

Cumulative Impact Assessment

This appendix provides a summary of catchments with highest flood risk and summarises strategic solutions applicable to Chichester District.

1 Background

1.1 Introduction

Under the revised 2021 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).

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume and potential effects of increased volumes of runoff from proposed development. Whilst the loss of storage or potential increase in flow volume for individual developments may only have minimal impact on flood risk, the cumulative effect of multiple developments may be more severe.

Chichester District Council policy requirements and application of accepted best practice should lead to the implementation of mitigation measures to address local increases in runoff as a result of development. The measures should be accompanied by appropriate management and maintenance arrangements so flood risk is not exacerbated.

The cumulative impact of development should be considered at both the Local Plan making and the planning application and development design stages. Appropriate mitigation measures should be identified and implemented and where possible the measures accompanying new development should be used to reduce existing flood risk issues.

1.2 Cross-Boundary Issues

Development control should address the effects on receiving watercourses from development in Chichester District during the planning application process so appropriate development management provisions are made and there are no adverse effects on flood risk or water quality. All developments are required to comply with the NPPF and demonstrate they will not increase flood risk elsewhere. Therefore, providing developments near watercourses in neighbouring authorities comply with the latest guidance and legislation relating to flood risk and sustainable drainage, they should result in no increase in flood risk within Chichester District.

Nevertheless, there will be areas where significant levels of concurrent development could alter catchment characteristics through changes to land elevations, peak runoff intensity and volumes of runoff. The potential effect of this will be amplified in circumstances where there are already existing problems or concerns over the level of flood risk. To understand the potential cumulative effects of proposed development, it is therefore important to identify catchments and receptors that are sensitive to changes in catchment hydrological processes

This is complicated as the district boundaries and catchment boundaries are not aligned meaning that catchments are in more than one administrative area. In upland areas of Chichester District for example, where the South Downs National Park runs east-west through the district, the headwaters of watercourses in Chichester District are in the South Downs National Park administrative area.

In the southern part of the district, river flows are generally directed in a southerly direction from the South Downs discharging along the River Lavant, River Ems and smaller Rifes. Land in the southern part of the district is low-lying with typical elevations between 0 and 50m AOD. Adjoining councils in this southern part of the District are Arun District Council to the east, and Havant District Council to the west. Cross boundary fluvial flood risk issues with Havant District are unlikely as areas draining from Havant District and Chichester District both drain into Chichester Harbour. Cross boundary issues are more likely to the east, where tributaries of the River Arun flow from Chichester District into Arun District.

Land to the north of Chichester district is generally much steeper than in the south. Elevations in some catchments are in excess of 250m AOD, however land within Horsham District (rather than the South Downs) is below 100m AOD, with approximately 50% below 50m AOD. Land with the Arun Valley generally lies at around 10m AOD.

The River Arun has historically been used to demark administrative borders, and therefore there is a greater opportunity for cross boundary issues to occur. The River Arun marks the border between Chichester and Horsham District Council to the east of the district, flowing in a southerly direction through the South Downs National Park and Arun District beyond.

Tributaries of the River Arun flow from the South Downs and Waverley District to the North. The Loxwood Stream flows from Waverley District, through Chichester District until its confluence with the River Arun on the district border with Horsham.

In the centre of the District, within the South Downs National Park, the River Rother flows in an easterly direction. The catchment for the River Rother is entirely contained within the National Park Authority area, including tributaries such as the River Lod and the Hammer Stream and therefore no cross-boundary issues are anticipated for this area. The presence of the South Downs National Park means that there is no border between Chichester District Council and East Hampshire District for the purposes of this assessment.

The following Local Plans in neighbouring authorities have been adopted. These Plans include policies relevant to drainage and flood risk:

- **South Downs Local Plan 2014-2033**
- **Arun Local Plan 2011-2031**
- **East Hampshire Local Plan 2014**
- **Horsham District Planning Framework**
- **Havant Local Plan Core Strategy (2011) and Site Allocations Plan (2014)**
- **Havant Draft Housing Delivery Position Statement**
- **Waverley District Local Plan Part 1 (2018) Local Plan (2002) and Local Plan Part 2 (at examination stage)**

2 Chichester District Council Level 1 SFRA CIA

A Broadscale Cumulative Impact Assessment (CIA) was undertaken as part of the Level 1 SFRA for the Chichester District Council Interim Level 1 SFRA in 2022.

The broadscale assessment identifies where the cumulative impacts of development may have the biggest effect on flood risk based on historic and predicted flood risk. The assessment also aims to provide greater detail on the characteristics of the catchment in order to assess potential effects of proposed development within those catchments.

Catchments at the highest potential change to flood risk have been taken forward to this Level 2 assessment to perform a qualitative assessment of the overall catchment characteristics and identify the potential risks to and from identified developments. This includes development that might have the potential to increase flood risk and also opportunities where development might contribute towards a reduction in flood risk across the wider area.

2.1 Broadscale Methodology

Future development sites within the study area were provided by Chichester District Council. Predicted flood risk was assessed using the following datasets:

- Total number properties within the merged 1% AEP surface water flooding extent and Flood Zone 3a for each catchment
- Total number properties within the merged 0.1% AEP surface water flooding extent and Flood Zone 2

The difference in the number properties at risk in these two datasets has then been used as an indicator to identify which catchments are more sensitive to increases in flood flows

To identify which catchments are more sensitive to cumulative impacts, each catchment was given a ranking for each of the three metrics:

- proposed level of growth,
- historic flood risk and
- properties sensitive to growth.

These rankings were then combined to give an overall ranking which was divided into three categories - high, medium, and low according to how sensitive each catchment is to cumulative impacts relative to one another.

Table 2-1 Summary of datasets used in the Broadscale CIA

Dataset	Coverage	Source of Data	Use of Data
Catchment Boundaries	Chichester District Study Area	Modified WFD Catchments	Assessment of susceptibility to cumulative impacts of development by catchment.
National Receptor Dataset	Chichester District Study Area	Environment Agency	Assessing the number of properties at risk of surface water flooding within each catchment.
Risk of Flooding from Surface Water	Chichester District Study Area	Environment Agency	Assessing the number of properties at risk of surface water flooding within each catchment.
Fluvial Flood Zones	Chichester District Study Area	Environment Agency	Assessing the number of properties at risk of fluvial flooding within each catchment
Future development areas (recently built out sites/sites under construction/sites with planning permission/previously allocated sites/currently allocated sites)	Chichester District & neighbouring authorities	Chichester District Council	Assessing the impact of proposed future development on risk of flooding.
Historic Flooding Incidents	Chichester District Study Area	Chichester District Council	Assessing incidences of historic flooding within the study area.

The rating of each catchment in each of these assessments was combined to give an overall ranking and the results are show in Figure 2-1 The five highest ranked catchments are:

- Aldingbourne Rife
- Kird
- Lavant (Sussex)
- Pagham Rife
- Arun (U/S Pallingham)

It should be noted that catchments which border the Chichester District Study area or fall wholly within neighbouring authorities were discounted from the final assessment outputs where there was a lack of countable data for one or more assessment criteria.

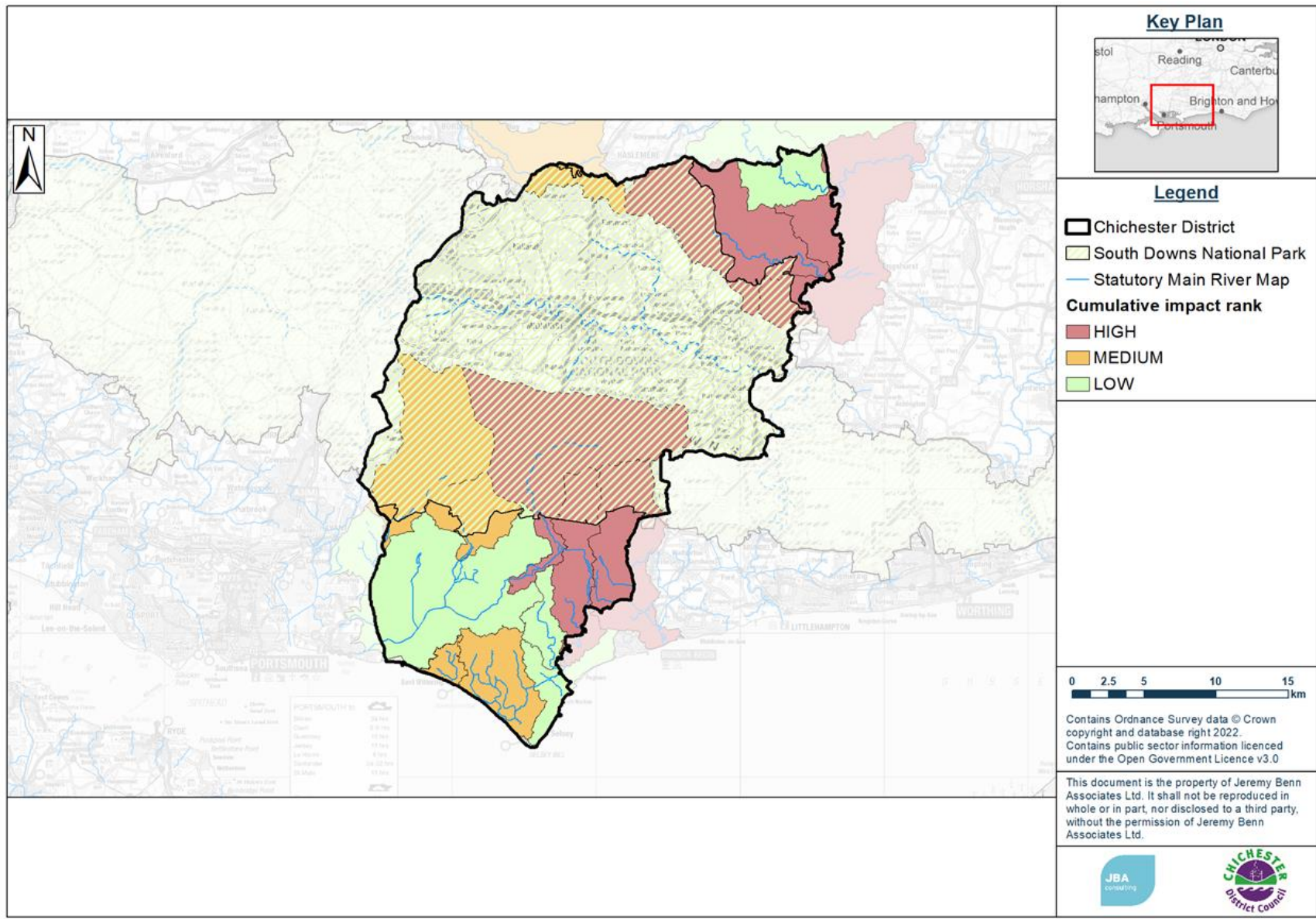


Figure 2-1: Final catchment rankings of cumulative impacts (from Chichester Level 1 interim SFRA)

3 Catchment-Level Assessment

3.1 Catchment-Level Assessment

In the catchment-level assessment, a detailed analysis of the high-risk catchments, as identified in the broadscale assessment, is undertaken. Other factors, such as existing urban extent, topography and location within the wider river drainage network, are also considered to determine policy recommendations to address the specific risks within the catchment.

3.1.1 Aldingbourne Rife

Catchment characteristics

The headwaters of the Aldingbourne Rife catchment are in the Chichester District Boundary, with four tributaries either within or forming the border of Chichester District. The Rife then flows in a southerly direction to the District Boundary at Elbridge, continuing in Arun District Council. The Aldingbourne Rife joins the Lidsey Rife to the north of Bognor Regis, before discharging to the sea at Longbrook Park.

