

1 Appendix B - Data sources used in the SFRA

1.1 Fluvial flooding

1.1.1 Flood Zones 2 and 3a

Flood Zones 2 and 3a, as shown in Appendix A, were produced from the Environment Agency's Flood Maps (which match the online Environment Agency's Flood Map for Planning), and the 1,000-year and 100-year fluvial model outputs, where they differ from Flood Map for Planning. The model outlines were compared with the Flood Map for Planning to determine whether the latest modelling results should be used, and this is shown in Appendix E.

Over time, the online mapping is likely to be updated more often than the SFRA, so SFRA users should check there are no major changes in their area.

1.1.2 Flood Zone 3b (the Functional Floodplain)

Flood Zone 3b, as shown in Appendix B, has been compiled for the study area as part of this SFRA and is based on the 5% AEP (1 in 20-year chance of flooding in any given year) or 4% AEP (1 in 25-year chance of flooding in any given year) extents produced from Environment Agency detailed hydraulic models, where outputs were available. This information is only available in the SFRA and not shown on the online map.

For areas not covered by detailed models, a precautionary approach should be adopted for Flood Zone 3b with the assumption that the extent of Flood Zone 3b would be equal to Flood Zone 3a. If development is shown to be in Flood Zone 3a, further work should be undertaken as part of a detailed site-specific Flood Risk Assessment to define the extent of Flood Zone 3b.

If the area of interest is in an area that has seen some major changes to the extent of the Flood Zones, having checked the online mapping, Developers will also need to remap Flood Zone 3b as part of a detailed site-specific Flood Risk Assessment.

1.1.3 Climate change

Please refer to Chapter 4 for information on the approach to climate change in this SFRA.

1.1.4 Surface water

Mapping of surface water flood risk in study area has been taken from the Risk of Flooding from Surface Water (RoFfSW) maps published online by the Environment Agency. These maps are intended to provide a consistent standard of assessment for surface water flood risk across England and Wales in order to help LLFAs, the Environment Agency and any potential developers to focus their management of surface water flood risk.

The RoFfSW is derived primarily from identifying topographical flow paths of existing watercourses or dry valleys that contain some isolated ponding locations in low lying areas. They provide a map which displays different levels of surface water flood risk depending on the annual probability of the land in question being inundated by surface water (Table B-1).

Table B-1: RoFfSW risk categories

| Category | Definition |
|----------|---|
| High | Flooding occurring as a result of rainfall with a greater than 1 in 30 chance in any given year (annual probability of flooding 3.3%) |
| Medium | Flooding occurring as a result of rainfall of between 1 in 100 (1%) and 1 in 30 (3.3%) chance in any given year. |

| | |
|-----|---|
| Low | Flooding occurring as a result of rainfall of between 1 in 1,000 (0.1%) and 1 in 100 (1%) chance in any given year. |
|-----|---|

Although the RoFfSW offers improvement on previously available datasets, the results should not be used to understand flood risk for individual properties. The results should be used for high level assessments such as SFRAs for local authorities. If a site is indicated in the Environment Agency mapping to be at risk from surface water flooding, a more detailed assessment should be considered to more accurately illustrate the flood risk at a site-specific scale.

1.1.5 Groundwater

Mapping of groundwater flood risk has been based on the Areas Susceptible to Groundwater Flooding (AStGWF) dataset.

The AStGWF dataset is a strategic-scale map showing groundwater flood areas on a 1km square grid. It shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring and does not take account of the chance of flooding from groundwater rebound (e.g. following cessation of mining or industrial activity). This dataset covers a large area of land, and only isolated locations within the overall susceptible area are likely to suffer the consequences of groundwater flooding.

The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale.

1.1.6 Sewers

Historical incidents of flooding are detailed by Severn Trent Water through their Historic Flood Risk Register (HFRR). The HFRR database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding. The risk register has been considered in the assessment of flood risk from sewers (see Chapter 5.9).

1.1.7 Reservoirs

The risk of inundation because of reservoir breach or failure of reservoirs within the area has been mapped using the outlines produced as part of the National Inundation Reservoir Mapping (NIRIM) study. These outlines were the same as those on the Long-Term Risk of Flooding website at the time of publication. The Environment Agency are currently updating their national reservoir flood maps and SFRA users should check there are no major changes to the reservoir maps before relying on the mapping in the SFRA.

1.1.8 Overview of supplied data for the South Staffordshire SFRA

| Source of flood risk | Data used to inform the assessment | Data supplied by |
|------------------------------------|--|-----------------------|
| Historic (all sources) | Historic Flood Map Recorded Flood Outlines Hydraulic Modelling Reports | Environment Agency |
| | Historic flood incidents/records | Canal and River Trust |
| | Sewer flooding | Severn Trent Water |
| Fluvial (including climate change) | Aston Chase Brook and Scotch Brook, Stone Hazard Mapping (2018, CH2M) Bell Brook and Otherton Brook, Penkridge tributaries hazard mapping study (2015, JBA) | Environment Agency |

| | | |
|---------------|--|-----------------------|
| | <p>Ridings Brook SFRM (2009, JBA) Rising Brook (Rugeley) FAS (2014, JBA) Rising Brook and Kingston Brook, Stafford tributaries study (2015, JBA) River Anker SFRM (2006, JBA) River Penk and River Sow, Visualisation model (2011, Halcrow) River Sow, Eccleshall Flood Modelling Study (2017, JBA) Smestow Brook, Wolverhampton, Wombourne and Kingswinford FRM study (2012, URS) River Tame SFRM (2009, Halcrow) River Trent, Model 1 Enhancement (2009, Capita Symonds) River Trent, Fluvial Trent Strategy Model 2 (2005, EA)</p> | |
| | Flood Map for Planning Flood Zones | Environment Agency |
| Surface Water | Risk of Flooding from Surface Water dataset | Environment Agency |
| Groundwater | <p>Areas Susceptible to Groundwater Flooding dataset Bedrock geology/superficial deposits datasets (online dataset)</p> | Environment Agency |
| Sewer | Hydraulic Flood Risk Register | Severn Trent Water |
| Reservoir | National Inundation Reservoir Mapping (Long term flood risk map) | Environment Agency |
| Canal | Description of flood incidences | Canal and River Trust |

