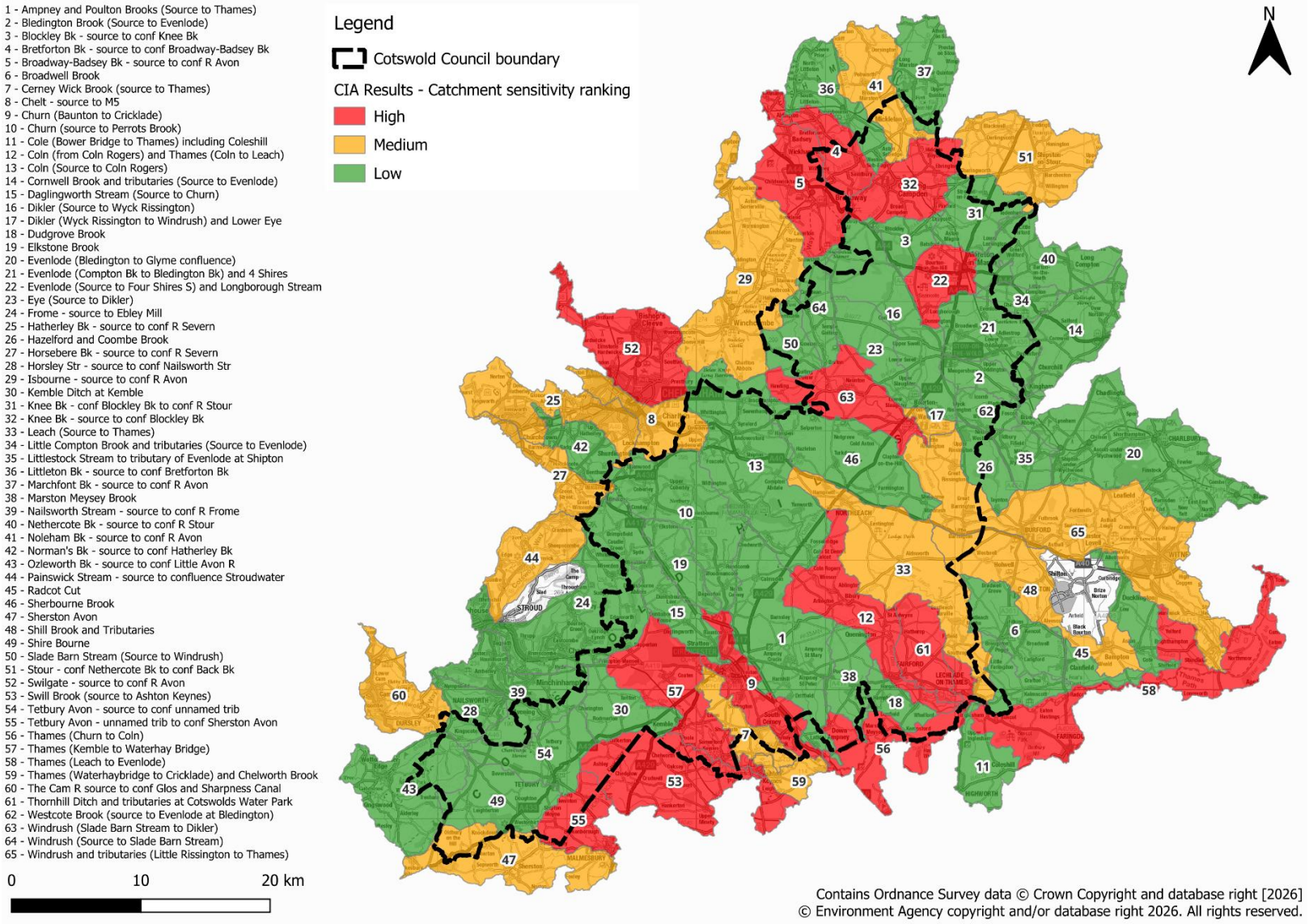

Figure 3-1: Sensitivity of catchments within and around the Cotswold study area to cumulative impacts