The catchment is predominantly rural with areas of woodland and farmland, isolated properties and small villages. Boxgrove, Tangmere and Oving are the largest settlements within the catchment. In Arun District, the catchment becomes distinctly more urbanised to the south of the A259, comprising approximately 20% of the total catchment. The main channel is bisected by disused canal and railway line.

Proposed development within the Aldingbourne Rife catchment is predominantly in the Tangmere and Oving areas. In Arun District, development is proposed to the west of North Bersted and adjacent to the Chichester/Arun District Council boundary at Elbridge. Development to the north of the A259 at South Bersted and at Lidsey would also fall partially within the Aldingbourne Rife catchment.

Flood Risk

Fluvial flood risk to property in this catchment is concentrated in the downstream end of the catchment around South Bersted. The quantity of incoming channels may pose a cumulative risk by increasing connectivity to the watercourse during high rainfall events.

As a catchment with a coastal outfall, it is possible that areas up to the tidal boundary inland may be subject to tide locking. During periods of tide-locking, cumulative effects of development could therefore be influenced by both the volume of runoff from development and the critical storm durations, particularly when critical storm durations are shorter than the duration of the tide-locked period such that minimal discharge would take place during the storm..

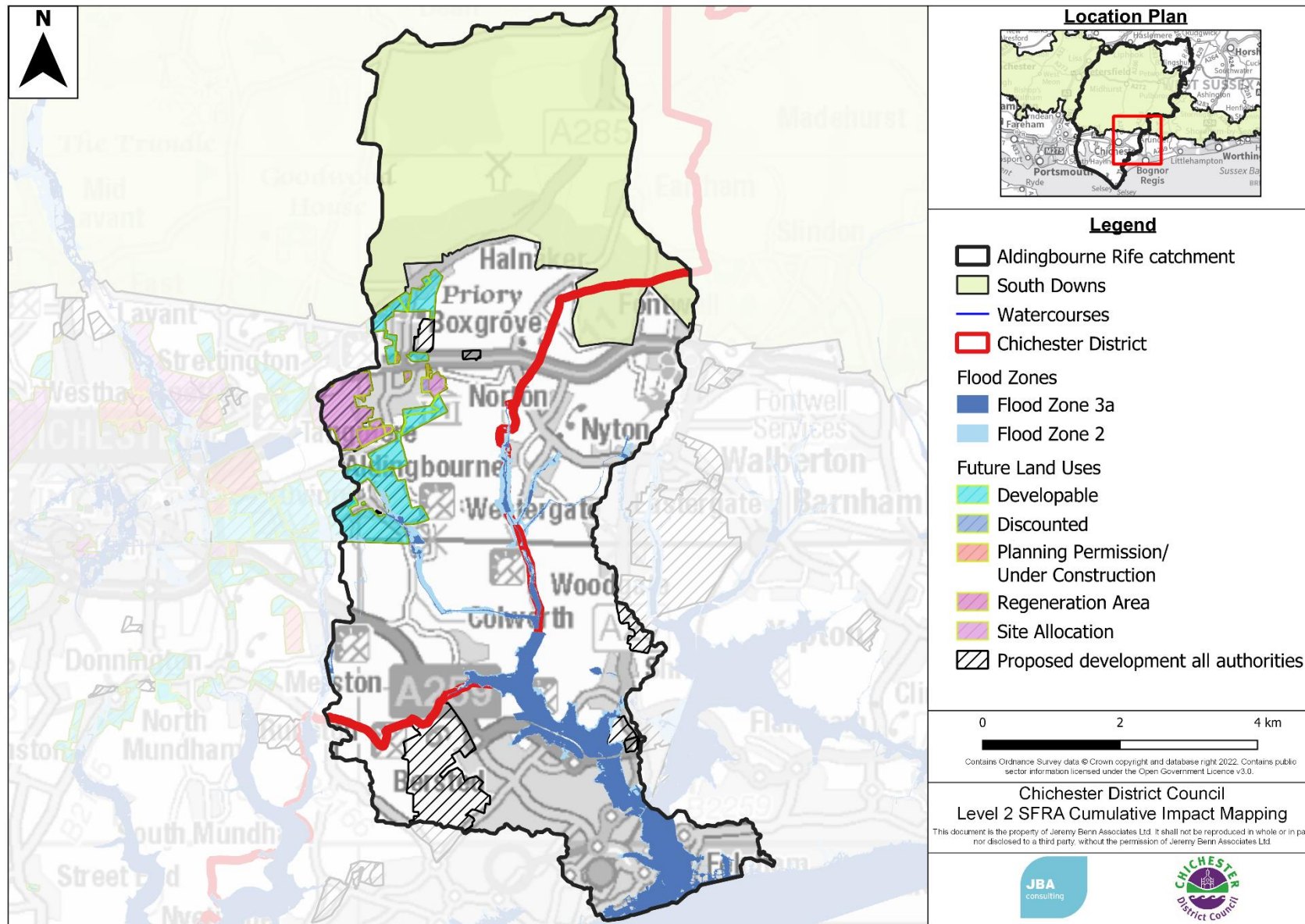


Figure 3-1: EA undefended flood zones (Aldingbourne Rife catchment)

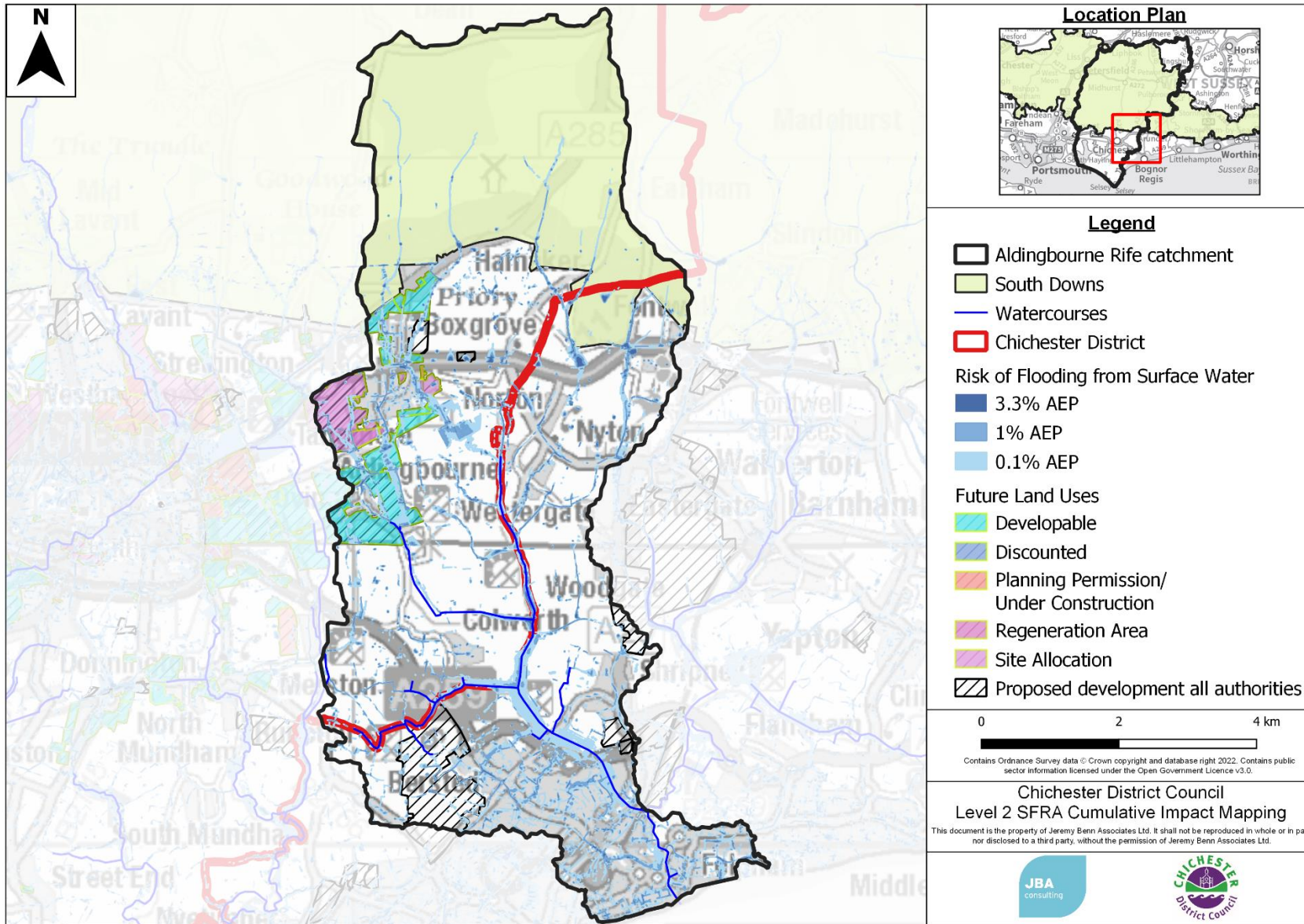


Figure 3-2: Risk of Flooding from Surface Water (Aldingbourne Rife Catchment)

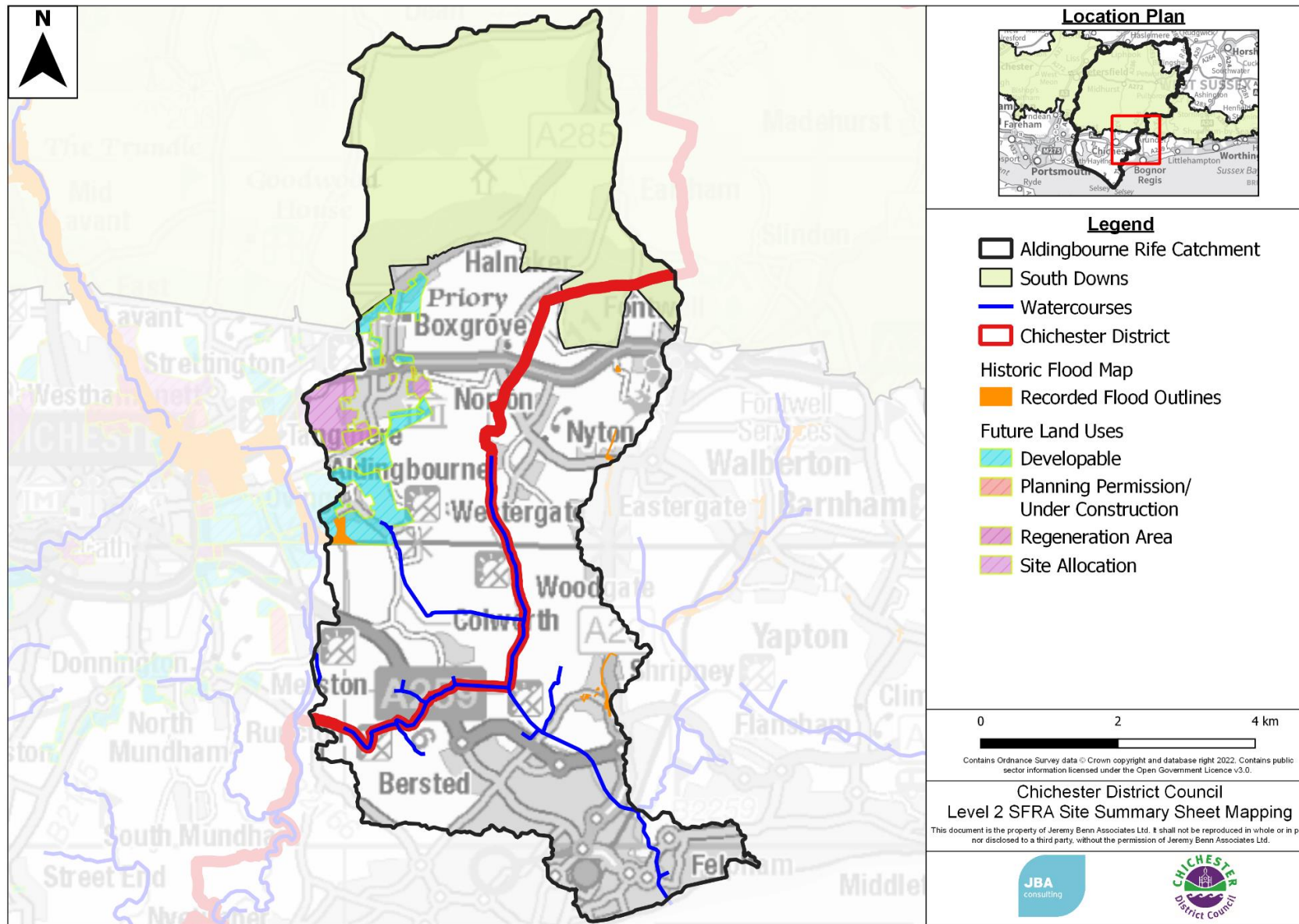


Figure 3-3: Historic flood map (Aldingbourne Rife catchment)