Appendix C - Flood Alert and Flood Warnings

1.1 Flood Alert Areas

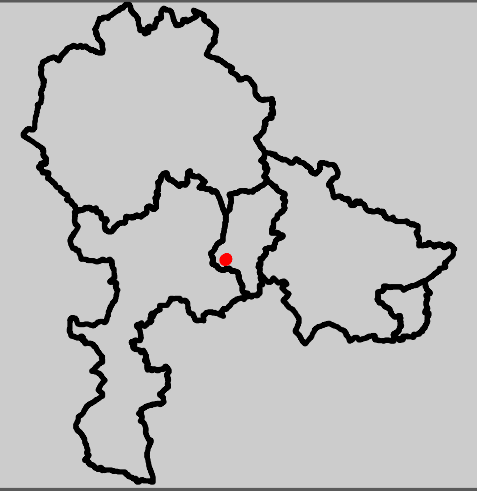
| Flood Alert Code | Flood Alert Name | Watercourse/s | Coverage |
|------------------|--|---|--|
| 031WAF104 | Tern and Perry Catchments | River Tern, River Perry | Rivers Tern, Perry, Roden, Strine and Meese and their tributaries |
| 031WAF106 | River Worfe | River Worfe | River Worfe, Wesley Brook and Albrighton Brook and their tributaries |
| 031WAF109 | River Stour in Worcestershire | River Stour | River Stour and its tributaries |
| 033WAF304 | Middle Tame | River Tame | Low-lying land and roads between Water Orton and Tamworth including the Bourne Brook at Fazeley |
| 033WAF305 | Bourne Brook (Tamworth) | Bourne Brook | Low-lying land and roads between Shenstone and Fazeley |
| 033WAF306 | Lower Tame | River Tame | Low-lying land and roads between Hopwas and the National Arboretum near Alrewas |
| 033WAF307 | River Anker and River Sence | River Anker, River Sence | Low-lying land and roads between Nuneaton and Tamworth on the River Anker and between Temple Mill and Ratcliffe Culey on the River Sence |
| 033WAF308 | River Mease | Gilwiskaw Brook, River Mease | Low-lying land and roads between Ashby and Croxall |
| 033WAF309 | Stoke Trent | Ford Green Brook, Lyme Brook, River Trent | Low-lying land and roads between Norton Green and Darlaston on the River Trent and on the Lyme Brook and Ford Green Brook |
| 033WAF310 | Stone Trent | River Trent | Low-lying land and roads between Darlaston and Great Haywood |
| 033WAF311 | Rugeley Trent | River Trent | Low-lying land and roads between Great Haywood to Yoxall |
| 033WAF312 | River Sow and River Penk | Sandyford Brook, Ridings Brook, Saredon Brook | Low-lying land and roads between Great Bridgeford and Shugborough on the River Sow, between Coven and Stafford on the River Penk, on the Sandyford Brook, on the Rising Brook, on the Ridings Brook and on the Saredon Brook |
| 033WAF313 | River Blithe and River Swarbourn | River Blithe, River Swarbourne | Low-lying land and roads between Blythe Bridge and Nethertown on the River Blithe and between Hoar Cross and Yoxall on the River Swarbourne |
| 033WAF314 | Burton Trent | River Trent | Low-lying land and roads between Kings Bromley to Clay Mills |
| 033WAF330 | River Stour and Smestow Brook in the Black Country and South Staffordshire | River Stour, Smestow Brook | River Stour and Smestow Brook in the Black Country and South Staffordshire |

1.2 Flood Warning Areas

| Flood Warning Code | Flood Warning Name | Watercourse/s | Coverage |
|--------------------|---|-----------------|--|
| 033FWF3ANKR008 | River Anker at Amington, Tamworth | River Anker | River Anker at Amington, Tamworth including Shuttington Road, Amington Old Hall, Amington Park, Filey, Selker Drive and Whitley Avenue |
| 033FWF3ANKR009 | River Anker at Tamworth Town Centre | River Anker | River Anker at Tamworth Town Centre including Stationfields Park Homes, Amington Road and Moor Lane |
| 033FWF3BLITHE01 | River Blithe at Blythe Bridge | River Blithe | River Blithe at Blythe Bridge including Uttoxeter Road, Roman Road, Blythe View and Blythe Bridge Mill |
| 033FWF3BLITHE03 | River Blithe from Leigh Crossing to Dapple Heath | River Blithe | River Blithe from Leigh Crossing to Dapple Heath including Lower Leigh, Field, Burndhurst and The Blythe |
| 033FWF3BLITHE04 | River Blithe from Blithfield Reservoir to Bancroft | River Blithe | River Blithe from Blithfield Reservoir to Bancroft including Hanstall Ridware |
| 033FWF3BOURNB01 | Bourne Brook at Hints and Drayton Manor Park | Bourne Brook | Bourne Brook at Hints and Drayton Manor Park including Mill Lane area in Fazeley |
| 033FWF3KINVER | River Stour at Kinver | River Stour | River Stour at Kinver |
| 033FWF3MEASE03 | River Mease at Clifton Campville, Harlaston and Croxall | River Mease | River Mease at Clifton Campville, Harlaston and Croxall including Main Street and Lullington Road in Clifton Campville, Main Road in Harlaston and The Hall at Croxall |
| 033FWF3PENK001 | River Penk at Coven | River Penk | River Penk at Coven |
| 033FWF3PENK003 | River Penk at Somerford | River Penk | River Penk at Somerford |
| 033FWF3PENK004 | River Penk at Congreve | River Penk | River Penk at Congreve |
| 033FWF3PENK005 | River Penk at Penkridge | River Penk | River Penk at Penkridge |
| 033FWF3PENK007 | River Penk at Acton Bridge | River Penk | River Penk at Acton Bridge |
| 033FWF3RID001 | Ridings Brook at Rumer Hill, Cannock | Ridings Brook | Ridings Brook at Rumer Hill, Cannock including parts of Rumer Hill Road, Walsall Road and St Johns Road |
| 033FWF3RID002 | Ridings Brook at Bridgetown, Cannock | Ridings Brook | Ridings Brook at Bridgetown, Cannock including parts of Walsall Road and Longford Industrial Estate |
| 033FWF3RISE001 | Rising Brook, Stafford | Rising Brook | Rising Brook, Stafford |
| 033FWF3SAND001 | Sandyford Brook in Stafford | Sandyford Brook | Sandyford Brook in Stafford at Sandon Road and the Queensway area |
| 033FWF3SARE001 | Saredon Brook at Wedges Mills, Cannock | Saredon Brook | Saredon Brook at Wedges Mills, Cannock |
| 033FWF3SARE002 | Saredon Brook at Standeford near Coven | Saredon Brook | Saredon Brook at Standeford near Coven |