Table 3-1: Results of the cumulative impact assessment

Map label	Catchment name	Area of growth (%)	Growth RAG score	Codepoints in historic flood outlines	Increase in properties at flood risk (%)	Flood Risk RAG score	Overall RAG score	Overall rank
1	Ampney and Poulton Brooks (Source to Thames)	2.4%	Medium	1	3.7%	Low	Low	35
2	Bledington Brook (Source to Evenlode)	0.1%	Low	2	3.7%	Low	Low	40
3	Blockley Bk - source to conf Knee Bk	0.2%	Low	0	1.1%	Low	Low	52
4	Bretforton Bk - source to conf Broadway-Badsey Bk	0.3%	Low	10	13.3%	High	High	4
5	Broadway-Badsey Bk - source to conf R Avon	0.0%	Low	38	13.3%	High	High	8
6	Broadwell Brook	0.0%	Low	1	4.2%	Low	Low	47

Map label	Catchment name	Area of growth (%)	Growth RAG score	Codepoints in historic flood outlines	Increase in properties at flood risk (%)	Flood Risk RAG score	Overall RAG score	Overall rank
7	Cerney Wick Brook (source to Thames)	6.7%	High	0	4.7%	Low	Medium	27
8	Chelt - source to M5	0.0%	Low	46	12.6%	Medium	Medium	19
9	Churn (Baunton to Cricklade)	4.6%	High	12	9.2%	Medium	High	9
10	Churn (source to Perrots Brook)	0.0%	Low	0	1.5%	Low	Low	58
11	Cole (Bower Bridge to Thames) including Coleshill	0.0%	Low	3	2.9%	Low	Low	43
12	Coln (from Coln Rogers) and Thames (Coln to Leach)	0.1%	Low	20	9.7%	High	High	9
13	Coln (Source to Coln Rogers)	0.1%	Low	0	0.0%	Low	Low	55

Map label	Catchment name	Area of growth (%)	Growth RAG score	Codepoints in historic flood outlines	Increase in properties at flood risk (%)	Flood Risk RAG score	Overall RAG score	Overall rank
14	Cornwell Brook and tributaries (Source to Evenlode)	0.0%	Low	0	3.3%	Low	Low	54
15	Daglingworth Stream (Source to Churn)	0.0%	Low	0	11.9%	Medium	Low	31
16	Dikler (Source to Wyck Rissington)	0.0%	Low	0	0.0%	Low	Low	59
17	Dikler (Wyck Rissington to Windrush) and Lower Eye	0.4%	Low	1	5.4%	Low	Medium	28
18	Dudgrove Brook	0.7%	Low	0	2.0%	Low	Low	45
19	Elkstone Brook	0.0%	Low	0	0.0%	Low	Low	59
20	Evenlode (Bledington to Glyme confluence)	0.0%	Low	12	3.9%	Low	Low	40

Map label	Catchment name	Area of growth (%)	Growth RAG score	Codepoints in historic flood outlines	Increase in properties at flood risk (%)	Flood Risk RAG score	Overall RAG score	Overall rank
21	Evenlode (Compton Bk to Bledington Bk) and 4 Shires	1.5%	Medium	0	4.3%	Low	Low	34
22	Evenlode (Source to Four Shires S) and Longborough Stream	4.3%	High	28	14.3%	High	High	2
23	Eye (Source to Dikler)	0.0%	Low	0	2.3%	Low	Low	57
24	Frome - source to Ebley Mill	0.1%	Low	10	3.8%	Low	Low	46
25	Hatherley Bk - source to conf R Severn	0.0%	Low	41	14.3%	Medium	Medium	17
26	Hazelford and Coombe Brook	0.0%	Low	0	2.7%	Low	Low	56
27	Horsebere Bk - source to conf R Severn	0.0%	Low	13	9.4%	Medium	Medium	26