Historic flooding in this catchment has been recorded to the north of the railway line approximately 800m south east of Oving (Chichester District). In the historic outline and the modelled flood zone 3 outline from the Flood Map for Planning, the railway line causes a constriction to flow causing areas of ponding to the north of the railway. Additional peak flows and volumes at this constriction may therefore lead to greater flood depths and extents upstream of the railway line.

Flooding was also recorded to the west of the A29 at Shripney (Arun District).

Conclusions and recommendations

- Development in Oving could potentially impact on downstream flood risk.
- The location of proposed development in Arun District Council is highly unlikely to impact flood risk in Chichester District, which is largely upstream of Arun District in this catchment.
- The upstream extent of the Aldingbourne Rife hydraulic model for the Flood Map for Planning is downstream of Gribble Lane in Oving. Historic mapping indicates that multiple tributaries of the Aldingbourne Rife are unmapped however the Risk of Flooding from Surface Water mapping provides a good indication of where these smaller watercourses are or have been historically.
- The head of these watercourses is likely to be variable as groundwater fed streams which may be intermittent in nature. Nevertheless, it is important to preserve these flow paths in the future design of any development with clear ownership and easements to oppose development on these pathways in the future.
- Proposed major development in this area may cross catchments (in Oving development may be in the Paghams Rife and Aldingbourne Rife catchments). Development proposals must demonstrate that the receiving catchments receive the pre-development volume and peak flows for each individual catchment. This may result in multiple discharge points from the same development or a lower overall runoff from the catchment for a single point of discharge.
- Development in Boxgrove and Tangmere is close to the border with the South Downs National Park Authority. Changes in land use and catchment management in the South Downs National Park could have a significant impact on flood risk in these areas. Cross-boundary policies are advised to manage runoff to the north of Boxgrove.
- Given the rural nature of the catchment and the catchment, there are likely to be opportunities for upstream measures such as flood storage and natural flood management (NFM) techniques to be implemented to reduce the flood risk issues downstream. There is the potential for development in this catchment to contribute towards works to reduce flood risk and enable regeneration as well as contributing to the wider provision of green infrastructure.
- The presence of historic flood risk upstream of the railway line and the potential effects of tide locking should be evaluated in FRAs for major development so that additional volumes of runoff do not exacerbate flood risk. This assessment should be performed for the life time of proposed development as predicted rise in mean sea level will increase the influence of tide locking events.

3.1.2 Arun upstream of Pallingham

Catchment characteristics

The Arun upstream of Pallingham Catchment refers to the reach of the River Arun from the confluence of the North River with the River Arun between Broadbridge Heath and Rudgwick. The River Arun flows in a westerly direction before turning south and forming the border between Chichester District and Horsham District Council downstream of the confluence with the River Lox. The majority of the River Arun catchment falls outside of the Chichester District area, including parts of Wisborough Green, Roundstreet Common, Newpound Common and approx 250ha of undeveloped area south west of Wisborough Green.

A number of smaller watercourses discharge into the River Arun within this reach. These include (amongst other smaller watercourses):

- Moons Brook, which flows into River Arun east of Wisborough Green
- The River Kird, which flows into River Arun approximately 1.5km south east of Wisborough Green
- Brockhurst Brook, which flows in a westerly direction from Billingshurst in Horsham District to the River Arun.
- The Par Brook (Horsham District) flows from the south of Billingshurst into the Brockhurst Brook.

The Wey and Arun Canal runs adjacent to the River Arun in this reach. Although much of the canal is not in operation at present some areas of the canal in this area are navigable. Billingshurst in Horsham District is the major settlement with the catchment. Other villages include Wisborough Green, Slinfold, Rudgwick, Bucks Green. Pulborough is immediately downstream of the catchment.

Development within Chichester District Council has been identified at

- Land north of A272 east of Wisborough Green
- Land south of A272 between Pulborough and Wisborough Green

Development with Horsham District Council area has been identified at:

- Bucks Green
- Rudgwick.
- North West of Billingshurst
- Land East of the A29 at Billingshurst.
- Land north east of North Heath

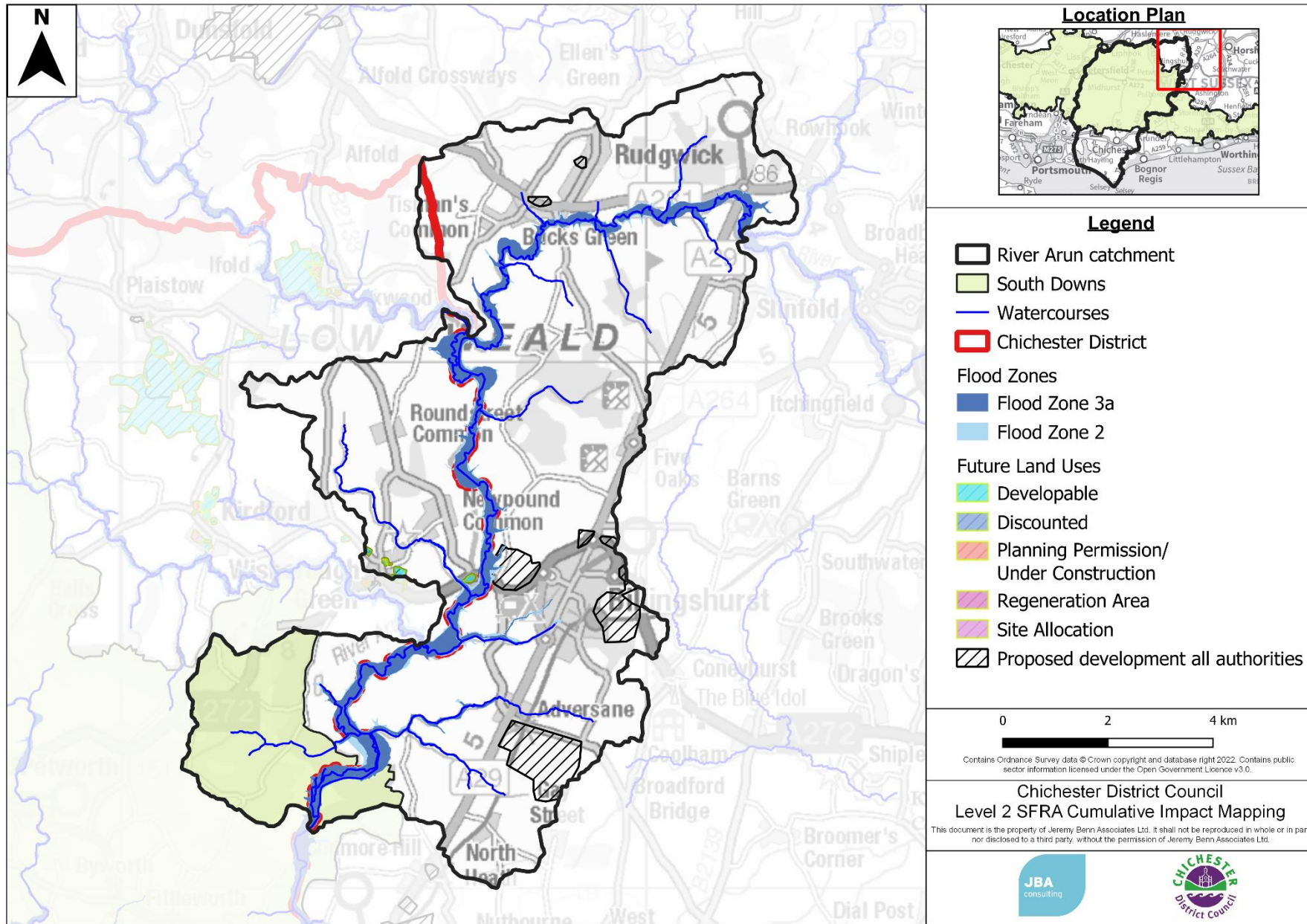


Figure 3-4: Undefended Flood Zones (River Arun catchment)

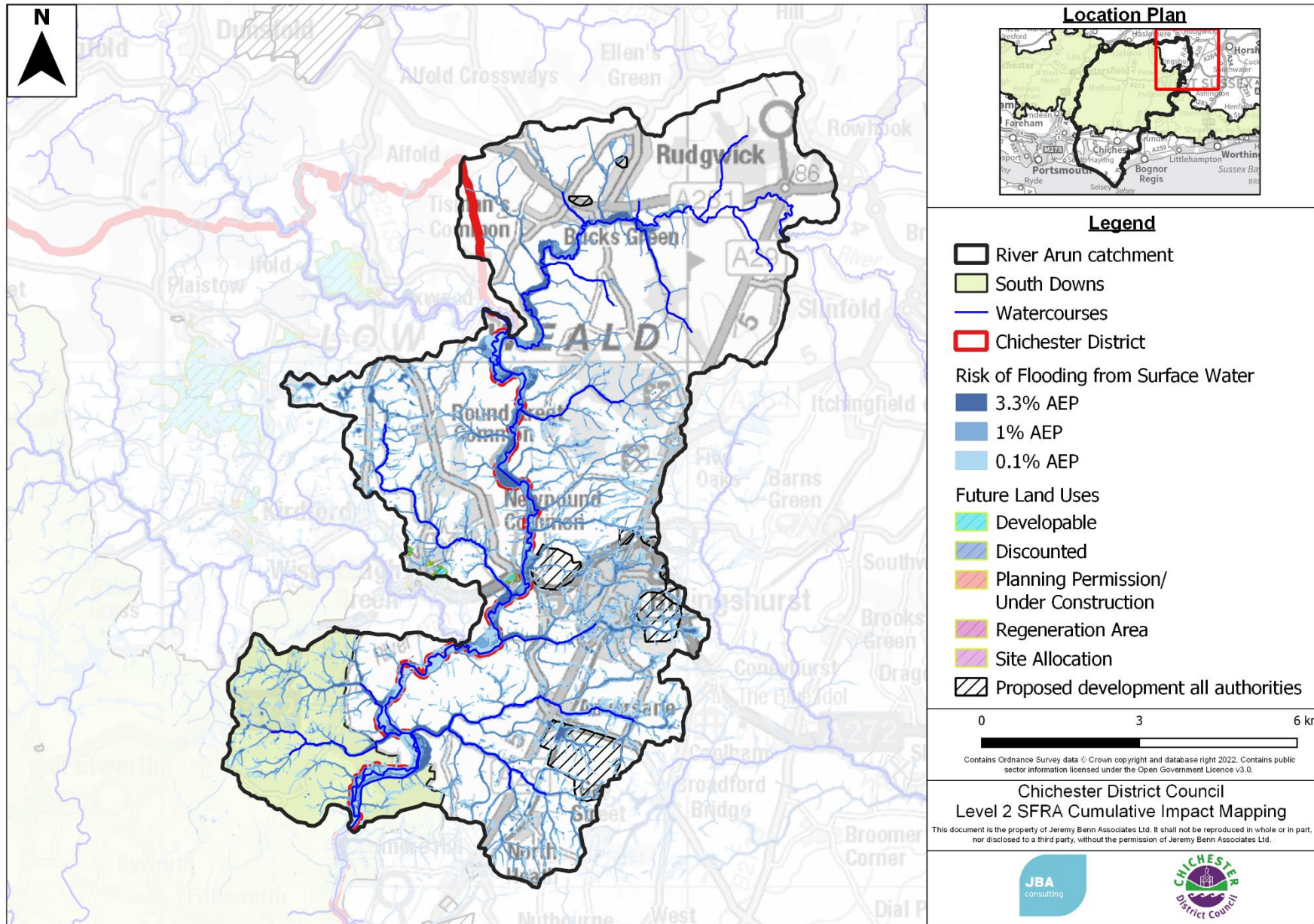


Figure 3-5: Risk of Flooding from Surface Water (River Arun catchment)