| Flood Warning Code | Flood Warning Name | Watercourse/s | Coverage |
|---------------------------|---|----------------------|---|
| 033FWF3SMES02 | Smestow Brook at Seisdon and Woodford Grange | Smestow Brook | Smestow Brook at Seisdon and Woodford Grange |
| 033FWF3SMES03 | Smestow Brook at Hinksford | Smestow Brook | Smestow Brook at Hinksford including Hinksford Park, Greensforge, Flatheridge Cottage and Greensforge Lane |
| 033FWF3SOW002 | River Sow St. Thomas area | River Sow | River Sow St. Thomas area |
| 033FWF3SOW003 | River Sow Tixall area | River Sow | River Sow Tixall area |
| 033FWF3STAFFPENK | River Penk at Stafford | River Penk | River Penk at Stafford including Queensville area |
| 033FWF3STAFFSOW | River Sow at Stafford | River Sow | River Sow at Stafford from Tillington to Kingston |
| 033FWF3STOURBRIDGE | River Stour at Stourbridge | River Stour | River Stour at Stourbridge Town Centre, Amblecote and Prestwood. |
| 033FWF3TAME017 | River Tame and Bourne Brook at Fazeley | River Tame | River Tame and Bourne Brook at Fazeley from Coleshill Road Bridge to Riverside Industrial Estate |
| 033FWF3TAME018 | River Tame at Kettlebrook | River Tame | River Tame at Kettlebrook including Reedmace, Champion Drive, Orchard Street and Anker View |
| 033FWF3TAME019 | River Tame at County Drive and Bitterscote | River Tame | River Tame at County Drive and Bitterscote area Tamworth |
| 033FWF3TAME020 | River Tame at Ventura Park | River Tame | River Tame at Ventura Park |
| 033FWF3TAME021 | River Tame at Lichfield Road Tamworth | River Tame | River Tame at Lichfield Road Tamworth from The Leys area to Coton Lane |
| 033FWF3TAME022 | River Tame at Comberford | River Tame | River Tame at Comberford including Fisherwick |
| 033FWF3TAME023 | River Tame at Elford | River Tame | River Tame at Elford including Elford Mill and Stubby Lea Farm |
| 033FWF3TAME024 | River Tame at Croxall | River Tame | River Tame at Croxall |
| 033FWF3TRENT05 | River Trent at Hanford and Trentham | River Trent | River Trent at Hanford and Trentham including Church Lane area of Hanford, Park Drive in Trentham and Trentham Gardens |
| 033FWF3TRENT07 | River Trent at Stone | River Trent | River Trent at Stone including Trent Close and Stafford Street |
| 033FWF3TRENT08 | River Trent at Enson, Sandon, Salt and Weston | River Trent | River Trent at Enson Sandon Salt and Weston areas |
| 033FWF3TRENT09 | River Trent at Great Haywood Little Haywood and Colwich | River Trent | River Trent at Great Haywood Little Haywood Colwich and Wolsley Bridge area |
| 033FWF3TRENT10 | River Trent at Rugeley | River Trent | River Trent at Rugeley including Mast Trading Estate, Power Station Road area, Boston Industrial Estate, Deacons Way, Bishops Grange and Vicars Croft |

| Flood Warning Code | Flood Warning Name | Watercourse/s | Coverage |
|---------------------------|--|----------------------|---|
| 033FWF3TRENT11 | River Trent at Hill Ridware, Pipe Ridware and Mavesyn Ridware | River Trent | River Trent at Hill Ridware, Pipe Ridware and Mavesyn Ridware areas |
| 033FWF3TRENT12 | River Trent at Handsacre, Nethertown and Kings Bromley | River Trent | River Trent at Handsacre, Nethertown and Kings Bromley |
| 033FWF3TRENT13 | River Trent at Alrewas and Wychnor | River Trent | River Trent in the Alrewas and Wychnor including Coton Close and Church Road in Alrewas, Wychnor Bridges and Sewage Works |
| 033FWF3TRENT14 | River Trent at Catton, Barton under Needwood and Branston Water Park | River Trent | River Trent at Catton, Barton under Needwood and Branston Water Park including Central Rivers Railway Depot, Barton Turns and Greycar Business Park area in Barton under Needwood and Lichfield Road area in Branston |



Authority Information

Council Boundary

Flood Alert Areas

Flood Warnings

033FWF3RID001

033FWF3RID002

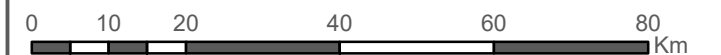
Notes

Flood Alerts are used to warn people of the possibility of flooding and encourage them to be alert, stay vigilant and make early preparations. It is issued earlier than a flood warning, to give customers advice notice of the possibility of flooding, but before we are fully confident that flooding in Flood Warning Areas is expected.

Flood Warnings warn people of expected flooding and encourage them to take action to protect themselves and their property.

Some areas may be covered by more than one flood warning area as they may be at risk of flooding from more than one watercourse.

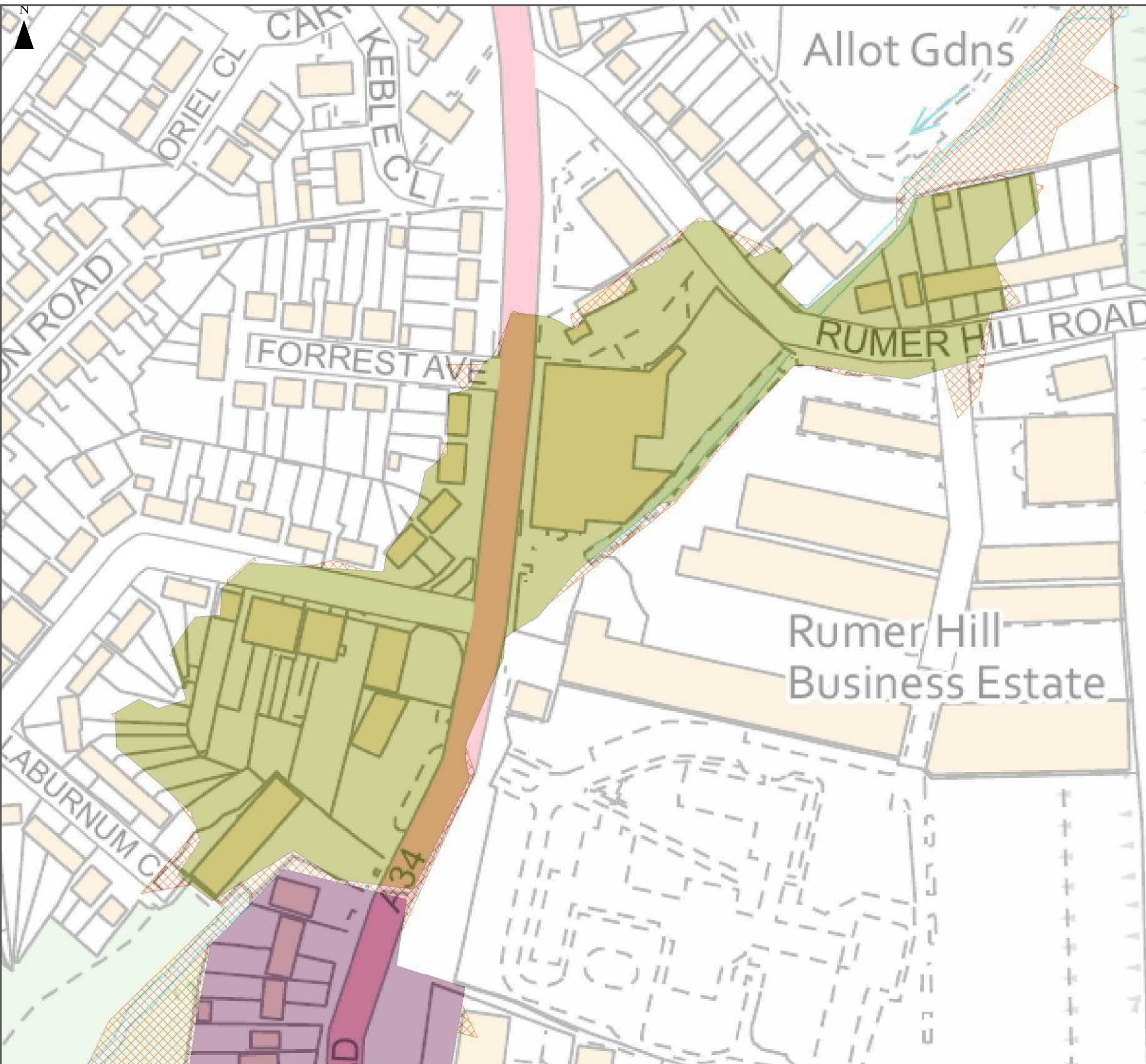
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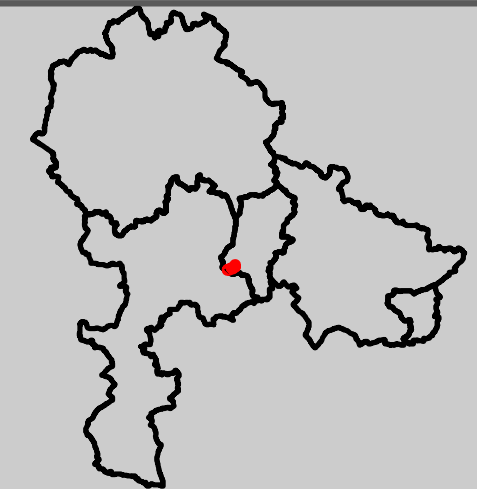