Map label	Catchment name	Area of growth (%)	Growth RAG score	Codepoints in historic flood outlines	Increase in properties at flood risk (%)	Flood Risk RAG score	Overall RAG score	Overall rank
28	Horsley Str - source to conf Nailsworth Str	0.1%	Low	0	3.0%	Low	Low	50
29	Isbourne - source to conf R Avon	0.0%	Low	18	8.9%	Medium	Medium	22
30	Kemble Ditch at Kemble	0.4%	Low	0	0.0%	Low	Low	49
31	Knee Bk - conf Blockley Bk to conf R Stour	0.2%	Low	0	6.8%	Low	Low	36
32	Knee Bk - source to conf Blockley Bk	0.3%	Low	21	11.5%	High	High	6
33	Leach (Source to Thames)	0.1%	Low	12	5.9%	Medium	Medium	21
34	Little Compton Brook and tributaries (Source to Evenlode)	0.0%	Low	0	0.0%	Low	Low	59

Map label	Catchment name	Area of growth (%)	Growth RAG score	Codepoints in historic flood outlines	Increase in properties at flood risk (%)	Flood Risk RAG score	Overall RAG score	Overall rank
35	Littlestock Stream to tributary of Evenlode at Shipton	0.0%	Low	1	5.3%	Low	Low	42
36	Littleton Bk - source to conf Bretforton Bk	0.0%	Low	2	9.6%	Medium	Low	30
37	Marchfont Bk - source to conf R Avon	0.0%	Low	0	8.7%	Low	Low	39
38	Marston Meysey Brook	0.0%	Low	1	2.3%	Low	Low	47
39	Nailsworth Stream - source to conf R Frome	0.1%	Low	4	6.0%	Low	Low	37
40	Nethercote Bk - source to conf R Stour	0.0%	Low	0	4.2%	Low	Low	50

Map label	Catchment name	Area of growth (%)	Growth RAG score	Codepoints in historic flood outlines	Increase in properties at flood risk (%)	Flood Risk RAG score	Overall RAG score	Overall rank
41	Noleham Bk - source to conf R Avon	0.5%	Low	0	6.9%	Low	Medium	29
42	Norman's Bk - source to conf Hatherley Bk	0.0%	Low	2	7.6%	Low	Low	38
43	Ozleworth Bk - source to conf Little Avon R	0.2%	Low	4	4.9%	Low	Low	31
44	Painswick Stream - source to confluence Stroudwater	0.0%	Low	1	14.7%	Medium	Medium	23
45	Radcot Cut	0.0%	Low	9	4.3%	Medium	Low	31
46	Sherbourne Brook	0.0%	Low	0	0.0%	Low	Low	59
47	Sherston Avon	0.9%	Low	11	4.2%	Medium	Medium	16
48	Shill Brook and Tributaries	0.0%	Low	18	7.4%	Medium	Medium	23
49	Shire Bourne	0.0%	Low	0	0.0%	Low	Low	59

Map label	Catchment name	Area of growth (%)	Growth RAG score	Codepoints in historic flood outlines	Increase in properties at flood risk (%)	Flood Risk RAG score	Overall RAG score	Overall rank
50	Slade Barn Stream (Source to Windrush)	0.0%	Low	0	0.0%	Low	Low	59
51	Stour - conf Nethercote Bk to conf Back Bk	0.0%	Low	13	11.5%	Medium	Medium	17
52	Swilgate - source to conf R Avon	0.0%	Low	165	13.6%	High	High	11
53	Swill Brook (source to Ashton Keynes)	0.8%	Low	16	11.5%	High	High	3
54	Tetbury Avon - source to conf unnamed trib	0.2%	Low	0	3.7%	Low	Low	43
55	Tetbury Avon - unnamed trib to conf Sherston Avon	2.8%	Medium	6	7.8%	Medium	High	11
56	Thames (Churn to Coln)	0.3%	Low	7	8.2%	Medium	High	13