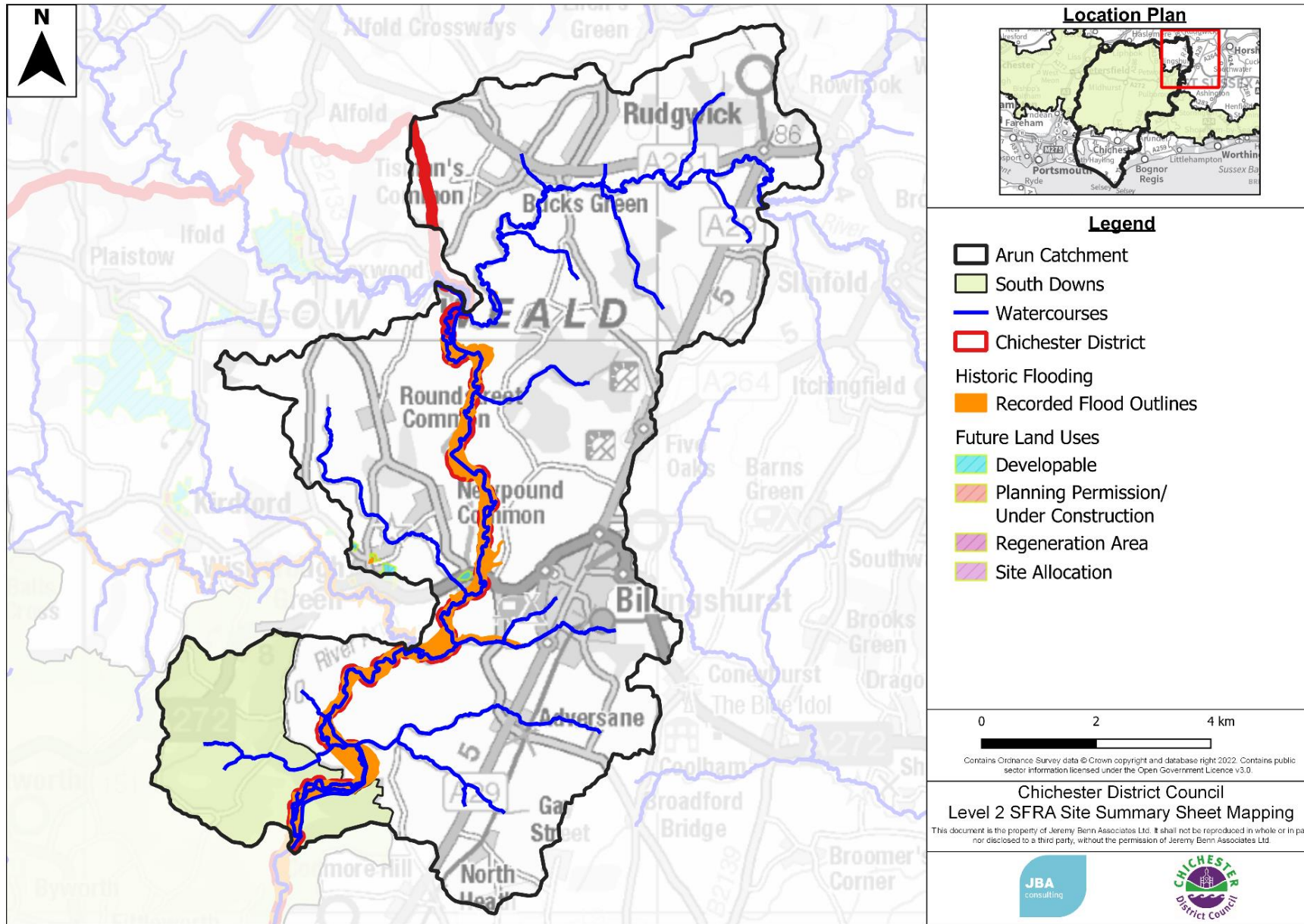


Figure 3-6: Historic flood risk (River Arun catchment)

Flood Risk

Fluvial flood risk (from main rivers) from the River Arun is contained with the undeveloped floodplain. Properties in the south of Billingshurst, which is outside of the Chichester District area but within the River Arun catchment, may be at risk of flooding from the Par Brook

The A29 at the junction with the A281 west of Clemsford may be at risk of flooding in a 1% AEP flood as well as Haven Road at Wanford Bridges and the A272 at Newbridge, east of Billingshurst.

The Risk of Flooding from Surface Water (RoFSW) mapping shows where water may flow when the rainfall intensity is greater than the infiltration rate, or capacity of sub-surface sewer networks to accept flows and can include smaller watercourses and drainage channels not included in the Flood Map for Planning. The RoFSW mapping shows flooding in the centre of Billingshurst (around Jengers Mead and the High Street) during a 3.3% AEP event. Flooding was reported in this area in June 2018.

The river Arun channel are at residual risk from Bury St Austen's Lakes in the event of breach or overtopping. The extent of the "wet day" flood scenario is comparable to the Flood Zone 2 extent.

Conclusions and recommendations

- Due to the predominantly rural nature of the catchment and location of villages away in headland areas of the catchment, it is unlikely that the cumulative effect of development will increase the risk of flooding in existing urban areas within the catchment or to existing properties within the Chichester District Council area.
- Downstream of the catchment, the town of Pulborough is adjacent to the channel and therefore development upstream could potentially impact Pulborough if runoff volumes and peak flows are not mitigated. However, the scale and location of developments with Chichester District identified within this catchment are unlikely to materially affect downstream risk at Pulborough.
- Development of land north west of Billingshurst (Horsham District) and land at confluence of Moons Brook and River Arun (Chichester District) could potentially lead to floodplain constriction, but is unlikely if development is implemented in accordance with accepted practice. The Par Brook runs through proposed development to the south east of Billingshurst and therefore could potentially increase flood risk in Chichester District. Areas of Chichester District downstream of the confluence of the River Arun and the Brockhurst Brook (into which the Par Brook discharges) are very rural in nature.
- No development in Chichester District is proposed that would impact flood risk at the A272 (New Bridge). Any windfall development in Chichester District between New Bridge and the Junction Canal should consider the potential impacts of development on the flood risk to the A272.
- Consultation with the owners/operators of the Wey and Arun Canal is recommended to determine any requirements for the future of the canal and any land to be safeguarded to facilitate the safe operation of the canal.
- Proposed major development in this area may cross catchments around Wisborough Green. Development proposals must demonstrate that the receiving catchments receive the pre-development volume and peak flows for each individual catchment. This may result in multiple discharge points from the same development or a lower overall runoff from the catchment for a single point of discharge.

3.1.3 River Kird

Catchment characteristics

The River Kird is a tributary of the River Arun entirely within the Chichester District Council boundary, however approximately 50% of the catchment is within the South Downs National Park. The catchment boundary extends from Fisher Street in the South Downs National Park to Wisborough Green, where the River Kird discharges into the River Arun.

The River Kird is a Main River from Ebernoe until the confluence with the River Arun. Fluvial flood risk is possible in Kirdford and Wisborough Green. In the lower reaches of the River Kird, a secondary drainage system followed the left bank of the River to feed the canal.

Development in the River Kird catchment is proposed

- south of Plaistow
- North of Kirdford
- Kirdford
- East of Wisborough Green

No development sites were considered from the South Downs National Park Authority and therefore it is not possible to assess the potential impact of the development in the South Downs National Park Authority Area. The Horsham District Council area is immediately downstream of the catchment.

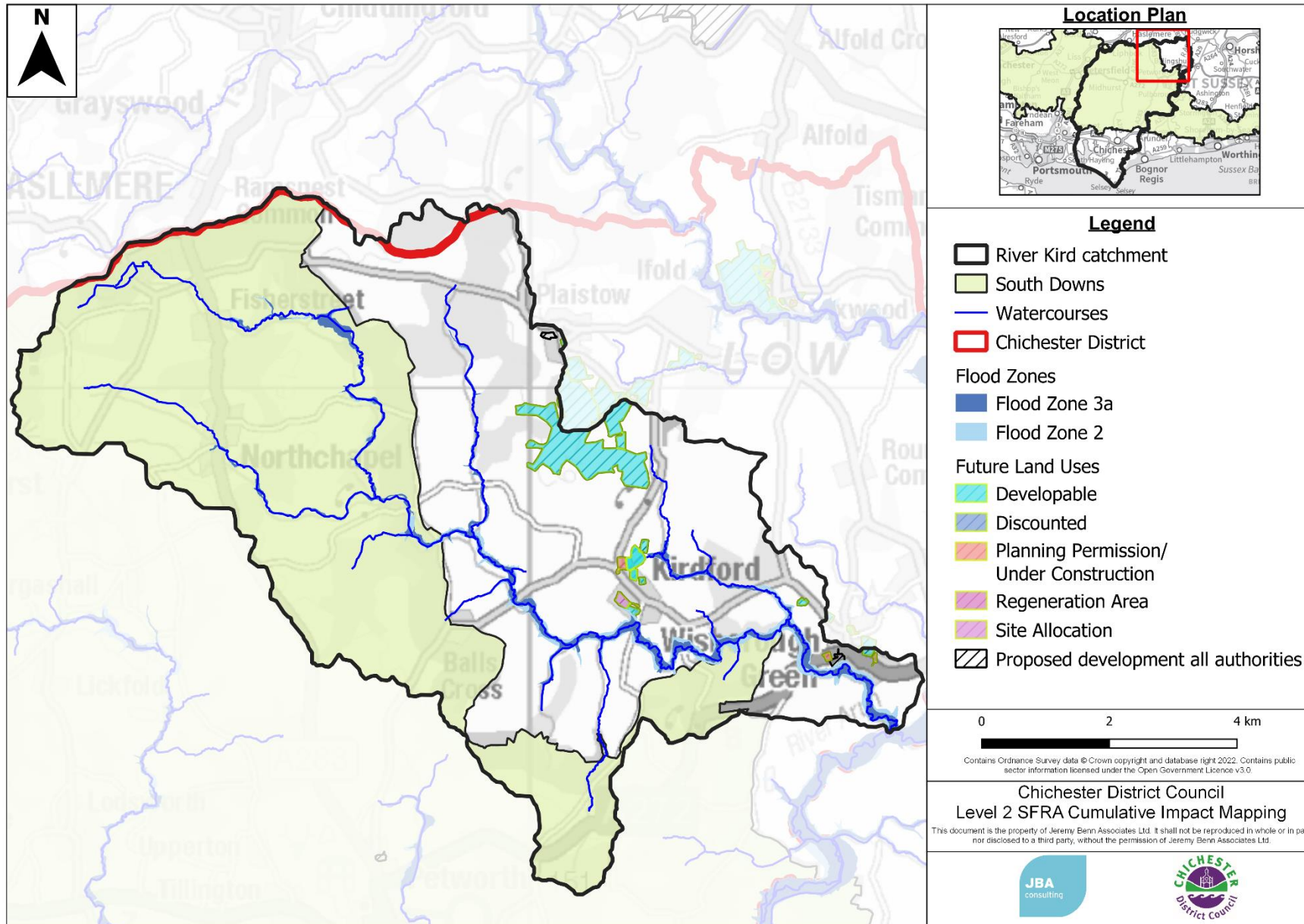


Figure 3-7: EA Undefended flood zones (River Kird catchment)