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Authority Information

Council Boundary

Flood Alert Areas

Flood Warnings

033FWF3RID001

033FWF3RID002

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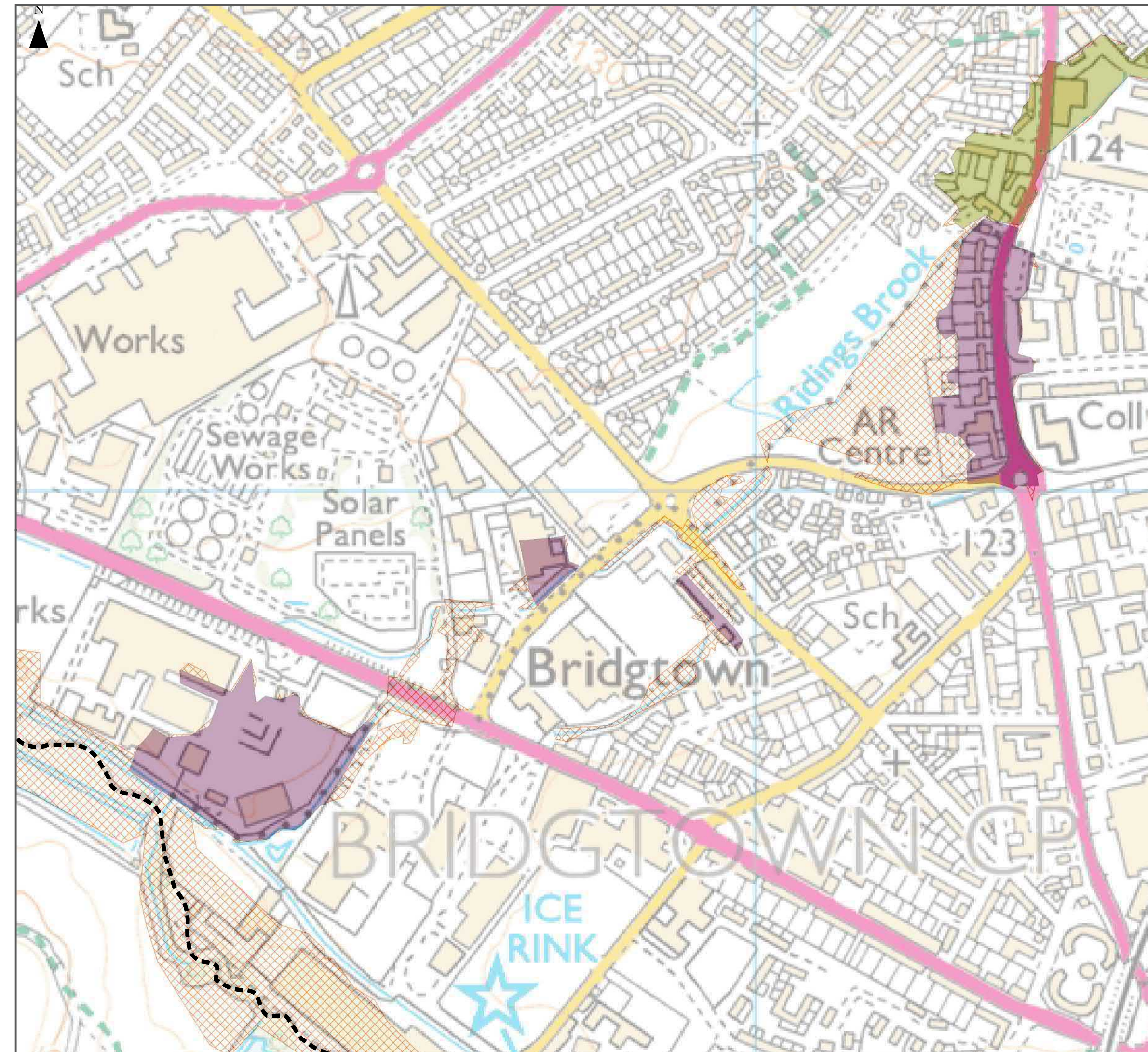
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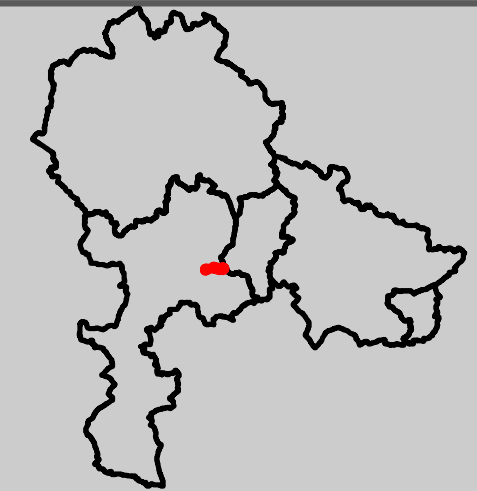