Map label	Catchment name	Area of growth (%)	Growth RAG score	Codepoints in historic flood outlines	Increase in properties at flood risk (%)	Flood Risk RAG score	Overall RAG score	Overall rank
57	Thames (Kemble to Waterhay Bridge)	0.6%	Low	12	9.6%	High	High	5
58	Thames (Leach to Evenlode)	0.1%	Low	29	8.9%	Medium	High	14
59	Thames (Waterhaybridge to Cricklade) and Chelworth Brook	0.0%	Low	5	13.3%	High	Medium	15
60	The Cam R source to conf Glos and Sharpness Canal	1.4%	Medium	7	6.4%	Low	Medium	20
61	Thornhill Ditch and tributaries at Cotswolds Water Park	2.3%	Medium	7	21.6%	High	High	1

Map label	Catchment name	Area of growth (%)	Growth RAG score	Codepoints in historic flood outlines	Increase in properties at flood risk (%)	Flood Risk RAG score	Overall RAG score	Overall rank
62	Westcote Brook (source to Evenlode at Bledington)	0.0%	Low	0	3.4%	Low	Low	53
63	Windrush (Slade Barn Stream to Dikler)	0.0%	Low	17	15.6%	High	High	7
64	Windrush (Source to Slade Barn Stream)	0.0%	Low	0	0.0%	Low	Low	59
65	Windrush and tributaries (Little Rissington to Thames)	0.0%	Low	52	9.0%	Medium	Medium	23

4 Assumptions and limitations

Table 4-1 sets out the assumptions and limitations of the cumulative impact assessment.

Table 4-1: Assumptions and limitations of the assessment

Assessment aspect	Assumption made	Details of limitation in method	Justification
Development pressure	Assumption of housing density and impermeable areas	Where potential development densities were not known for the sites, it is assumed that 70% of the site area would contribute surface water runoff to the wider catchment. This takes into account a 30% allowance for landscaping and requirements for sustainable drainage systems (SuDS) within sites, which lessens the impacts of new development	With housing densities and proportions of undeveloped areas not known, the approach aims to provide a more realistic indication of site development in the growth scenario
Development pressure	Current site use assumed to be greenfield (undeveloped)	The current use of the sites (e.g. greenfield/brownfield) is often undefined. Brownfield sites are likely to have a less significant impact on flood risk as they have previously been developed. Therefore, in absence of this information, a 'worst case' assessment is produced, which assumes that all sites are greenfield (undeveloped) and may overestimate the risk within each catchment	The assessment considers the 'worst case' development scenario, that all sites were greenfield (undeveloped) prior to growth. With the former land uses for each site not known, the approach overestimates the potential impact, but this is a precautionary approach
Development pressure	Potential development site area not provided for all neighbouring authorities	Potential development sites were available for consideration for the South Oxfordshire, South Gloucestershire, Stroud, Wiltshire and Vale of White Horse authority areas.	Potential development pressure was not taken into account for the WFD catchments shared between Cheltenham, Stratford-on-Avon, Swindon, Tewkesbury, West Oxfordshire and Wychavon. Cumulative

Assessment aspect	Assumption made	Details of limitation in method	Justification
			impacts were assessed through flood risk only. It is recommended that this assessment is updated should this information be made available.
Flood risk	Overlap between fluvial and surface water extents	The Risk of Flooding from Surface Water mapping identifies the lowest points in the landscape, and therefore low-lying river floodplains are also classified as being at surface water risk. This can lead to 'double counting' of flood risk.	To prevent double counting, the Flood Zone and Risk of Flooding from Surface Water datasets are merged, to create a composite flood risk layer, with any overlapping areas dissolved.
Flood risk	Conservative assumption of using the 1 in 1000-year event to represent the future 1 in 100-year event	The 1 in 1000-year has been used as a conservative proxy to represent the likely influence of climate change on a fluvial 1 in 100-year flood event to inform on the sensitivity of catchments to increases in flooding.	This approach has been taken to ensure a consistent approach between the consideration of fluvial and surface water flooding. There is no suitable surface water climate change information currently available from the EA at the time of writing.
Flood risk	Use of OS Code Point Open postcode point data to represent properties affected by historic/predicted flood risk	As postcode points represent the average location of all properties within a postcode area, there may be properties at the edges of a catchment or the study area which are counted within the neighbouring area or not picked up at all. The dataset is based on full postcodes.	The postcode points are an available open source dataset. Postcode area sizes are also relative to the density of properties in a location, providing better data coverage in areas where a greater number of properties were likely to be affected.