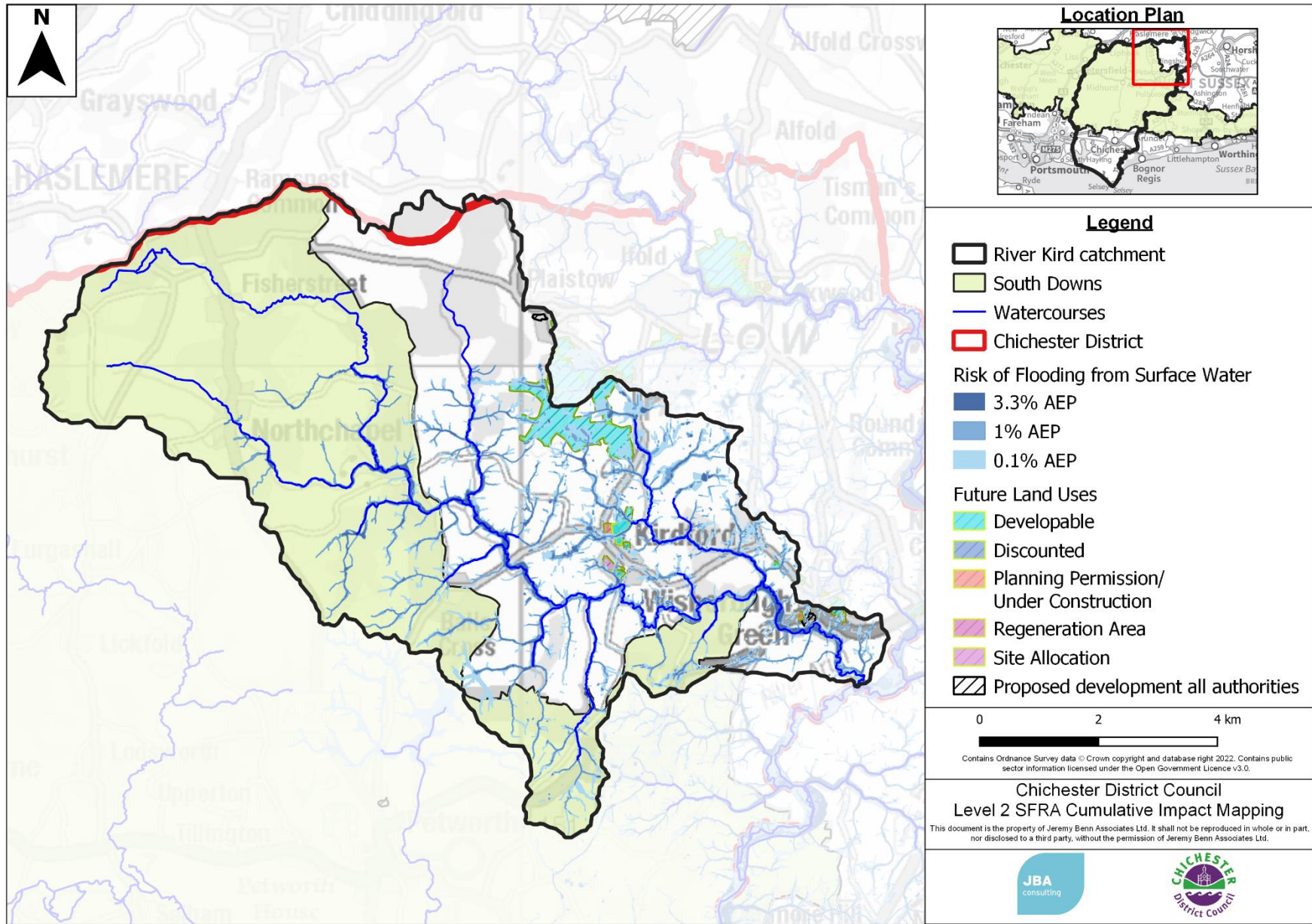


Figure 3-8: Risk of Flooding from Surface Water (River Kird catchment)

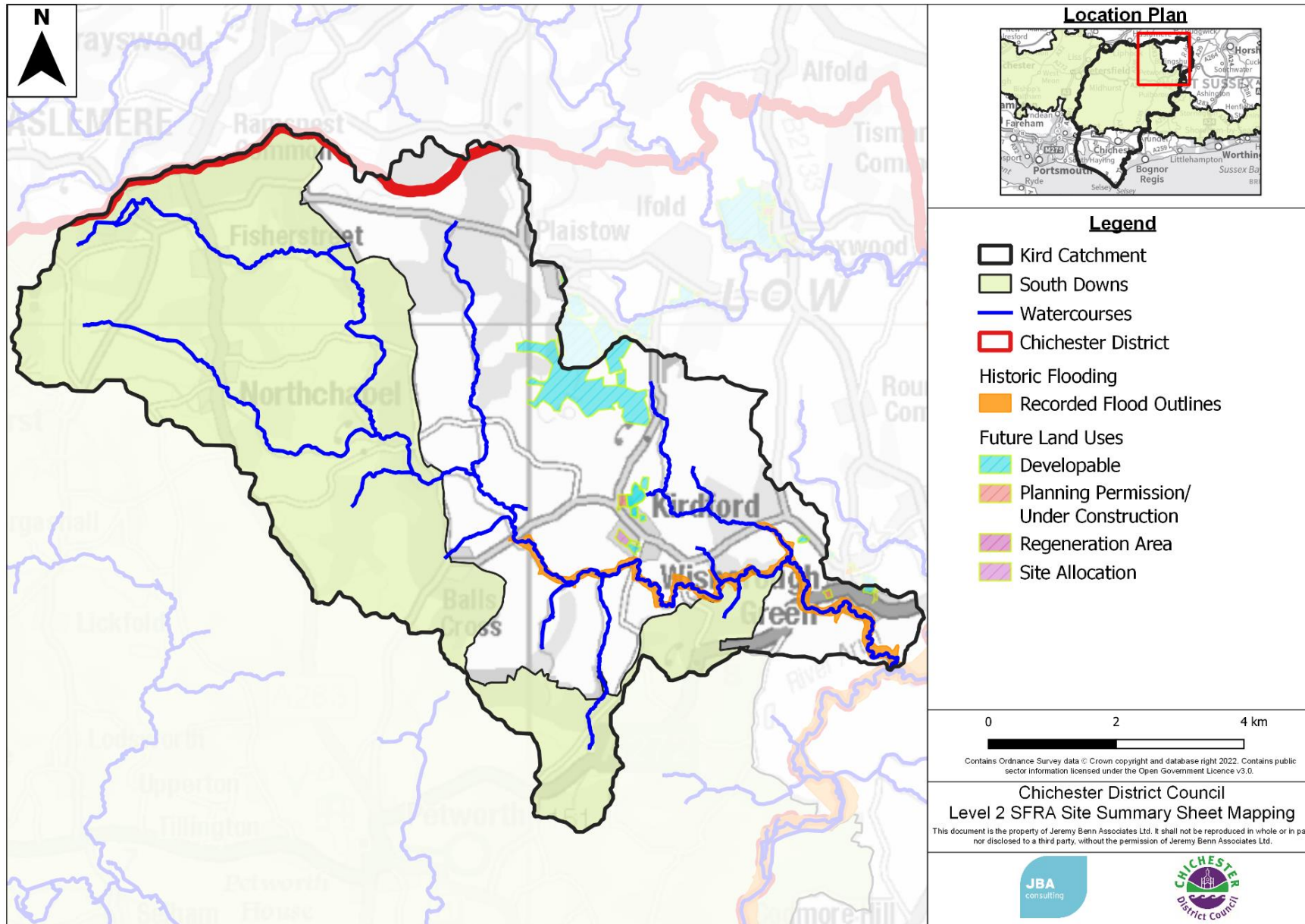


Figure 3-9: Historic flood risk (River Kird catchment)

Flood Risk

The fluvial flood risk from the River Kird is limited to undeveloped areas, although isolated mill properties may be at risk of flooding. The Wisborough Green Water Treatment works is at risk of flooding in a 0.1% AEP fluvial flood event and the A272 to the west of Wisborough Green is at risk of flooding in a 1% AEP fluvial flood.

The RoFSW mapping shows that flooding may occur in the north of Kirdford at the junction of Plaistow Road with Village Road in a 3.3% AEP event. Further flooding in the Townfield area is predicted in the 1% AEP flood event.

Areas within the River Kird catchment are at residual risk from breach or overtopping of Shillinglee Lake at Kirdford and Wisborough Green. The extent of flooding in the Wet Day scenario is similar to the fluvial flood zone 2 extent.

Recommendations

- Proposed development at Kirdford is situated at the upstream modelled extent of smaller tributaries into the River Kird however the Risk of Flooding from Surface Water mapping extends further upstream into areas identified within land allocations. These flow routes must be incorporated into the overall layouts of the site with clear land ownership and easements to maintain the flow route in perpetuity.
- Sites within the River Kird catchment are sufficiently large that the development may cross sub catchments. Further analysis may be required to delineate sub-catchments and determine the existing runoff rates to each sub-catchment and allowable peak flows and volumes at discharge points.
- Where further analysis of flow routes shows a defined channel within a site boundary, the LPA may consider asking developers to provide further modelled information regarding the risk at these locations and provide greater detail on the depths, extents of flooding. This will be required where there is insufficient information to show whether sustainable drainage features can be situated outside of the 1% plus climate change flood extent.
- For major development sites, infiltration rates may vary across the site. Where infiltration is possible, conservative infiltration rates should be used in design criteria to minimise the risk of storage exceedance. Where infiltration is possible over part of a site consideration should be given to the drainage strategy for each parcel and whether infiltration can be achieved.
- For major phased developments, reserved matters applications for each phase should show adherence to the site wide plans for surface water and flood mitigation. An overall site plan should be produced for outline applications demonstrating the allowable discharge rate from each parcel and how flood risk will be mitigated during the construction phase.
- Opportunities to retain and enhance Natural Flood Management in the upstream areas of the catchment should be explored.
- Development in areas at residual risk of flooding from reservoirs should consider the impact of development on the upstream reservoir. If a sequential approach to site development is taken it is unlikely that the risk categorisation would be changed based on the potential site allocations. This should, however, be taken into consideration for windfall sites proposed in flood zone 2 in this catchment.

