

Appendix D - Cumulative Impact Assessment

1 Background

1.1 Introduction

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

Paragraph 166 of the National Planning Policy Framework (NPPF, 2023) 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.'

Appropriate mitigation measures should be undertaken to prevent exacerbation of flood risk, and where possible the development should be used to reduce existing flood risk issues, both onsite and downstream of the development.

To understand the impact of future development on flood risk in the South Downs National Park Authority (SDNPA), catchments were identified where development may have the greatest potential effect on flood risk, and where further assessment would be required within a Level 2 SFRA or site-specific Flood Risk Assessment (FRA). To identify the catchments at greatest risk, various factors were considered, including the potential change in developed area within each catchment and communities sensitive to increased risk of surface water and fluvial flooding, alongside evidence of historic flooding incidents. Where catchments have been identified as sensitive to the cumulative impact of development, the assessment sets out planning policy recommendations to help manage the risk.

1.2 Assessment of Cross-Boundary Issues

The SDNPA is the planning authority for all development within its boundary. However, there are multiple local and district councils that overlap the SDNPA boundary. These authority areas are shown in Figure 1-1.

The topographic characteristics of the area vary significantly. There are six river catchments in SDNPA which all rise within the authority area. The River Itchen flows west with SDNPA and then south into Southampton Water. The River Meon flows south into The Solent. The River Arun (including the Rivers Stor and Rother tributaries), River Adur, River Ouse, and Cuckmere River flow south into the English Channel. The River Wey and its tributaries rise in the north of SDNPA at Alton and

flow in a north-easterly direction, eventually into the River Thames in the north of Weybridge. Section 2 of the Main Report provides further details on the study area.

Flow direction of the majority of watercourses within SDNPA means that the neighbouring and overlapping authorities of Winchester, East Hampshire, Chichester, Arun, Adur, Mid Sussex, Lewes, Brighton and Hove, and Eastbourne have the potential to be affected, in terms of flood risk, by SDNPA. Therefore, future development both within and outside SDNPA could have the potential to affect flood risk to existing communities and surrounding areas, depending on the effectiveness of SuDS and drainage implementation.

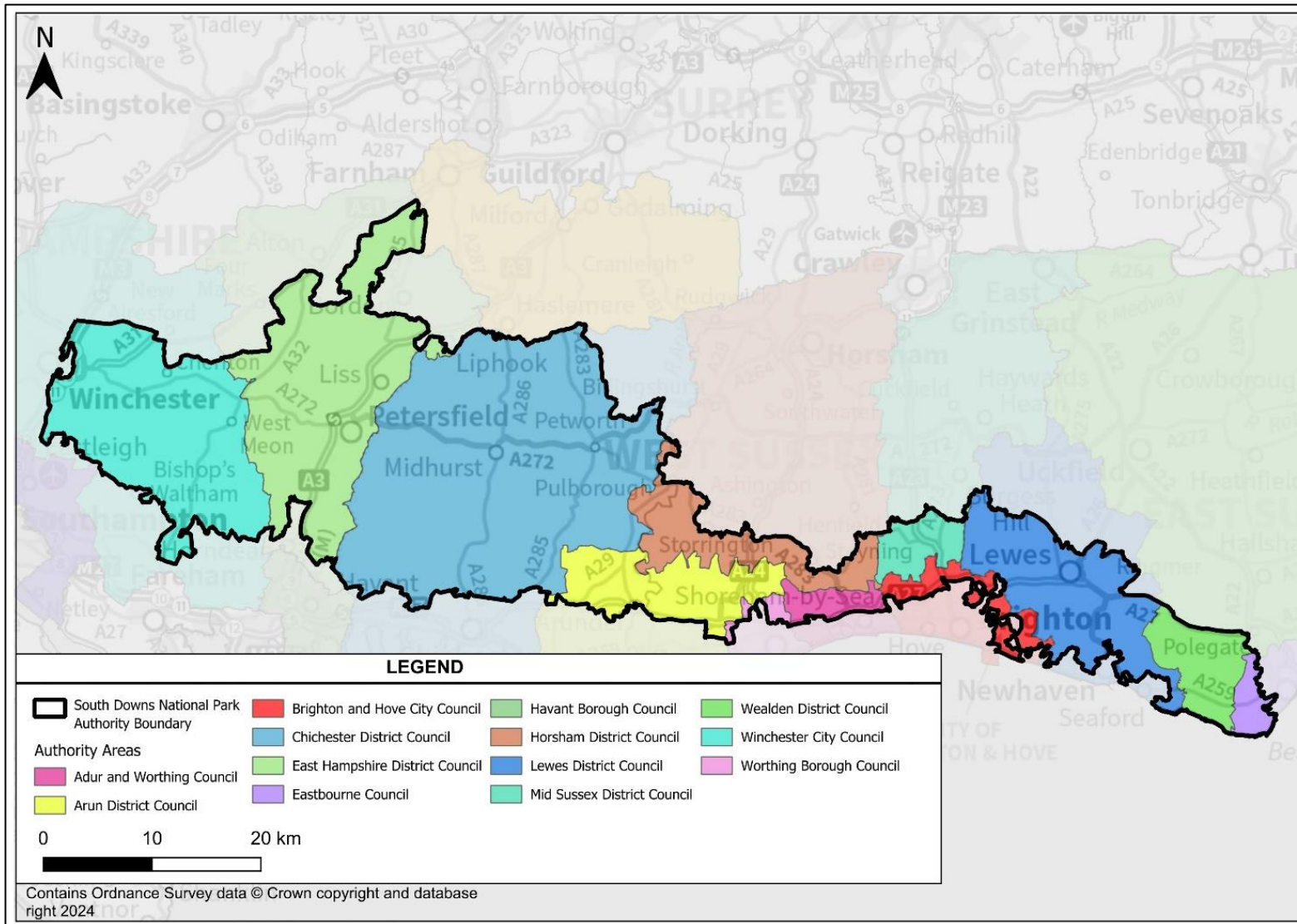


Figure 1-1: Council authority areas which neighbour and overlap SDNPA

1.3 Cumulative Impact Assessment Methodology

For the Cumulative Impact Assessment (CIA), SDNPA was assessed at a catchment level using the Water Framework Directive (WFD) catchments. Due to the high number of catchments covering SDNPA, the figures have been divided into five grids, each showing a separate area within SDNPA. These are displayed Figure 1-2, Figure 1-3, Figure 1-4, Figure 1-5 and Figure 1-6. There are a total of 70 WFD catchments which fall within SDNPA to some extent; however, eight of these have less than 5% of their area within the authority area and have therefore been removed from the assessment. The eight catchments are listed below:

- Adur (Burgess Hill)
- Arle
- Candover Brook
- Horton Heath Stream
- Loxwood/Chiddingfold Trib
- Not part of a river WB catchment_1
- Nun's Walk Stream
- Wallington below Southwick

These eight catchments are not areas with proposed allocations within SDNPA. Five of these catchments drain out of SDNPA. The following three catchments either flow into SDNPA or flow into a neighbouring catchment which in turn flows into the authority area:

- Candover Brook
- Arle
- Nun's Walk Stream

There are four stages to the Level 1 CIA:

1. Assess sensitivity to fluvial and surface water flood risk.
 - This will be assessed by calculating the change in the building area shown to flood from the 1% AEP to the 0.1% AEP events for fluvial and surface water flooding respectively, given as a percentage of the total building area in the catchment.
2. Identify historic flooding incidents.
 - Identify the total number of historic flooding incidents within each catchment.
3. Assess the catchments with the highest degree of proposed new development.
 - This will be assessed by calculating the percentage area of each catchment covered by proposed development.
4. Identify the catchments at greatest risk.
 - Rank catchments in each category.

- Discussion of catchments which are at high risk in all categories/individual categories.
- Policy recommendations for developments in higher risk catchments.
- Identify catchments needing further consideration within a Level 2 SFRA (if required).

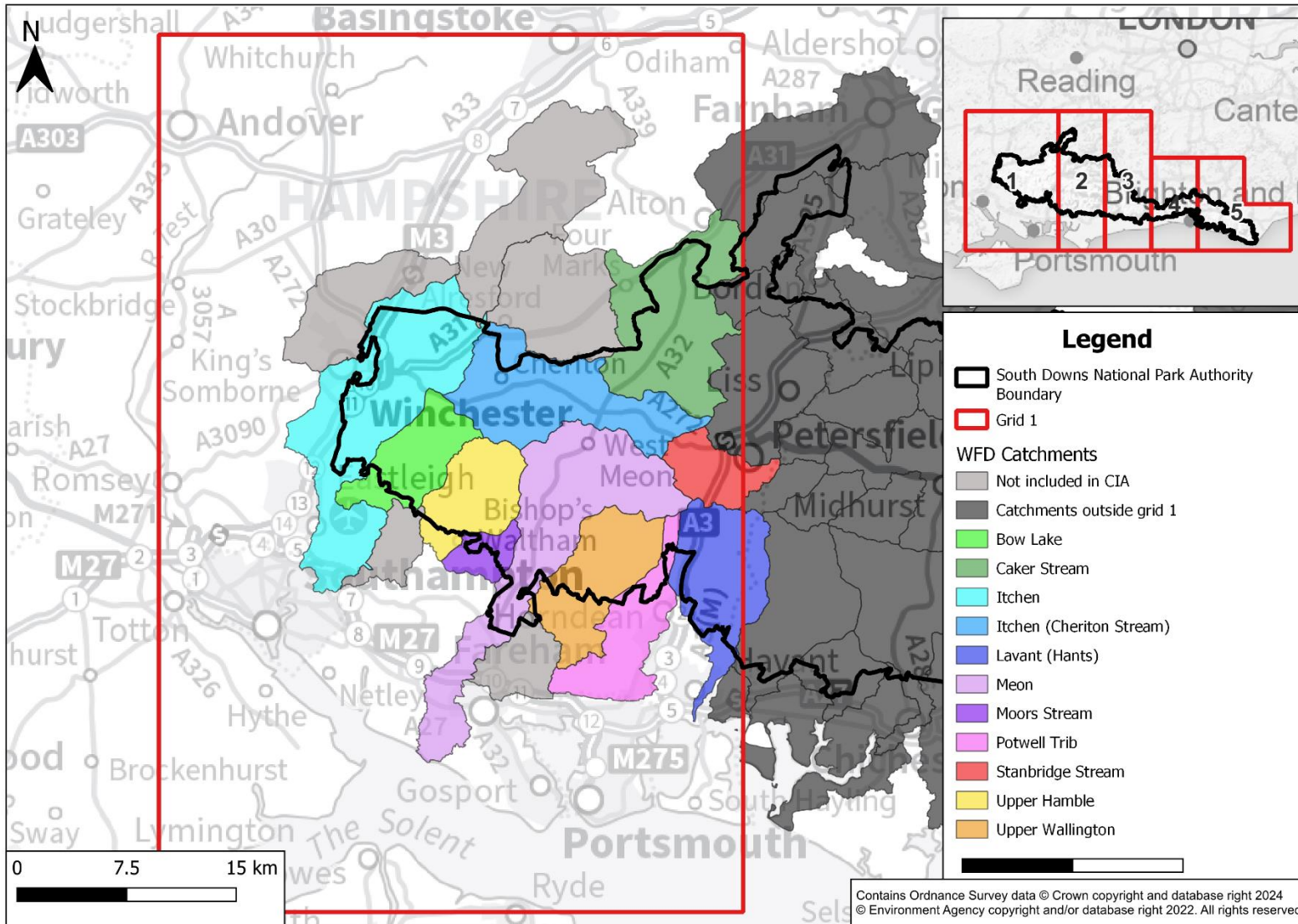


Figure 1-2: Catchments within SDNPA (grid 1)