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Authority Information

Council Boundary

Flood Alert Areas

Flood Warnings

033FWF3SARE001

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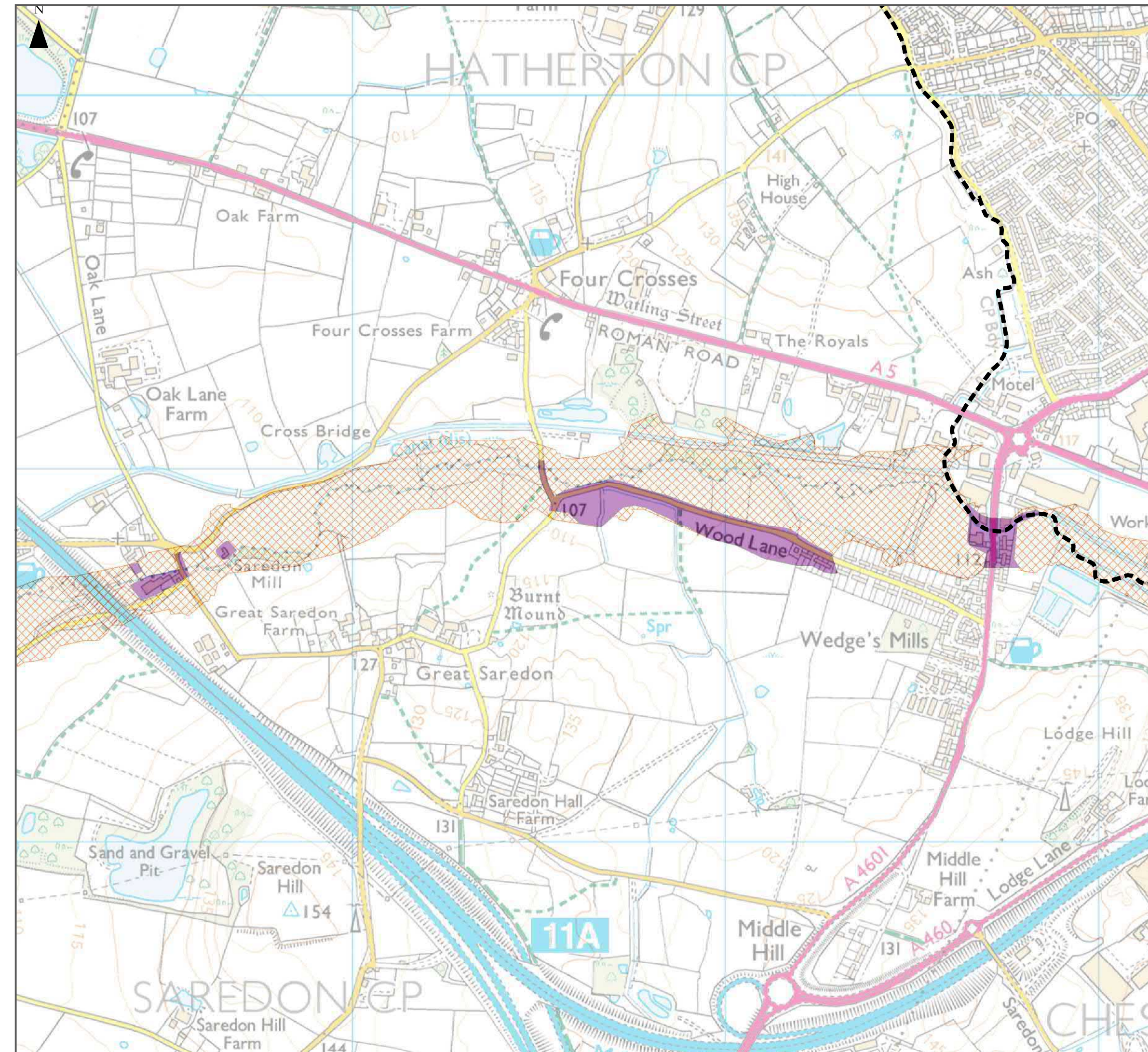
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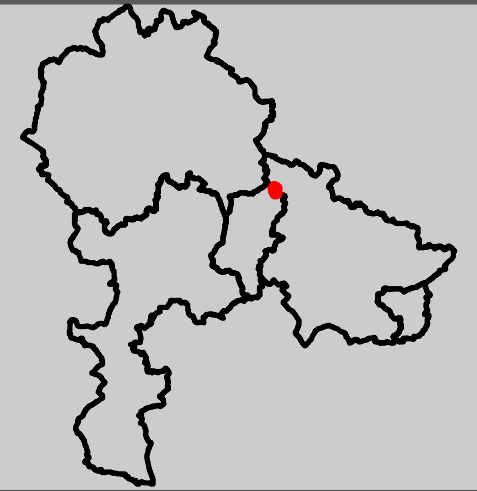


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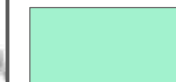


Authority Information

 Council Boundary

 Flood Alert Areas

Flood Warnings

 033FWF3TRENT10

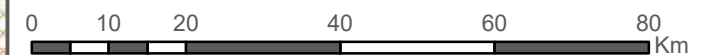
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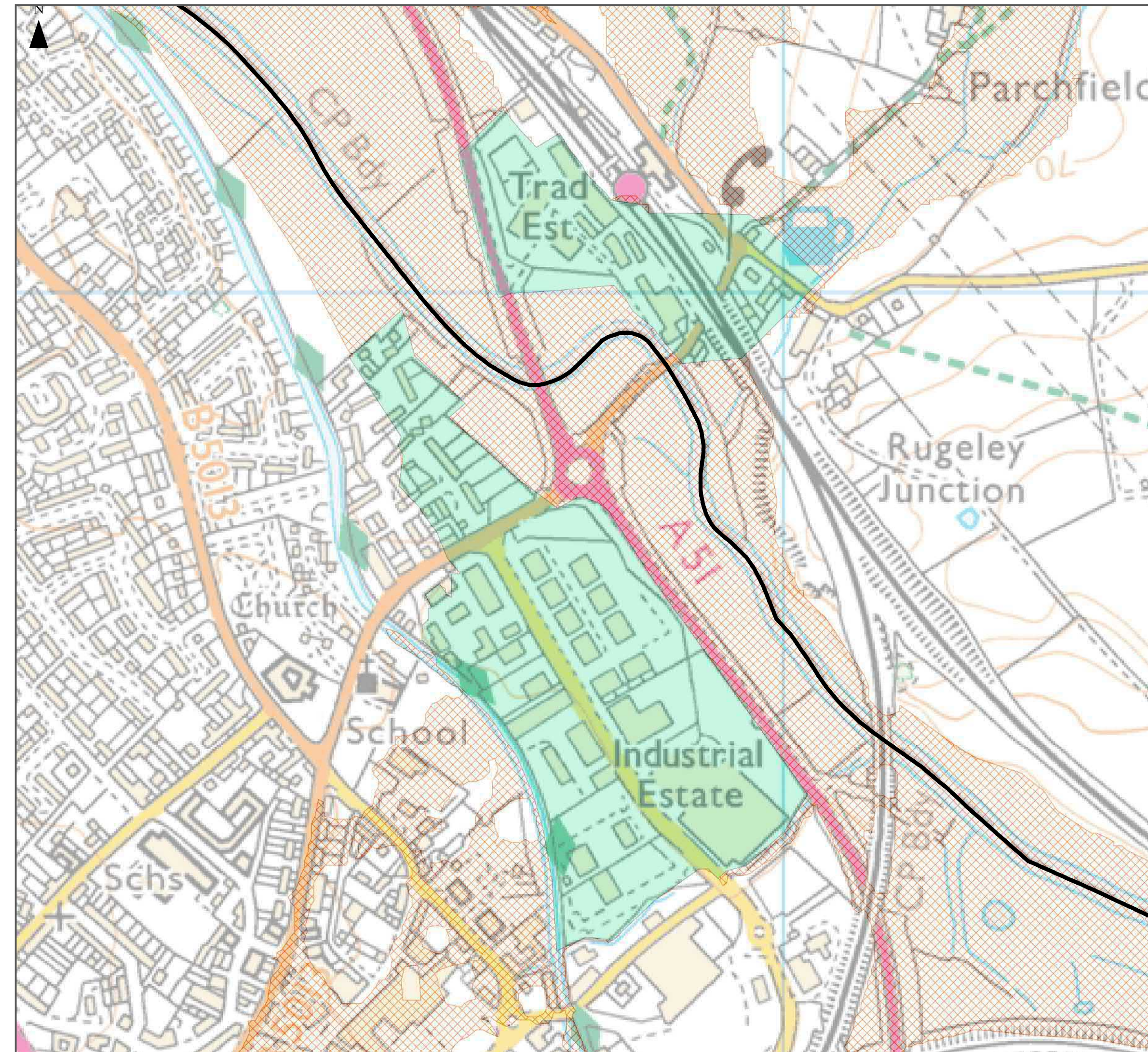
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Appendix D2 – Summary of flood risk in Cannock Chase District