5 Planning policy considerations

5.1 Introduction

Catchment-specific planning policy considerations have been identified for the catchments where cumulative development is likely to have the greatest impact on flood risk to communities.

In addition to assessment at this Level 1 SFRA level, it is recommended that site-specific FRAs are required to include consideration of the cumulative effects of the proposed development. It should be demonstrated that flood risk downstream will not be made worse by the combination of effects from more than one development allocation.

Specific policy considerations are provided for each sensitivity category and are set out in Sections 5.2 to 5.4 below.

5.2 Considerations for all new development in Cotswold

The following planning policy considerations apply to development within all catchments:

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

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

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

5.3 Considerations for medium sensitivity catchments

The following planning policy considerations apply to development within those catchments identified as being at medium sensitivity. All new developments (other than minor extensions) in these catchments should:

- Incorporate SuDS and provide details of adoption, ongoing maintenance, and management, in line with the Gloucestershire SuDS Design and Maintenance Guide and the National Standards for SuDS. Preference will be given to above

ground, vegetated SuDS, which contribute to the conservation and enhancement of biodiversity and green infrastructure in the study area.

- Be incentivised to provide wider betterment by being requested to demonstrate in site-specific FRAs and surface water drainage strategies what measures can be put in place to contribute to a reduction in flood risk downstream. This may either be through provision of additional storage on site e.g. through oversized SuDS, natural flood management techniques, green infrastructure and green-blue corridors and/or by providing a Partnership Funding contribution towards a wider community scheme.
- Ensure both greenfield and brownfield developments are to aim to achieve greenfield runoff rates and volumes in their post-development state.
- Ensure Surface Water Management Plans are developed as required.

5.4 Considerations for higher sensitivity catchments

The following planning policy considerations apply to development within those catchments identified as being at higher sensitivity. For all new developments (other than minor extensions) in these catchments, consider:

- National and local flood risk planning policy must be stringently applied within these areas, with flood risk from all sources given the appropriate priority, particularly when applying the sequential and exception tests.
- Both greenfield and brownfield developments to achieve 20% betterment over pre-development greenfield runoff peak flows[2] and volumes[3] in their post-development state, to counter cumulative impacts of development within the catchment.
- A surface water drainage strategy should be required for all developments in these catchments, regardless of development size. This would mean that a site-specific FRA would be required for all developments, regardless of their size.
- The EA may designate higher sensitivity catchments as Areas with Critical Drainage Problems (ACDPs) as required. If an area with critical drainage is identified, the LPA (supported by the LLFA) should draft a policy within their Local Plan to manage flood risk from local sources in these catchments with critical drainage problems.
- For larger sites and strategic developments (e.g. new settlements and urban extensions):
    - The LLFA, EA and LPA should be consulted at pre-application stage.
    - The FRA should examine the cumulative impacts of proposed peak surface water runoff rates and volumes from across the site on the peak flows, duration of flooding and timing of flood peaks in receiving watercourses. This