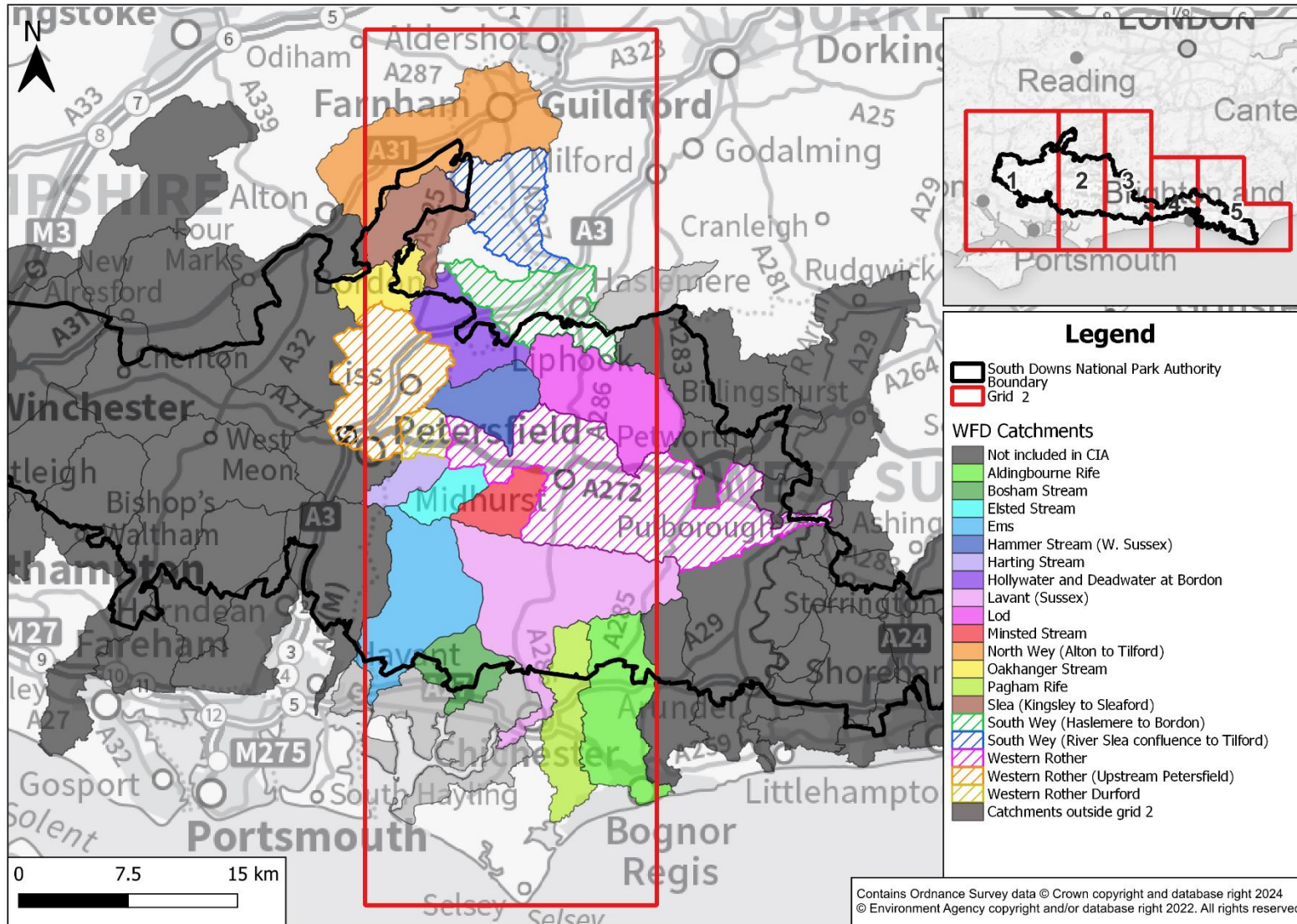


Figure 1-3: Catchments within SDNPA (grid 2)