The table below summarises the flood risk in a number of locations within the District. Due to its size, Cannock has been split into its wards.

| Settlement/ ward | Fluvial flood risk | Existing defences | Surface water flood risk | Susceptibility to Groundwater flood risk | | | | Reservoir inundation risks | Historic, recorded flood events |
|---------------------|---|--|--|--|-----------|-----------|------|--|--|
| | | | | <25% | ≥25% <50% | ≥50% <75% | ≥75% | | |
| Cannock | | | Cannock was identified in the 2015 LFRMS as the urban area at the highest risk of surface water flooding in Staffordshire, with 1292 properties at risk. Cannock was also identified in the 2010 SWMP being at high risk of surface water flooding and was therefore taken forward for a Phase 2 SWMP assessment. | | | | | | |
| Cannock East ward | The Riding Brook flows through the east and south of the ward. The fluvial extents are well confined to the channel, with extents getting out of bank through the Mill Green and Hawks Green nature valley reserve. | An embankment is located downstream of the Mill Green reservoir. | Surface water flow paths follow the topography with high ground in the north and west of the ward and lower ground towards the railway line and the Ridings Brook in the south and the east. A prominent flow path in the 30-year event is from an existing flow path originating in Cannock North ward, crossing Huntington Terrace Road, Cannock Road, Sankey Road, Redwood Drive and Common Lane before ponding behind the railway line. Another flow path exists in the north of the ward from Kingsway towards the Ridings Brook. In the higher return period events, surface water is seen to back up behind the railway line and new overland flow paths are present. | ✓ | | ✓ | | Cannock South ward is partially located within the inundation extent of the Ridings Brook (Mill Green) reservoir | Approximately 80 properties with a history of sewer flooding in Cannock. |
| Cannock North ward | There are no watercourses in Cannock North ward, therefore the fluvial flood risk is low. | None | Some overland flow paths exist in the 30-year event, including along the A34, Bevan Lee Road, and flowing through gardens on Edward Street and Rigby Drive towards the lower ground of the railway line. These flow paths become more prominent in the 100-year and 1,000-year events and more flow paths are present following the topography towards the lower ground in the east and the south. | ✓ | ✓ | | | None | Approximately 80 properties with a history of sewer flooding in Cannock. |
| Cannock South ward | The Ridings Brook flows from north-east to south-west through the centre of the ward, and the Golly Brook and the Saredon Brook are in the south of the ward. The fluvial flood risk in Cannock South originates from these watercourses. The Flood Zones are well confined to the channel in places, however do spread to a number of properties and buildings, including along Rumer Hill Road, Laburnum Avenue, Laburnum Close, the A34, Fairway and the A5 which are partially within Flood Zone 3, and New Street and Delta Way which are partially within Flood Zone 2. | Wall along the left bank of the Golly Brook, parallel to the A5 in the south of the ward. Wall along both banks of the Ridings Brook crossing Rumer Hill Road. | Surface water flow paths follow the topography from high ground in the north to lower ground in the south-west. A number of overland flow paths exist in the 30-year event, including along the A34, the A4601, Wellington Drive, Langdale Drive and the A5190. More overland flow routes become prominent in the 100-year and 1,000-year events and areas of ponding become larger. | ✓ | ✓ | ✓ | ✓ | Cannock South ward is partially located within the inundation extent of the Ridings Brook (Mill Green) reservoir | 1994- South West of the district impacted. Approximately 80 properties with a history of sewer flooding in Cannock. |
| Cannock West ward | There are no watercourses in Cannock West ward, therefore the fluvial flood risk is low. | None | Surface water flood risk in the 30-year event is mainly small isolated areas of ponding, with larger areas of ponding on the golf course where there are two small drains, and on New Penkridge Road. Flow paths in the 100-year event include Gorsey Lane, Poplar Lane, Lloyd Street, Pye Green Road and the A34. | ✓ | ✓ | ✓ | ✓ | None | 1994- South West of the district impacted. Approximately 80 properties with a history of sewer flooding in Cannock. |
| Hawks Green ward | Two unnamed drains flow through the west and east of the ward towards the Ridings Brook. These are not included in the Flood Zones due to their size, however these could still pose a fluvial flood risk to Hawks Green. | None | Minor overland flow paths towards the unnamed watercourses exist in the 30-year event, including along Hemlock Way and cutting through gardens from Heath Way to Salisbury Drive. There are larger areas of ponding around Gorsewood Primary School in the 30-year event. In the 100-year event flow routes are present along | | ✓ | ✓ | | None | |