3.1.4 Lavant (Sussex)

Catchment characteristics

The River Lavant (Sussex) flows in from the South Downs National park, draining the Downs from Treyford in the west to East Lavington and Sutton in the east. The total catchment size is 91km² of which approximately 6.5km² of the downstream extent is within Chichester District.

The River is designated as a Main River downstream of East Dean, flowing initially in a westerly direction towards West Dean before flowing southwards towards Chichester. There are no major tributaries of the River Lavant, however upstream of Chichester the channel splits into two channels. A flood alleviation diversion channel flows to the east of Chichester before joining the Pagham Rife, whilst the main channel is culverted at Market Avenue and divided into two channels through the centre of Chichester. The main channel joins again southwest of the Chichester bypass before discharging into the Fishbourne Channel at Dell Quay.

The Lavant is a chalk winterbourne groundwater-fed channel with periods of no/low flows. Groundwater recharge levels from the South Downs are therefore critically important to the River Lavant.

Development is proposed for this Local Plan at the following locations in the River Lavant catchment (along with other smaller development sites):

- North of Madgwick Lane (allocated)
- Graylingwell (permission granted)
- Land at Barnfield Drive (under construction)
- Southern Gateway regeneration
- Manor Farm (south west Chichester)

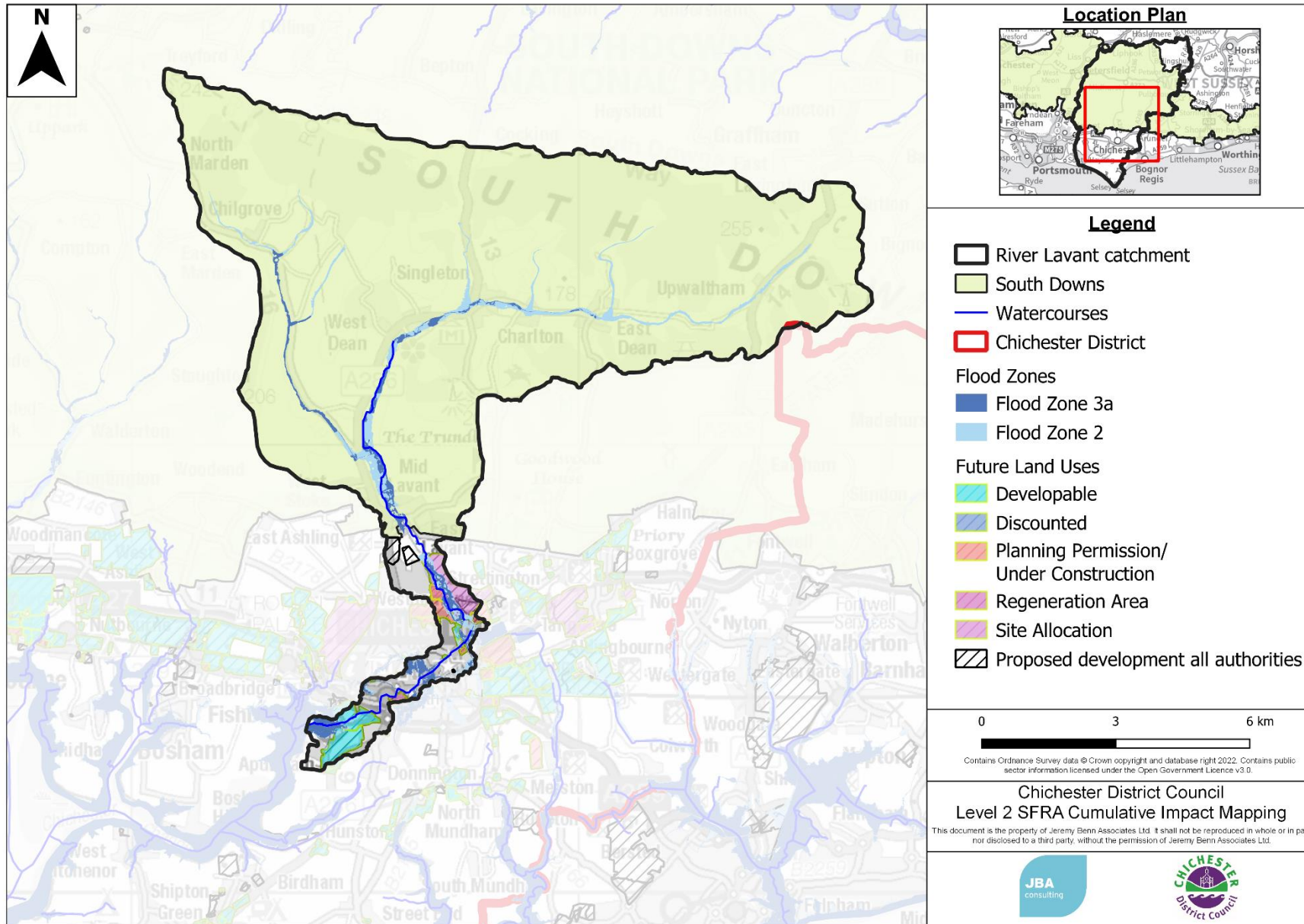


Figure 3-10: EA undefended flood zones (River Lavant catchment)

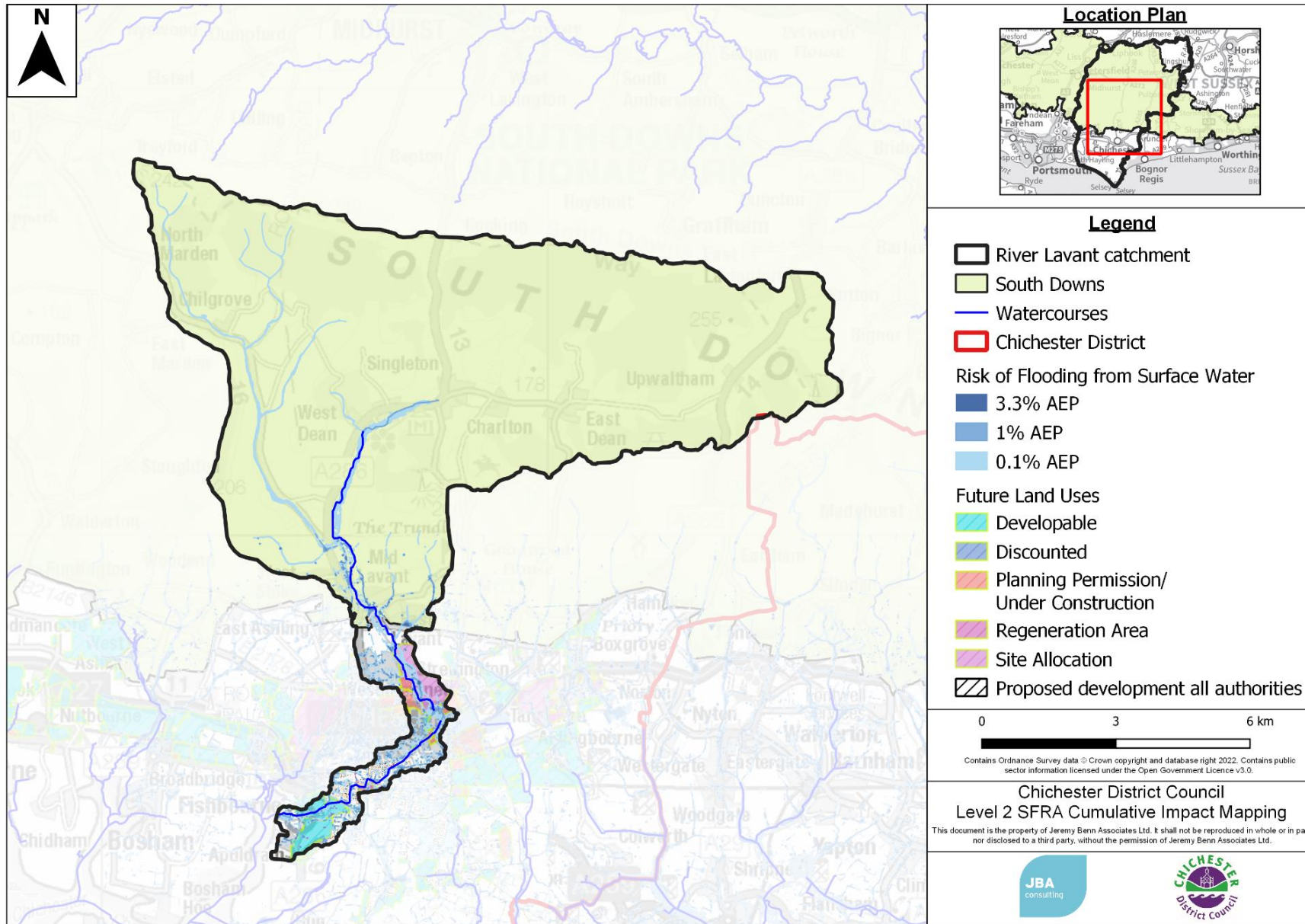


Figure 3-11: Risk of Flooding from Surface Water (River Lavant catchment)

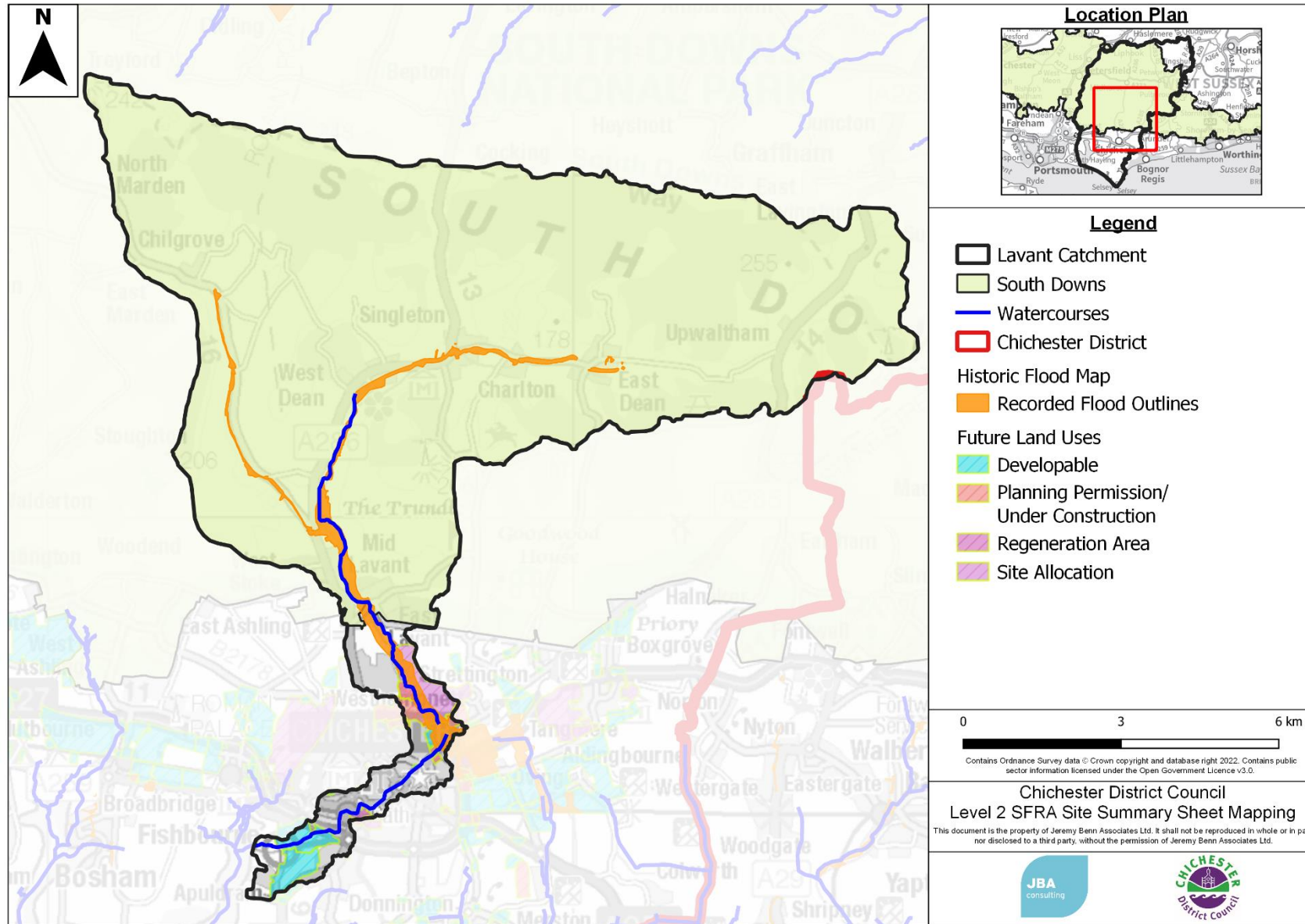


Figure 3-12: historic flood map (River Lavant catchment)

Flood Risk

Historic flooding within Chichester has been recorded and a flood alleviation scheme is in place with sluice gates at Westhampnett Mill diverting water to an alleviation channel and the Pagham Rife. Chichester is defended from fluvial flooding in a 1% AEP event (current day). A flood embankment along both banks of the Westhampnett Mill bypass channel, between Barnfield Drive and the confluence with the eastern channel is also present.