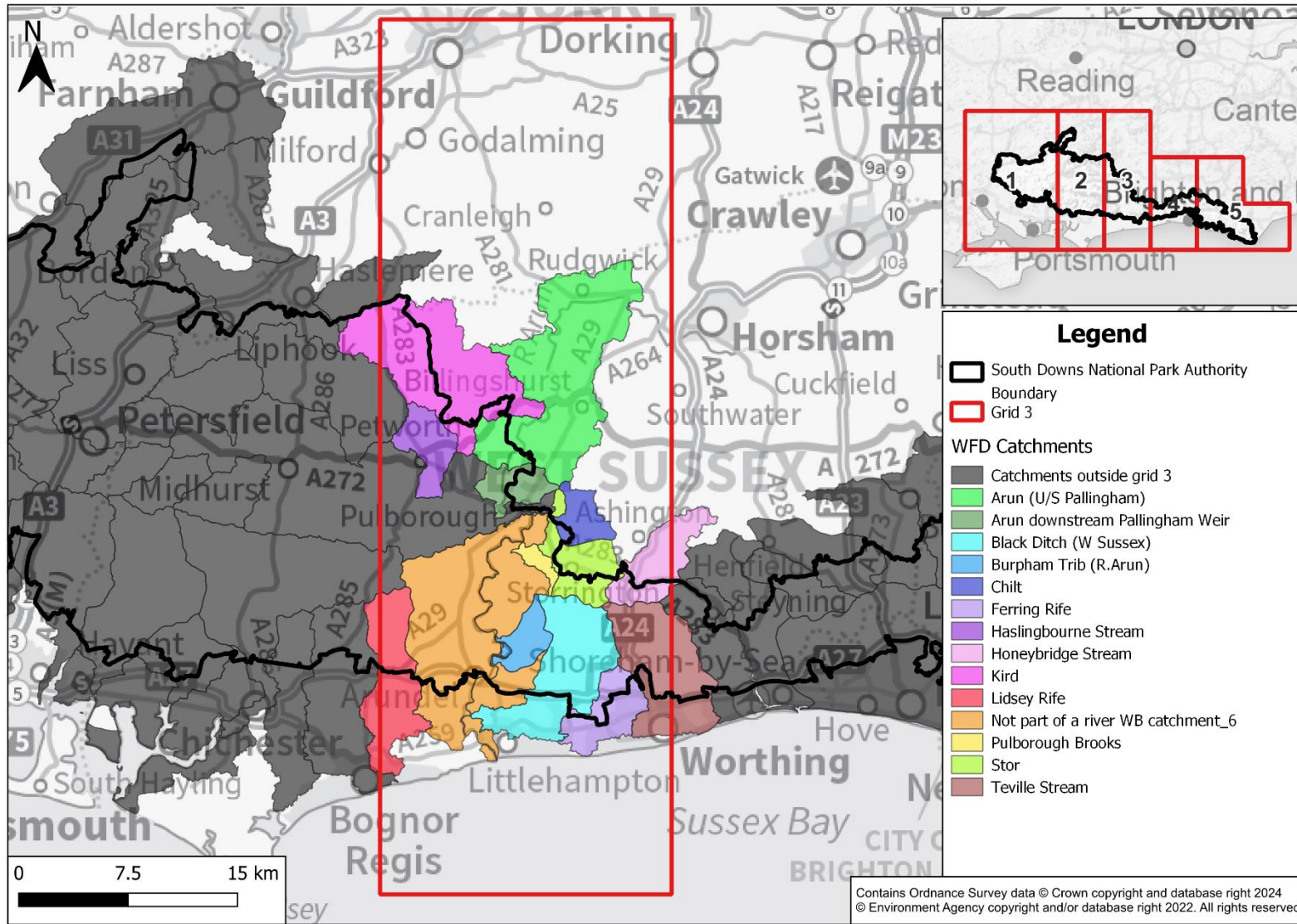


Figure 1-4: Catchments within SDNPA (grid 3)

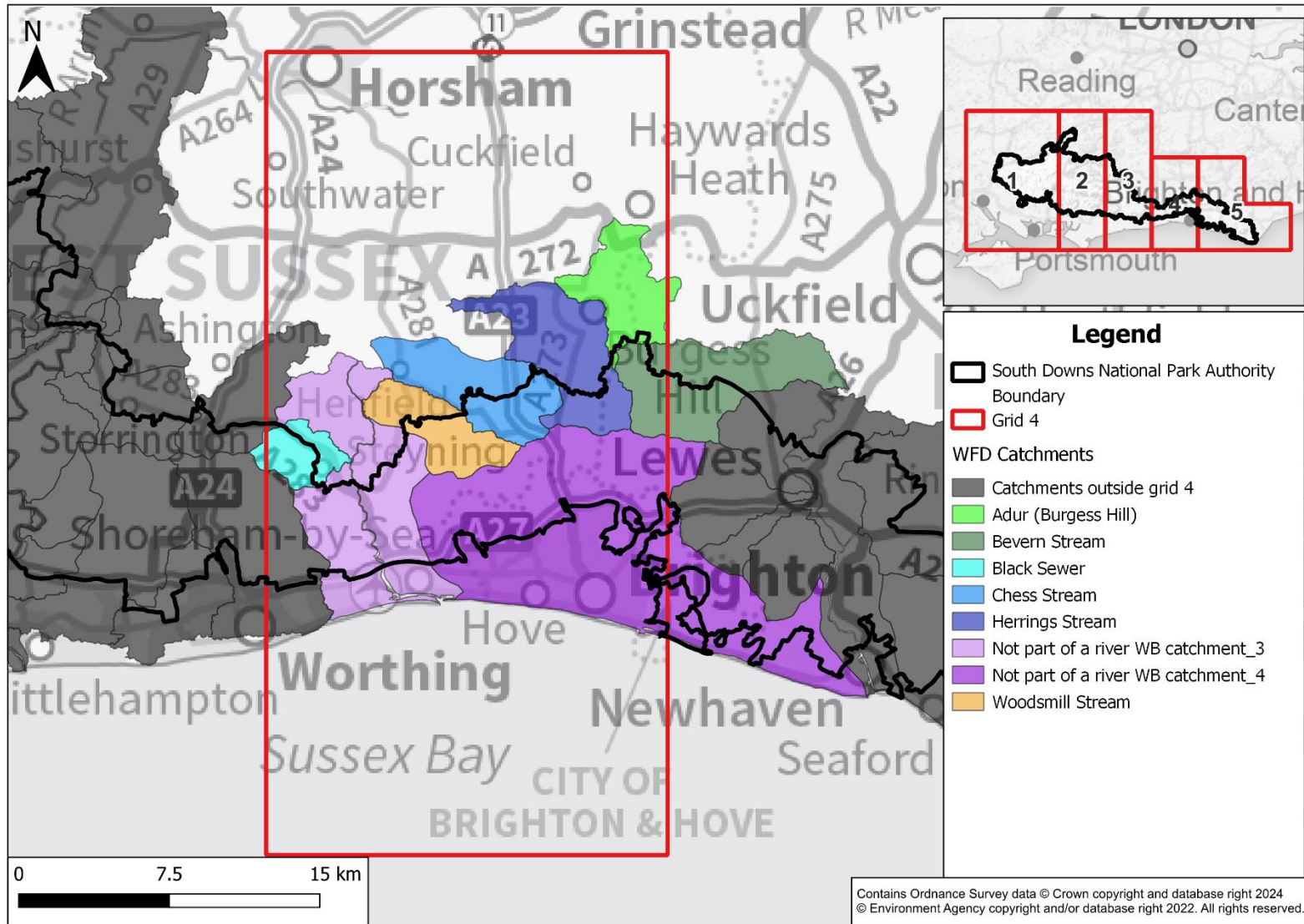


Figure 1-5: Catchments within SDNPA (grid 4)