2 For the 1 in 1 year rainfall event and the 1 in 100 year rainfall event
3 For the 1 in 100 year, 6 hour rainfall event

should include the impact of other developments within the WFD catchment, if appropriate, as advised by the LPA/LLFA.
    - A surface water drainage strategy should be developed and implement appropriate drainage sub-catchments for the management of surface water, with specific runoff rate and volume requirements set for each sub-catchment, in line with the SuDS management train.
- Particular attention should be given to limiting runoff volumes to greenfield volume, with long-term storage to be provided where required. The timing of runoff released from the development site will need to be assessed against peak flow timings on the receiving watercourse, to ensure that discharges do not have a detrimental impact on downstream flood risk.
    - The timing of flows released from the development site will need to be assessed in the context of peak flows on the receiving watercourse.
    - Every opportunity should be taken to infiltrate and/or store water at a plot level.
    - Longer-term measures for managing flood risk should be considered, including river restoration and contributions to pipeline flood alleviation schemes.
- Where development sites receive runoff from, or drain towards, neighbouring authorities, the LPA should work closely with neighbouring LPAs and the LLFA to develop complementary local plan policies on cumulative flood risk and sustainable drainage.

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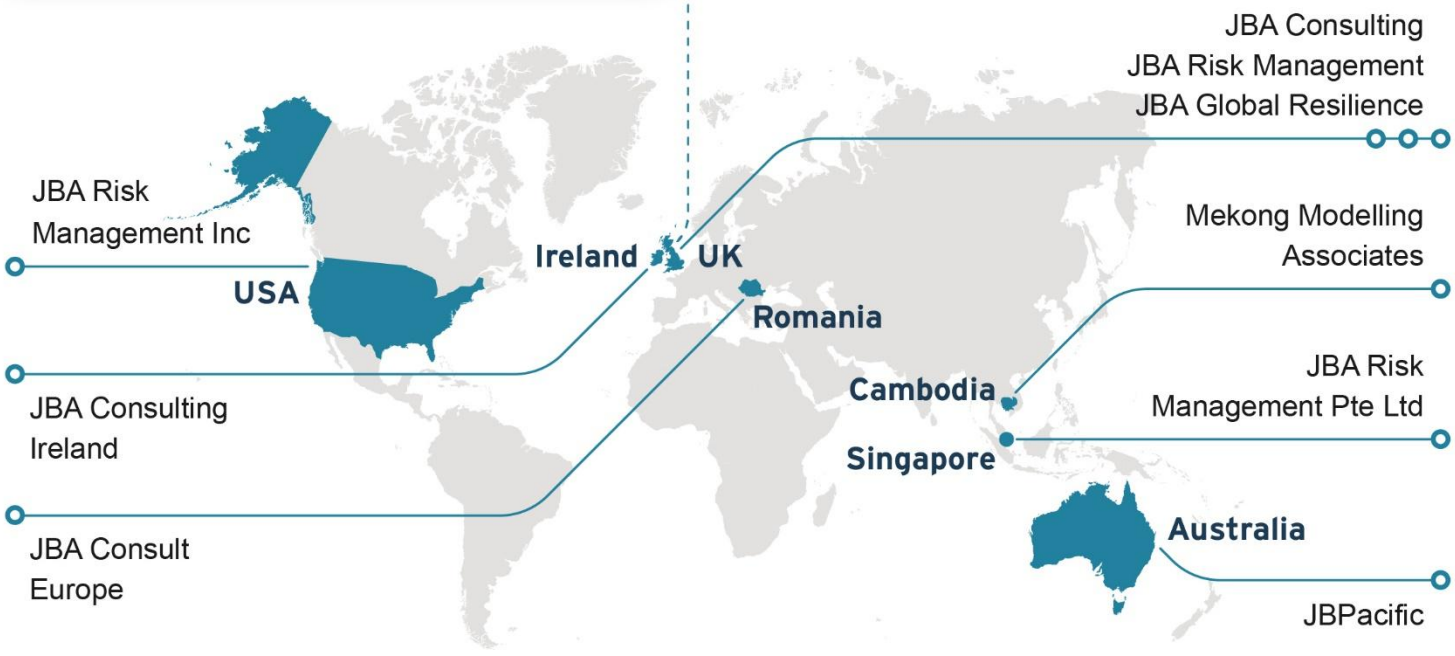

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