| | | | | | | | | | |
|--------------------------------------|---|--|---|---|---|---|---|---|--|
| | | | Hayes Way and Heath Way and many more are present in the 1,000-year event. | | | | | | |
| Heath Hayes East and Wimblebury ward | Heath Hayes East and Wimblebury ward is not located in the Flood Zones, however small drains are present in the north and east of the ward which could pose a fluvial flood risk but are not included in the Flood Zones due to their size. | None | Surface water flood risk in the 30-year event is mainly small isolated areas of ponding with a minor overland flow routes along Bank Street, the B4154, Lynhurst Road and Cleeton Street and towards the drains. Wimblebury Road, Melbourne Road and Brickworks Road also become flow routes in the 100-year event. There are large areas of ponding around the drains and properties along Cleeton Street, Brooklyn Road and nearby roads in the 1,000-year event. | ✓ | ✓ | | | None | |
| Hednesford Green Heath ward | Hednesford Green Heath is situated on high ground and therefore fluvial flood risk is fairly low. There is an unnamed watercourse flowing from the north-west to the south-east which could pose a fluvial flood risk to the ward but has not been included in the Flood Zones. | None | Flow routes in the ward follow topography towards the unnamed watercourse within Pyegreen Valley. The 30-year surface water extents are mainly small, isolated areas of ponding with flow paths becoming present in the 100-year and 1,000-year events. | ✓ | | | | None | Approximately 40 properties with a history of sewer flooding in Cannock. |
| Hednesford North ward | The Bentley Brook and an unnamed drain flow towards the Rising Brook in the north-east of the ward. The watercourses mainly cover the rural area in the north of the ward; however, the Flood Zones do reach properties on the A460 and Fallow Park. | None | Surface water risk in the 30-year event is mainly small isolated areas of ponding, with some minor flow paths along Mount Street and crossing Mcghie Street and Booth Street towards Station Road. Bradbury Road and the A460 become flow paths in the 100-year event. | ✓ | | | | None | Approximately 40 properties with a history of sewer flooding in Cannock. |
| Hednesford South ward | The Ridings Brook flows through the west of the ward. Flood Zone 3 is well confined to the channel however Flood Zone 2 extends out of bank in places to reach properties on Stafford Lane and Cheviot Rise. An unnamed tributary of the Ridings Brook flows east to west through Hednesford South but is not included in the Flood Zones due to its size, however it could pose a fluvial flood risk to the ward. The unnamed watercourse is culverted from Raven Close to a pond south of Copperkins Road and from Splash Lane to the north-west of Keys Close therefore could cause flooding if these culverts became blocked. | None | Surface water flow paths follow the topography from higher ground in the north of the ward to lower ground in the south and west. Surface water extents in the 30-year event are mainly isolated areas of ponding, most significant on Herondale, Keys Close and Meadowsweet Way. An overland flow route exists along Sharon Way. More flow routes are present in the 100-year and 1,000-year events and the flow route along Sharon Way causes large flood extents in the 1,000-year event. | ✓ | ✓ | ✓ | | None | Approximately 40 properties with a history of sewer flooding in Cannock. |
| Norton Canes | Two unnamed drains flow towards the north of Norton Canes and into Chasewater reservoir. The Gains Brook flows south out of Norton Canes. These watercourses are not included in the Flood Zones due to their size, however, could still pose a fluvial flood risk to the village. | None | The 30-year surface water extent in Norton Canes is mainly small, isolated areas of ponding, with flow routes prominent along Norton East Road, Park Road and Brownhills Road in the 100-year event. Notable areas of ponding across all events are behind Norton East Road, covering Brownhills Road, Lingfield Road, Beaumont Way and Newmarket Road, Red Lion Crescent, Norton Grange and the police station. Norton Canes was identified in the 2010 SWMP as being at high-risk of surface water flooding. | | ✓ | ✓ | ✓ | None | 4 properties with a history of sewer flooding in Cannock. |
| Rugeley | Fluvial flood risk in Rugeley originates from the River Trent and the Rising Brook. The implementation of the Rugeley Flood Alleviation Scheme has significantly reduced fluvial flood risk to parts of the town. Buildings along Millington Street, Riverside, and Power Station Road are located in Flood Zone 3. There is a large overland flow route present in Flood Zone 2, between Power Station Road and the A460 affecting Tannery Close, Phoenix Close, Bryans Lane, Market Street, Anson Street, Elmore Lane, Mill Lane, Albion Street, Queen Street, King Street, Talbot Street, Keystone Road, Lichfield Street, Bees Lane, Bow Street and Crossley Stone. | A Flood Alleviation Scheme was implemented along the right bank of Rising Brook in 2017 which includes approximately 324m embankment on Hagley Playing Fields, adjacent to Western Springs Road. | Some minor overland flow routes are present in the 30-year surface water event along Redbrook Lane, Woodcock Road, Fairmount Way and through a number of roads from Green Lane towards Wolseley Road. Large areas of ponding in the 30-year event are behind the A460 near School Road and Portobello and the industrial estate on Wheelhouse Road. A number of overland flow routes are present in the 100-year and 1,000-year events which pose a risk to a number of roads and properties in the town. Rugeley was identified in the 2015 LFRMS as the urban area at the 5 th highest risk of surface water flooding in Staffordshire, with 729 properties at risk. Rugeley was also identified in the 2010 SWMP as being at high-risk of surface water flooding. | ✓ | ✓ | ✓ | ✓ | Rugeley is partially located within the reservoir inundation extents of Belvide, Gailey Upper Pool, Rugeley Cooling Tower and Rugeley Ash Lagoons reservoirs. | 30 properties with a history of sewer flooding in Cannock. |

Appendix E – Models used in the SFRA

| Watercourse | Model details | SFRA Flood Zone 2 and 3a | Model used to map Flood Zone 3b? | Return period Flood Zone 3b is taken from | Climate Change 100 year + 20% outline mapped from this model? | Climate Change 100 year + 30% outline mapped from this model? | Climate Change 100 year + 50% outline mapped from this model? | Climate Change 100 year + 25% outline mapped from this model? | Climate Change 100 year + 35% outline mapped from this model? | Climate Change 100 year + 70% outline mapped from this model? | Comment |
|-------------------------|---|--|----------------------------------|---|---|---|---|---|---|---|--|
| Aston Chase Brook | 2018, Stone hazard mapping study, CH2M | Model results included in Flood Map for Planning | Yes | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | |
| Bell Brook | 2015, Penkridge tributaries hazard mapping study, JBA | Model results included in Flood Map for Planning | Yes | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | |
| Dawley Brook | 2012, Wolverhampton, Wombourne and Kingswinford FRM study, Capita Symonds and URS | Model results included in Flood Map for Planning | Yes | 20-year | n/a | n/a | n/a | Yes | Yes | Yes | See comments below for Smestow/Wom/Warstones Brook. |
| Kingston Brook | 2015, Stafford tributaries study, JBA | Model results not included in Flood Map for Planning, 100-year and 1,000-year undefended model outlines used to define Flood Zones | Yes | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | |
| Otherton Brook | 2015, Penkridge tributaries hazard mapping study, JBA | Model results included in Flood Map for Planning | Yes | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | |
| Ridings Brook | 2009, Ridings Brook SFRM, JBA | Model results included in Flood Map for Planning | Yes | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | |
| Rising Brook (Rugeley) | 2014, Rising Brook FAS, JBA | Model results included in Flood Map for Planning | Yes | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | The climate change outlines were derived from the flood alleviation scheme design model, as this scheme has been implemented and supersedes the 2014 baseline model. |
| Rising Brook (Stafford) | 2015, Stafford tributaries study, JBA | Model results not included in Flood Map for Planning, 100-year and 1,000-year undefended model outlines used to define Flood Zones | Yes | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | |
| River Anker | 2006, River Anker SFRM, JBA | Model results included in Flood Map for Planning | Yes | 25-year | Yes | Yes | Yes | n/a | n/a | n/a | |
| River Penk | 2011, Visualisation model, Halcrow | Model results not included in Flood Map for Planning, 100-year and 1,000-year undefended model outlines used to define Flood Zones | Yes | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | Flood Map for Planning has not been updated with these model results. |
| River Sow | 2011, Visualisation model, Halcrow | Model results not included in Flood Map for Planning, 100-year and 1,000-year undefended model outlines used to define Flood Zones | Yes | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | Flood Map for Planning has not been updated with these model results. |
| River Sow | 2017, Eccleshall Flood Modelling Study, JBA | Model results included in Flood Map for Planning | No | n/a | Yes | Yes | Yes | n/a | n/a | n/a | Model only run to update Flood Zones 2 and 3a. 20-year model for Flood Zone 3b was not run. |