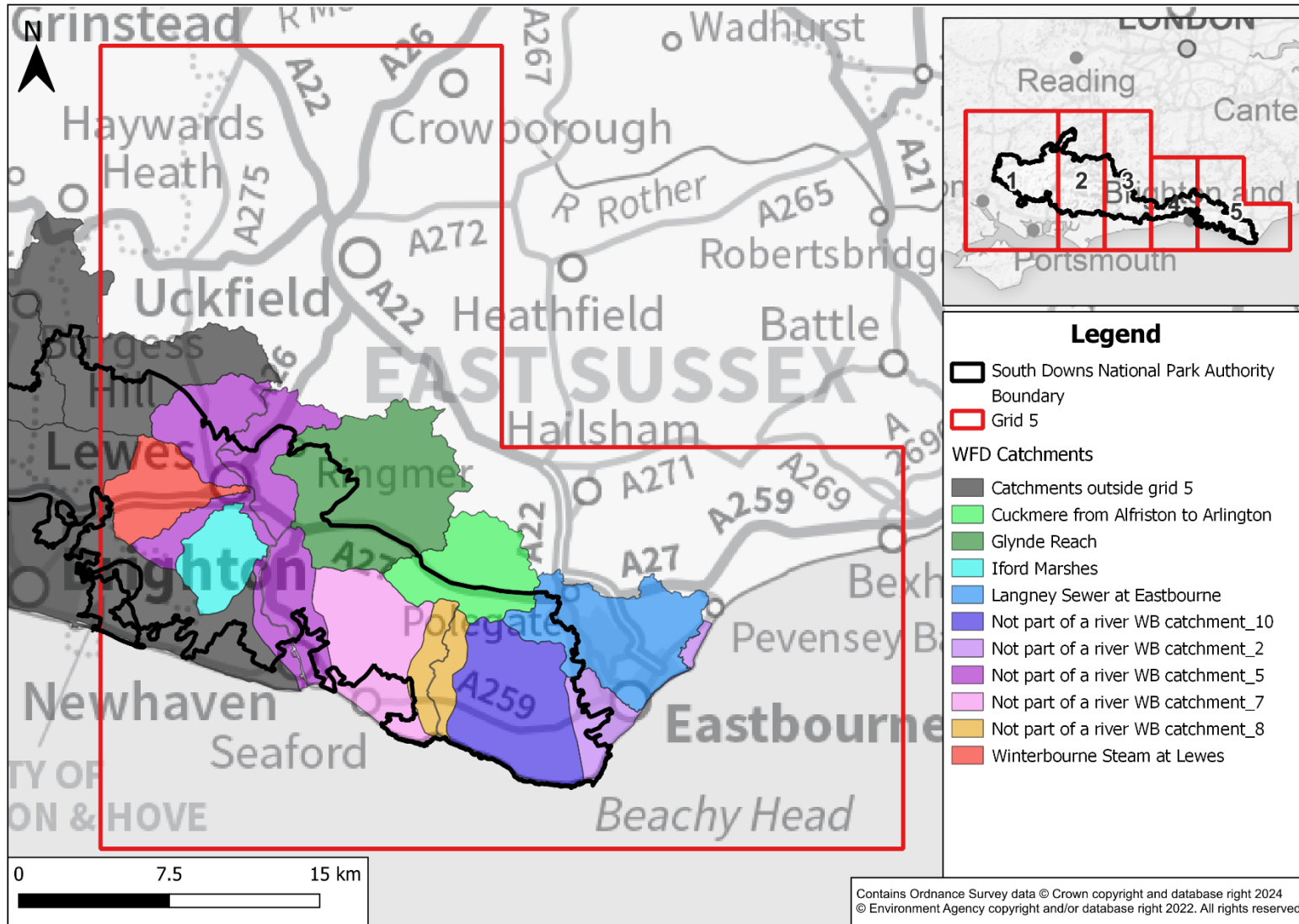


Figure 1-6: Catchments within SDNPA (grid 5)

Catchments within the study area were ranked on four metrics: sensitivity to increased fluvial flood risk, sensitivity to increased risk of surface water flooding, prevalence of recorded historic flood incidents (limited by the data available), and area of new development proposed within the catchment.

The final results of this assessment gave a rating of low, medium, or high risk for each metric, for each catchment within the study area, the boundaries of which were derived from the WFD. The rating of each catchment in each of these assessments was combined to give an overall ranking.

Table 1-1: Summary of datasets used within the Broadscale CIA.

Dataset	Coverage	Source of data	Use of data
Catchment Boundaries	SDNPA and neighbouring/overlapping authorities	Water Framework Directive Catchments	Assessment of susceptibility to cumulative impacts of development by catchment
OS Open Zoomstack Local Buildings	SDNPA and neighbouring/overlapping authorities	Ordnance Survey	Built area for the assessment of flood risk
Risk of Surface Water Flooding Mapping	SDNPA and neighbouring/overlapping authorities	Environment Agency	Assessing the building area at risk of surface water flooding within each catchment
Fluvial Flood Zones 2 and 3a	SDNPA and neighbouring/overlapping authorities	EA Flood Map for Planning	Assessing the building area at risk of fluvial flooding within each catchment
Historic Flooding Incidents	SDNPA and the following districts: Winchester, Eastleigh, Havant, East Hampshire, Chichester, Arun, Horsham, Mid Sussex, Lewes, Wealden, Eastbourne, Adur, Worthing and Brighton and Hove.	SDNPA, Hampshire County Council, East Sussex County Council and Southern Water (historic sewer flooding records).	Assessing incidences of historic flooding. The data used is a combination of historic flooding incidents held by councils and historic sewer flooding incidents held by Southern Water.