The RoFSW mapping shows considerable accumulations of surface water immediately north of Westhampnett Mill. Isolated areas of surface water flooding are shown to occur in the 1% AEP event and 3.3% AEP event +45% climate change allowance throughout the catchment. In the 0.1% AEP surface water flood, substantial flow routes are predicted through the urban centre

The Lavant Parish Council document **Historical flooding in Lavant** (Lavant Neighbourhood Development Plan 2016-2031) gives a detailed history of fluvial and groundwater flooding immediately upstream of the Chichester District Council boundary and West Sussex District Council have produced a Surface Water Management Plan for the Upper Lavant Valley.

The residual risk of flooding from high risk reservoirs in the river Lavant catchment is considered to be low.

Conclusions and recommendations

It is highly unlikely that development in the Lavant catchment within the Chichester District boundary would have any cross-boundary impacts given the position of Chichester District at the downstream end of the catchment and discharging into estuarine channel.

According to the data provided, the South Downs National Park Authority do not presently have any development plans within the Lavant catchment. However, Chichester District Council have proposed development both within Chichester and to the north of Chichester within this catchment including land between Summersdale and Westhampnett, and to the north of Summersdale.

- Sites within the River Lavant catchment are sufficiently large that the development may cross sub catchments. Further analysis may be required to delineate sub-catchments and determine the existing runoff rates to each sub-catchment and allowable peak flows and volumes at discharge points.
- Land north of Magwick Lane is a site just under 100ha in this catchment and areas within the same area currently have planning permission or are under construction. Development could therefore take place on both banks of the River Lavant.
- Plans for the overall site layout should demonstrate a sequential approach to development within the site plan, minimising the requirements for floodplain compensation and avoiding it wherever possible. Where floodplain compensation is required, it will need to be demonstrated that the downstream flood risk will not be increased for the lifetime of the development allowing for climate change. Any site-specific modelling in this area should take into consideration the potential impact of displaced floodwater including reference to development plans and proposed elevations for existing and forthcoming development which may not be included in existing flood models.
- For larger development sites, infiltration rates may vary across the site. Where infiltration is possible conservative infiltration rates should be used in design criteria to minimise the risk of storage exceedance. Where infiltration is possible over part of

a site consideration should be given to the drainage strategy for each parcel and whether infiltration can be achieved.

- For larger phased developments, reserved matters applications for each phase should show adherence to the site wide plans for surface water and flood mitigation. An overall site plan should be produced for outline applications demonstrating the allowable discharge rate from each parcel and how flood risk will be mitigated during the construction phase.
- There may be strategic opportunities upstream of Chichester to reduce flows into the culverted sections downstream.
- For previously developed sites in Chichester, there should be an expectation that runoff rates will be reduced to greenfield rates to reduce the likelihood of surcharging and flooding from the existing adopted sewer network.
- The flood risk associated with the downstream flow capacity in the culverted river Lavant and the Pagham Rife flood alleviation scheme should be considered when assessing proposals for all major development upstream. Should there be insufficient capacity in the downstream culvert there will be a necessity to introduce strategic solutions so that existing flood risk is not exacerbated. The potential benefits afforded by NFM measures should also be evaluated.

Consideration should be given to the potential effect of tide locking as this influence will increase as a result of the climate change rise in mean sea level. The effect of the increase in the volume of runoff from proposed development should be evaluated to understand whether flood risk is increased and addressed as appropriate.

3.1.5 Pagham Rife

Catchment characteristics

The Pagham Rife is connected to and receives flows from the River Lavant, and forms part of the flood alleviation scheme for Chichester. As a result, there are flow contributions from the River Lavant as well as the Pagham Rife catchment.

The upstream area of the natural Pagham Rife catchment is situated within the South Downs National Park. Smaller watercourses and rills drain the areas north of the A27 including Westhampnett and Westerton as indicated by flow routes on the Risk of Flooding from Surface Water mapping. These flow routes generally drain in a southerly direction in the eastern arm of the Pagham Rife. The western channel drains from lakes south of the A27 Chichester Bypass formed from gravel extraction in the superficial gravel deposits. The tributaries join on the district border approximately 400m south west of Lagness before discharging into Pagham Harbour to the west of Pagham.

The southern part of the catchment is characterised by relatively flat topography with superficial sand, silt and clay deposits and clay bedrock. The main channel is meandering with a relatively wide floodplain.

Areas close to the channel are mostly undeveloped with the exception of the channel at Merston and Runcton. A section of the Chichester and Arundel Canal can be found at North Mundham.

Development is proposed at

- North Mundham
- Runcton
- South of Shopwyke

Approximately 15% of the downstream section of the Pagham Rife catchment is within Arun District. Arun District Council have provided information regarding potential development to the west of Nyetimber.

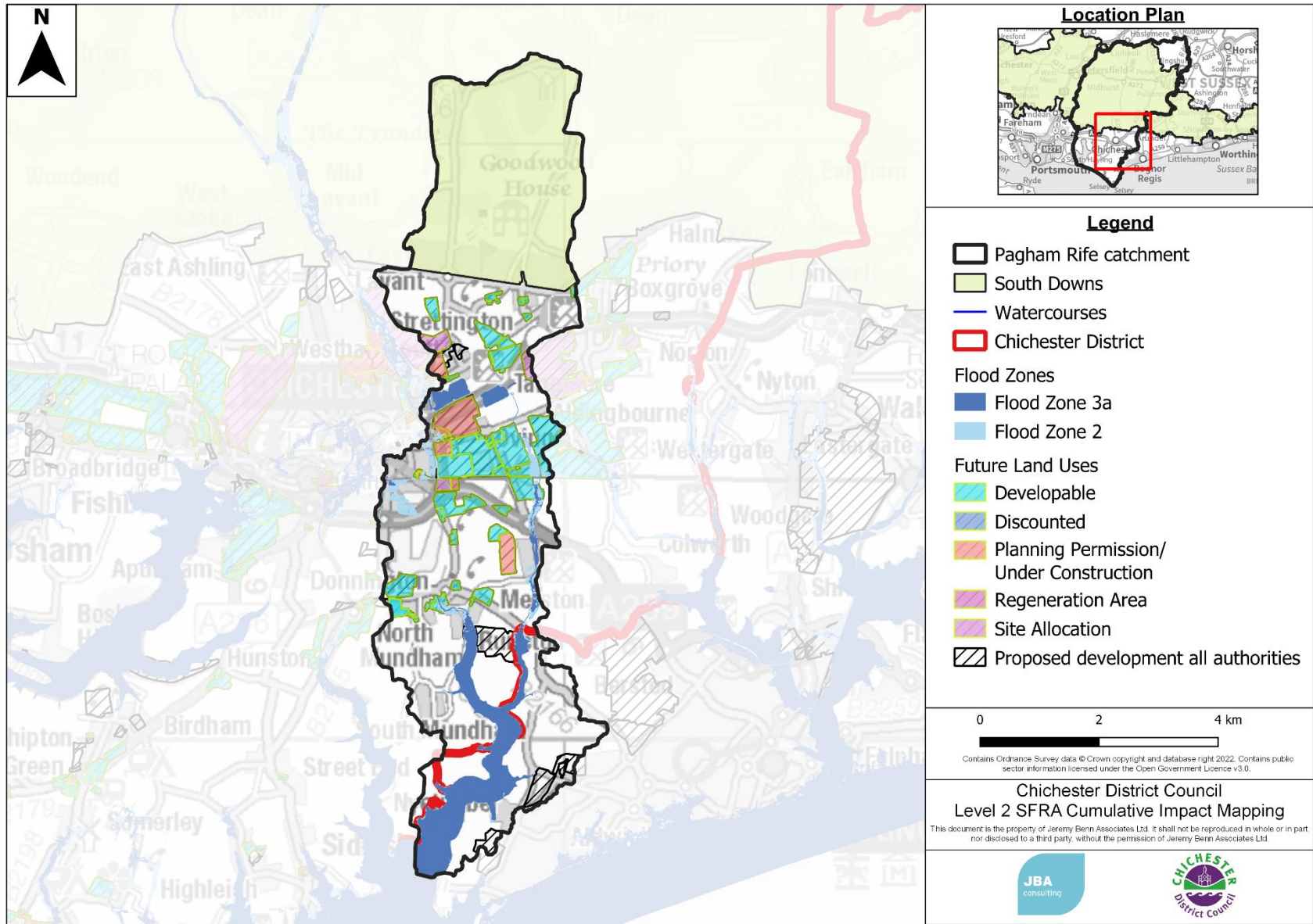


Figure 3-13: EA undefended flood zones (Pagham Rife catchment)

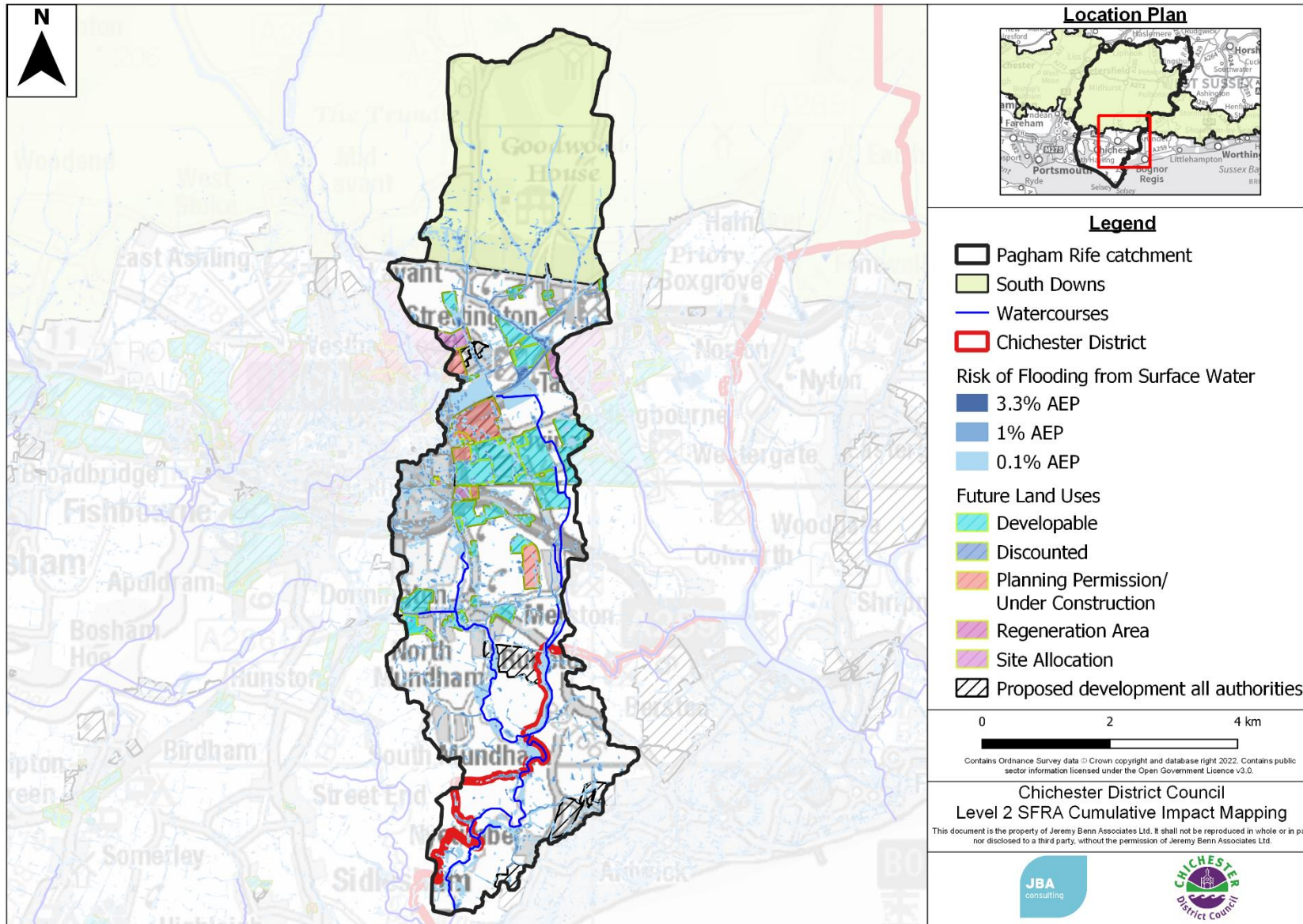


Figure 3-14: Risk of Flooding from Surface Water (Pagham Rife catchment)

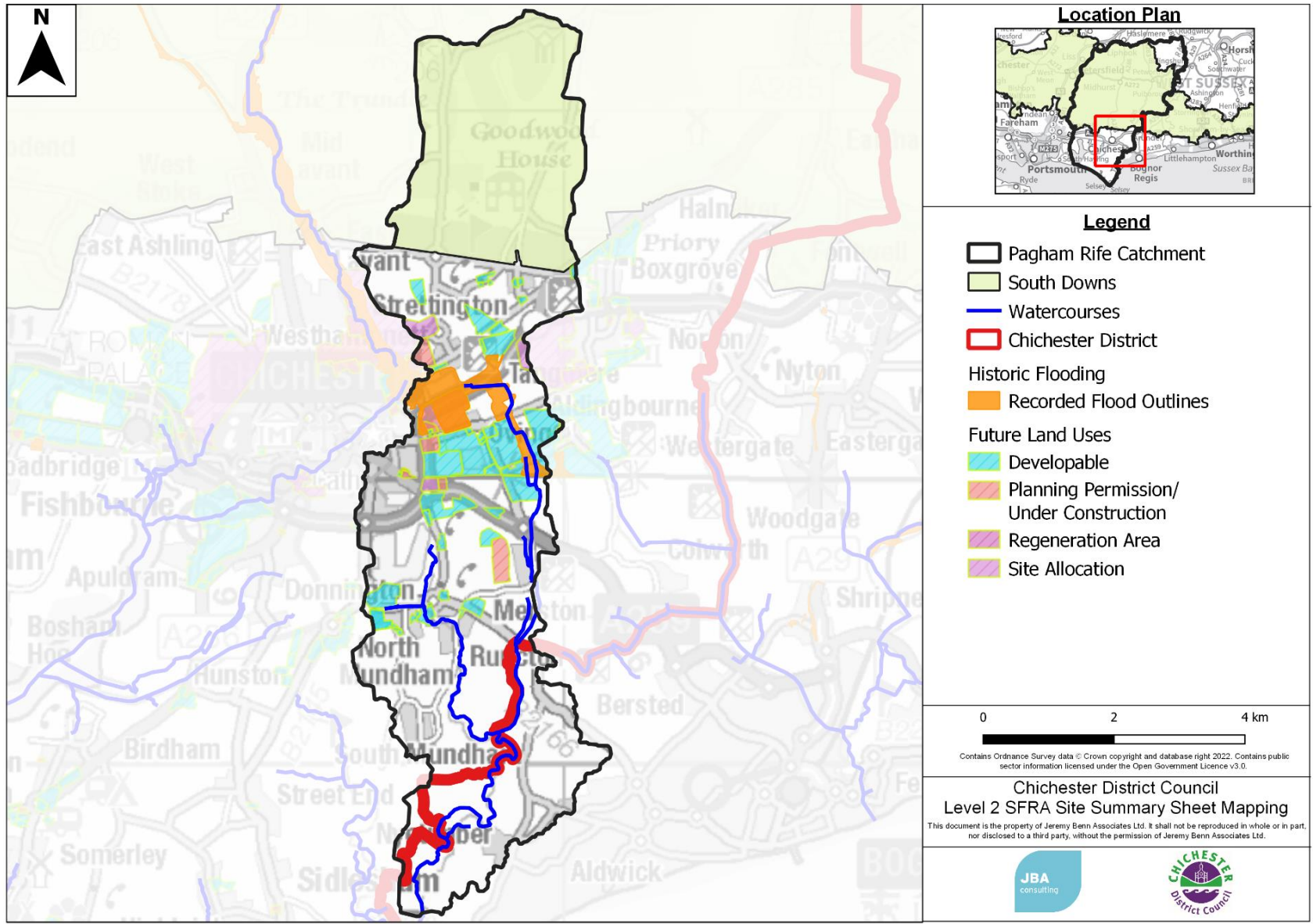


Figure 3-15: historic flood risk (Pagham Rife catchment)

Flood Risk

Due to the river Lavant FAS, the flood mechanism in the Pagham Rife catchment is heavily modified. When flooding is predicted, water levels in Church Farm Pit and East Pit, to the east of Chichester, are lowered through the sluice gate operation and diverted into the Pagham Rife catchment. Once the pits are full, flood water flows down the route of the alleviation scheme to the outfall at Pagham harbour. Recorded flood outlines are shown in the Church Farm Pit and East Pit areas.

Flood risk in the south of the catchment is tidally influenced downstream of Merston and North Mundham.

To the north of Westhampnett, the Risk of Flooding from Surface Water mapping shows flow routes originating from the South Downs chalk, including a significant flow path north of Westhampnett in the 3.3% AEP flood. In the 0.1% AEP event, surface water flows are predicted through Westhampnett adjacent to Claypit Lane. In the 1% AEP surface water flood, flooding is predicted in the west of Nyetimber in the lower reaches of the catchment and at North Mundham in the centre of the catchment.

Recommendations

Due to the interaction between the River Lavant catchment and the Pagham Rife, the impact of development within the River Lavant catchment may impact on development in the Pagham Rife catchment.

Development within the Pagham Rife catchment could also potentially limit future options available for flood risk reduction in Chichester by limiting land available for flood storage in the Pagham Rife catchment. Therefore, land required for the ongoing safe operation of the Chichester flood alleviation scheme in the Pagham Rife catchment should be identified in conjunction with the Environment Agency prior to site allocations.

- Sites within the Pagham Rife catchment are sufficiently large that the development may cross catchments. Further analysis may be required to delineate catchments and determine the existing runoff rates to each catchment and allowable peak flows and volumes at discharge points.
- As the Pagham Rife is a component of the River Lavant Flood Alleviation Scheme (FAS) proposed major development should assess the implications of increased runoff volumes to demonstrate that the design performance of the FAS is not affected now or in the future.
- Consideration should be given to the potential effect of tide locking. This influence will increase as a result of the climate change rise in mean sea level and may significantly impact the volume of surface water storage required.
- The effect of the increase in the volume of runoff from proposed development should be evaluated to understand whether flood risk is increased and addressed as appropriate.

4 Policy Recommendations

4.1 Broadscale Recommendations

Flood risk could potentially be increased by proposed development through increases to runoff volumes from impermeable areas and floodplain modification, however it can also provide opportunities for reductions through the provision of strategic schemes. It is necessary that all new development supports the aims to reduce flood risk whether the catchment is low, medium or high risk for sensitivity to changes within the catchment.

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

- Chichester District Council and neighbouring local authorities should develop complementary local planning policies for cross-boundary catchment areas and significant drainage paths to minimise cross boundary issues of cumulative impacts of development.
- Developers must incorporate SuDS into new development or provide reasoned justification for not using SuDS techniques supported by evidence. It is noted that some SuDS features can be incorporated into almost all new development and non-compliance on cost grounds must be demonstrated in line with the requirements of National Planning Practice Guidance: Development and Flood Risk. The details of adoption, ongoing maintenance and management on all development sites must be submitted with the planning application.
- West Sussex County Council as LLFA will review surface water drainage strategies in accordance with their local requirements for major and non-major developments (according to the definition in paragraph 56 of the National Planning Policy Framework). These should take into account all sources of flooding to ensure that future development is resilient to flood risk and does not increase flood risk elsewhere.
- The opportunity for Natural Flood Management in rural areas should be explored, maximising opportunities to slow the flow of water in upland catchments to reduce flood risk downstream. This is of particular relevance for the steeply sloped chalk catchments draining from the South Downs National Park.
- In urban areas, SuDS retrofit in urban areas and river restoration should be maximised to promote amenity, biodiversity and water quality benefits.
- Culverting should be opposed, and day-lighting existing culverts promoted through new developments.
- Runoff rates from all development sites must be limited to greenfield rates and volumes unless there are specific reasons on brownfield sites for a higher rate or volume that would impact on the viability of the overall scheme.
- Site-specific FRAs should explore opportunities to provide wider community flood risk benefit 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 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 any flood alleviation schemes.

4.2 Further recommendations for high-risk catchments

Recommendations for high risk catchments should be considered by developers as part of a site-specific assessment, but more detailed modelling must be undertaken by the developer to fully understand the off-site effects and ascertain the true storage needs and potential at each site at the planning application stage.

Particular attention should be paid to the effect of all proposed development in a plan at the location of existing sensitive receptors and included as appropriate for the assessments performed at the respective sites in the plan (but this also applies to “windfall” sites within these catchments. This wider approach to assessment will be required where receiving watercourses are subject to tide locking in their lower reaches or where there are Flood alleviation Schemes that operate within specific design criteria.

Developers should also include a construction surface water management plan to support the Construction Drainage Phasing Plan. This should provide information to the Environment Agency, LLFA and the LPA regarding the proposed management approach during the construction phase to address surface water management during storm events. Where possible, this should include information in the same catchment regarding other sites likely to come forward during the construction phase. This is particularly important where dewatering from multiple development sites in the same catchment could potentially increase fluvial flows.

For developments in high risk catchments, the LLFA and LPA should consult with Local Not-For-Profit organisations such as wildlife trusts, rivers trusts and catchment partnerships 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.