Dataset	Coverage	Source of data	Use of data
Future development areas	SDNPA and the following districts: Winchester, Eastleigh, Waverley, Arun, Horsham, Mid Sussex, Lewes, Wealden, Havant, Adur, Chichester, and East Hampshire	SDNPA and the following districts: Eastleigh, Havant, Horsham, Lewes, Eastbourne, Mid Sussex, Waverley, Arun, Winchester, and Wealden	Assessing the impact of proposed future development on risk of flooding

1.3.1 Sensitivity to increases in fluvial flooding

This is the measure of the increase in the area of buildings at risk of fluvial flooding from the 1% AEP event to the 0.1% AEP event. It is an indicator of where local topography makes an area more sensitive to increases in flood risk that 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.

The OS Open Zoomstack Local Buildings layer was used to identify all buildings within the catchments as this is an open data source which provides full coverage of the authority area and cross boundary catchments.

The buildings layer was intersected with the 1% and 0.1% AEP fluvial flood extents separately to determine the area of buildings flooded in each catchment, in each flood extent. The difference between the two values was then taken as a percentage of the total building area within the catchment to allow comparison between catchments of different sizes.

The fluvial flood risk is shown to be generally low across the authority area. Catchments with greater than 5% of the building area at increased risk were considered to be highly sensitive.

1.3.2 Sensitivity to increases in surface water flooding

This is the measure of the increase in the area of buildings at risk of surface water flooding in a 1% AEP event to a 0.1% AEP event and follows the same process as for fluvial flood risk, see Section 1.3.1 above.

Catchments with greater than 4.5% of the building area at increased risk were considered to be highly sensitive.

1.3.3 Growth in the area

Development within SDNPA has the potential to affect flood risk in neighbouring or overlapping authorities, especially if there are existing flood risk issues.

Areas for future proposed development were received from SDNPA. Of these, the sites assessed as part of this CIA have been classified by SDNPA as 'Has Potential'. This CIA does not take into consideration any sites provided by SDNPA which are classified as 'Rejected' or 'Excluded'.

Other development sites surrounding SDNPA have been received from the following districts: Eastleigh, Havant, Horsham, Lewes, Eastbourne, Mid Sussex, Waverley, Arun, Winchester, and Wealden. The area of new development within each catchment was expressed as a percentage of the total catchment area to determine the potential for increase in flood risk as a result of new development. This data was assessed as part of this CIA. It should be noted that data was not received from other neighbouring/overlapping authorities.

For some catchments which cover both the SDNPA and a neighbouring authority, the earmarked development sites are only situated within the neighbouring authority. In other catchments which cover the SDNPA and a neighbouring authority, the level of development growth within the SDNPA only covers less than 0.8% of the total catchment area. For these reasons, the assessment of development growth was excluded from the following catchments:

- Arun (U/S Pallingham)
- Ferring Rife
- Itchen
- Langney Sewer at Eastbourne
- Lavant (Hants)
- Lidsey Rife
- North Wey (Alton to Tilford)
- Not part of a river WB catchment_3
- Not part of a river WB catchment_4
- Not part of a river WB catchment_5
- Potwell Trib

Catchments with more than 4% of their area earmarked for development were considered high risk.

1.3.4 Historic flood risk

Recorded flooding event data was provided by Hampshire County Council and East Sussex County Council for SDNPA for this assessment. Historic sewer flooding records were provided by Southern Water which cover SDNPA and the neighbouring/overlapping authorities listed in Table 1-1. No other historic flooding data was made available for this assessment. Therefore, the analysis within this assessment should not be used as a definitive guide to historic flooding within the study area.

Details of historic flood events can be found in Section 5.1 of the Main Report. The historic data was represented as point data, where each point represents a location

where it is known there has been at least one flood event (however, the nature and scale of these flood events vary significantly).

A count of each historical flood incident was conducted for each catchment to determine the historic flood risk within the catchments. Where more than 50% of a catchment's area lies outside SDNPA, and no historic flooding data was available, the historic assessment result was not included in calculating the overall ranking for the catchment. The historic assessment was therefore excluded from the following catchments:

- Arun (U/S Pallingham)
- North Wey (Alton to Tilford)
- South Wey (Haslemere to Bordon)
- South Wey (River Slea confluence to Tilford)

Catchments with 800 or more recorded flooding incidents were considered high risk.

1.3.5 Ranking the results

The results for each assessment were ranked into high, medium, and low risk as shown in Table 1-2. Ranking delineations were given at natural breaks in the results.

The ranking results were combined from all four assessments (except for the historic assessment for some catchments as discussed in Section 1.3.4) to give an overall high, medium, and low ranking for all catchments within SDNPA. Each catchment was assigned a score for each assessment based on its ranking (high = 3, medium = 2, low = 1) and these were then averaged to produce a final score and ranking. Any catchment producing an overall score of 2 or greater was considered high risk.

There is currently no national guidance available for assessing the cumulative impacts of development. These rankings provide a relative assessment of the catchments within SDNPA and are not comparable across other boroughs/districts. The thresholds used have been based on natural breaks in the data and professional judgement.

Table 1-2: Ranking assessment criteria

Flood risk ranking	Percentage of increased building area at risk of fluvial flooding	Percentage of increased building area at risk of surface water flooding	Total number of historic flooding incidents	Percentage area of catchment covered by new development
Low risk	<1	<3	<100	<0.9
Medium risk	1 to 5	3 to 4.5	100 to 800	0.9 to 4
High risk	>5	>4.5	>800	>4

1.3.6 Assumptions

The assumptions made when conducting the CIA are shown in Table 1-3.

- Policy recommendations with regards to managing the cumulative impact of development have been made in Section 2 below. This will help to ensure there is no incremental increase in flood risk both within and downstream of SDNPA.

Table 1-3: Assumptions of the CIA

Assessment aspect	Assumption made	Details of limitation in method	Justification of method used
Surface water flood risk; Flood Zone 2 and 3a	Total building area	Assumption that all buildings have been included in the OS Open Zoomstack Local Buildings dataset. It may not include all new buildings. It also does not include all buildings across some of the larger cross-boundary catchments.	This was the most up to date and accurate data available.
Fluvial flood risk	Climate change proxy	Used the Flood Map for Planning Flood Zone 2 as an indicative estimate of the impacts of climate change across the authority area.	Although detailed climate change modelling was available for some watercourses, the broader Flood Map for Planning covers the entire area of the catchments both within and outside the authority area and therefore provided a consistent approach for this high level assessment.
Historic Flooding incidents	Total number of historic events and severity of flooding	Only flooding incidents recorded that could be georeferenced with XY coordinates to produce GIS files were used. Each point represents a location where it is known there has been at least one flood incident. The severity of the historic flooding event relating to the point has not been considered, just the total number of points within each catchment where there has been a flood incident.	GIS data sourced provided the most accurate results possible for the location of historic flooding incidents across the district.

Assessment aspect	Assumption made	Details of limitation in method	Justification of method used
Historic Flooding incidents	Coverage	Historic data provided by East Sussex County Council and Hampshire County Council only cover SDNPA. Historic sewer flooding data provided by Southern Water covers additional areas within SDNPA as well as neighbouring/overlapping authorities listed in Table 1-1. However, these flood incidents only occurred between 2013 and 2023 and records for each catchment may be incomplete. It should also be noted that the data provided by Southern Water only takes into consideration historic sewer flooding. Therefore, flooding from other sources may have occurred but have not been made available for this assessment by the respective councils.	Best available historic data has been used. To reduce the impacts of the limited data coverage, for catchments where 50% or greater of their areas lies outside SDNPA, and where there are no recorded historic flooding incidents, the historic assessment was not included within the overall ranking as the count is likely to be a considerable underestimate for these catchments.
Development	Area of development	Assumed that the whole site area will be developed.	Information on site layout not available at this time so this assumes a worst-case scenario.
	Coverage	For some catchments which cover the SDNPA and a neighbouring authority, the earmarked development sites are only situated within the neighbouring authority. In other catchments which cover the SDNPA and a neighbouring authority, the level of development growth within the SDNPA only covers less than 0.8% of the total catchment area.	To reduce the impacts of the limited data coverage, the assessment of development growth was excluded from the catchments listed in Section 1.3.3.

1.4 Overall rankings

For each assessment, catchments were given a score of 3 (high), 2 (medium), or 1 (low) risk, excluding the historic data assessment where sufficient information was not available. These scores were then averaged across the assessment to give a combined score.

- A Red-Amber-Green (RAG) rating was then applied to the catchments, with red being high risk, amber being medium risk, and green being low risk. The RAG ratings are shown in Figure 1-7. The catchments with an average score of greater than or equal to 2 were deemed high risk.

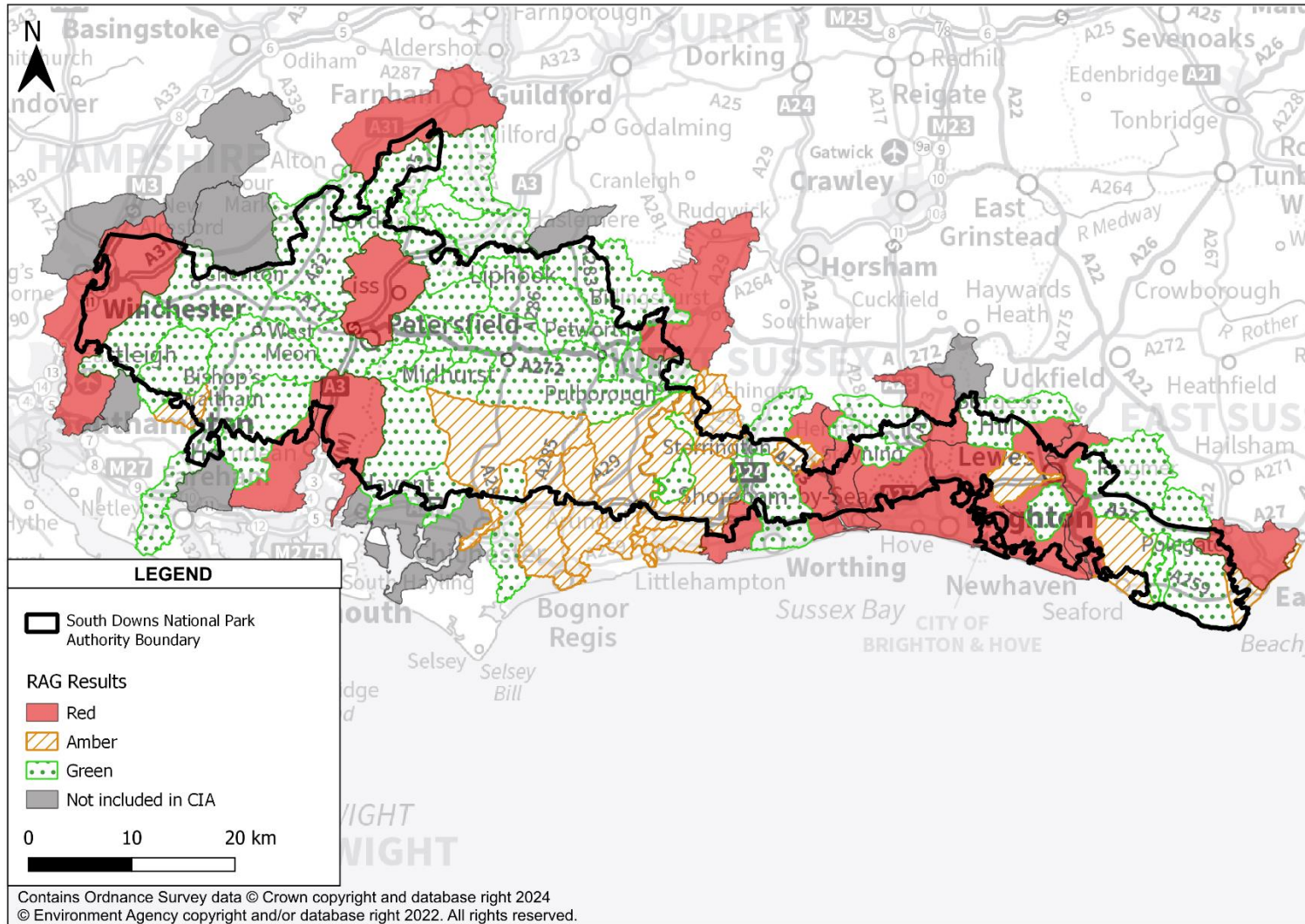


Figure 1-7: Results of the CIA RAG assessment for catchments within or overlapping with SDNPA

2 Level 1 SFRA Policy recommendations

2.1 Broadscale recommendations

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.

The high-level CIA for SDNPA has highlighted areas where there is the potential for development to have a cumulative impact on flood risk. Catchments have been identified as high, medium, or low risk, relative to the other catchments within the authority area.

Flood risk can be affected by several different factors, which have been assessed as part of the CIA. As a result, incremental action and betterment in flood risk terms across the whole authority area should be supported where possible.

The following policy recommendations therefore apply to all catchments within the study area:

- SDNPA should work closely with neighbouring and overlapping local authorities to develop complementary Local Planning Policies for catchments that drain into and out of the area to other local authorities in order to minimise any cross-boundary issues of cumulative impacts of development.
- Developers should incorporate SuDS and provide details of adoption, ongoing maintenance, and management on all development sites. Proposals will be required to provide reasoned justification for not using SuDS techniques, where ground conditions and other key factors show them to be technically feasible. Preference will be given to systems that contribute to the conservation and enhancement of biodiversity and green infrastructure where practicable. Developers should refer to the relevant Lead Local Flood Authority (LLFA) guidance for the requirements for SuDS in SDNPA. Further guidance on SuDS can be found in Section 10 of the Main Report.
- The four LLFAs, whose remits cover SDNPA, will review Surface Water Drainage Strategies in accordance with their local requirements for major and non-major developments. These should consider all sources of flooding to ensure that future development is resilient to flood risk and does not increase flood risk elsewhere.
- Where appropriate, the opportunity for NFM in rural areas, SuDS retrofit in urban areas and river restoration should be maximised. Culverting should not be

supported, and day-lighting existing culverts should be promoted through new developments.

- Runoff rates from all development sites must be limited to greenfield rates (including brownfield sites) unless it can be demonstrated that this is not practicable. If it is demonstrated that greenfield rates are not practicable then the runoff rates should be restricted to the closest rate that is practicable, not exceeding brownfield rates.
- Where required, site-specific FRAs should explore opportunities to provide wider community flood risk benefits through new developments. Measures that can be put in place to contribute to a reduction in flood risk downstream should be considered. This may be either by the provision of additional storage on site e.g. through oversized SuDS, NFM techniques, green infrastructure, and green-blue corridors, and/ or by providing a Partnership Funding contribution towards any flood alleviation schemes.
- SDNPA should consider requiring developers to contribute to community flood defences outside of their red line boundary to provide wider benefits and help offset the cumulative impact of development.

Section 9 of the Main Report details the local requirements for mitigation measures. Catchment-specific recommendations are made for high and medium risk catchments below.

If any future windfall sites are proposed within these catchments, then developers should consider the recommendations set out below so that existing flooding issues in the catchment are not exacerbated by any future development and options for betterment are considered.

2.2 Recommendations for high-risk catchments

High-risk catchments are shown in Figure 1-7. From analysing the results produced above, high-level recommendations for flood storage and betterment have been proposed for sites in each of the high-risk catchments. These recommendations should be considered by developers as part of a site-specific assessment, but more detailed modelling must be undertaken by the developer to ascertain the true storage needs and potential at each site at the planning application stage. The FRA should consider the potential cumulative effects of all proposed development and how this affects sensitive receptors.

The following recommendations are made for high-risk catchments:

- Developers should include a construction surface water management plan to support the Construction Drainage Phasing Plan. This should provide information to the EA, the LLFAs and the Local Planning Authority (LPA) regarding the proposed approach to surface water management in storm events during the construction phase.

- The LLFAs and LPA should consult with Local Not-For-Profit organisations such as wildlife trusts, rivers trusts, and catchment partnerships. This will help to understand ongoing and upcoming projects where NFM, flood storage and attenuation, and environmental betterment may be possible alongside developments and aid in reducing flood risk.
- The LPA should work closely with the EA and the LLFAs to identify any areas of land that should be safeguarded for any future flood alleviation schemes and NFM features. Investigations should seek to determine where developments have the potential to contribute towards works to reduce flood risk and enable regeneration in catchments as well as contributing to the wider provision of green infrastructure.

This is applicable to the following catchments:

- Arun (U/S Pallingham)
- Ferring Rife
- Herrings Stream
- Itchen
- Langney Sewer at Eastbourne
- Lavant (Hants)
- North Wey (Alton to Tilford)
- Not part of WB catchment_3
- Not part of WB catchment_4
- Not part of WB catchment_5
- Potwell Trib
- Western Rother (Upstream Petersfield)

2.3 Development within medium risk catchments

Catchments that have scored an overall ranking of medium, but where development is proposed should also consider the following recommendations:

- LPAs should work closely with the EA and the LLFAs to identify any areas of land that should be safeguarded for any future flood alleviation schemes and NFM features.
- There is the potential for development in these catchments to contribute towards works to reduce flood risk and enable regeneration as well as contributing to the wider provision of green infrastructure.

This is applicable to the following catchments:

- Aldingbourne Rife
- Black Ditch (W Sussex)
- Black Sewer
- Chilt

- Lavant (Sussex)
- Lidsey Rife
- Moors Stream
- Not part of river WB catchment_2
- Not part of river WB catchment_6
- Not part of river WB catchment_7
- Stor
- Winterbourne Steam at Lewes