| Watercourse | Model details | SFRA Flood Zone 2 and 3a | Model used to map Flood Zone 3b? | Return period Flood Zone 3b is taken from | Climate Change 100 year + 20% outline mapped from this model? | Climate Change 100 year + 30% outline mapped from this model? | Climate Change 100 year + 50% outline mapped from this model? | Climate Change 100 year + 25% outline mapped from this model? | Climate Change 100 year + 35% outline mapped from this model? | Climate Change 100 year + 70% outline mapped from this model? | Comment |
|-----------------|---|--|----------------------------------|---|---|---|---|---|---|---|---|
| River Tame | 2009, River Tame SFRM, Halcrow | Model results included in Flood Map for Planning | Yes | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | The climate change 1D mapped outputs extended to cover a large area of Tamworth where defences are present. The maximum stage in the model results was analysed to determine whether flooding would overtop the defences, given the crest level specified in the data, and the extents were trimmed to the defences accordingly. More information is shown below. |
| River Trent | 2009, River Trent Model 1 Enhancement Model, Capita Symonds | Model results included in Flood Map for Planning | Yes | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | |
| River Trent | 2009, Stone revised flood zones, River Trent 1 Enhancement Model, Capita Symonds | Model results included in Flood Map for Planning | TBC | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | |
| River Trent | 2005, Fluvial Trent Strategy Model 2, Environment Agency | Model results included in Flood Map for Planning | Yes* | 25-year | Yes* | Yes* | Yes* | n/a | n/a | n/a | *Downstream of the railway line downstream of Rugeley, Flood Zone 2 was used as a conservative indication of climate change and Flood Zone 3a was used as a conservative indication of Flood Zone 3b, due to 1d mapping techniques producing unreliable results, as full GIS mapping data was not included in the supplied model data. |
| Scotch Brook | 2018, Stone hazard mapping study, CH2M | Model results included in Flood Map for Planning | Yes | 20-year | Yes | Yes | Yes | n/a | n/a | n/a | |
| Smestow Brook | 2012, Wolverhampton, Wombourne and Kingswinford FRM study, Capita Symonds and URS | Model results included in Flood Map for Planning | Yes | 20-year | n/a | n/a | n/a | Yes | Yes | Yes | The 1D-2D version of the model was able to run for the 25% and 35% climate change scenarios; however, the 70% model failed due to model instabilities. The original modelling study stated that the 1D-2D combined model could not be run stably at high flows, therefore for the 1,000-year model event, a 1D-only model had to be run. This model was therefore used to represent the 70% climate change scenarios and means that the 70% extents were created from 1D-mapping techniques, rather |
| Warstones Brook | 2012, Wolverhampton, Wombourne and Kingswinford FRM study, Capita Symonds and URS | Model results included in Flood Map for Planning | Yes | 20-year | n/a | n/a | n/a | Yes | Yes | Yes | |
| Wom Brook | 2012, Wolverhampton, Wombourne and Kingswinford FRM study, Capita Symonds and URS | Model results included in Flood Map for Planning | Yes | 20-year | n/a | n/a | n/a | Yes | Yes | Yes | |

| | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | than 1D-2D outlines as were produced for the 25% and 35% climate change extents. |
|--|--|--|--|--|--|--|--|--|--|--|--|

River Tame mapping

Due to the nature of 1D mapping techniques, defences are not always represented in the model if cross sections do not extend to reach the defences in the floodplain and must therefore be manually edited out of the flood outlines produced from the model. Several defences exist around Tamworth along the Tame, and investigations were undertaken by comparing the maximum stage at different cross sections to the stated crest level of the defence, to determine whether the flood extents would overtop the defence. If the extents did not overtop, the outlines were manually edited to extend as far as the defence but not overtop. This was also done in comparison to the outlines from the 20% CC outline from the original 2009 model. Where the maximum stage at a cross section was greater than the height of one part the defence, but at another cross section on the same defence the maximum stage was lower than the defence height, the extent was assumed to overtop the defence everywhere, as the extents would likely spread behind the defence if any part of it was overtopped.

The extents have been manually trimmed using the best judgement of topography, defence height, maximum stage and defence location; however, it is strongly recommended that developers conduct more detailed modelling as part of a site-specific assessment to confirm the impacts of residual flood risk against defences.

| Defence | Cross section | Defence height (m AOD) | Max stage 20% CC (m AOD) | Max stage 30% CC (m AOD) | Max stage 50% CC (m AOD) | Max stage 20% CC ORIGINAL model (m AOD) | Conclusion |
|--|---------------|------------------------|--------------------------|--------------------------|--------------------------|---|--|
| Coton Defences (200 year SoP, built 2013) | TM030023RB | 58.83 | 58.201 | 58.281 | 58.547 | 58.191 | Original outlines show overtopping, but defences (2013) are more recent than model (2009). Maximum stage of CC does not overtop the defence. |
| | TM030167RB | 58.82 | 58.336 | 58.411 | 58.657 | 58.327 | |
| | TM030527RB | 58.82 | 58.408 | 58.483 | 58.727 | 58.4 | |
| | TM031111RB | 58.82 | 58.475 | 58.549 | 58.79 | 58.467 | |
| Upstream A51 defences (100 year SoP, built 1962/1999) | TM032303 | 59.37 | 59.046 | 59.082 | 59.281 | 59.045 | Original outlines do not overtop defence, maximum stage of CC does also does not overtop the defence. |
| | TM032494 | 59.46 | 59.142 | 59.192 | 59.371 | 59.14 | |
| | TM032653 | 61.51 | 59.18 | 59.23 | 59.429 | 59.187 | |
| Bitterscote defences (100 year SoP, built 1962) | TFRC1196LB | 59.65 | 59.153 | 59.202 | 59.373 | 59.151 | Original outlines do not overtop defence, maximum stage of CC does also does not overtop the defence. |
| | FRDR0182D | 59.89 | 59.452 | 59.502 | 59.686 | 59.451 | |
| Fazeley Road defences (100 year SoP, built 1963) | TM034260 | 61.18 | 61.223 | 61.319 | 61.59 | 61.231 | Original outlines overtop the defence and maximum stage of all CC results for TM034260 overtops the defence. |
| | TM035002 | 61.55 | 61.359 | 61.446 | 61.664 | 61.366 | |
| Brook End defence (200 year SoP, built 1963/2014) | TM040105D | 62.8 | 62.194 | 62.376 | 62.676 | 62.208 | Original outlines overtop the defence; however, part of the defence was constructed in 2014 which would not have been included in the original model. The maximum stages of all CC results do not overtop the defence. |
| | TM040232 | 62.8 | 62.22 | 62.401 | 62.715 | 62.234 | |
| Mayfair Drive/ New Mill Lane defence (200 year SoP, built 2018) | TM040573 | 62.78 | 62.304 | 62.455 | 62.763 | 62.292 | Original outlines show overtopping, but defences (2018) are more recent than model (2009). Maximum stage of CC does not overtop the defence. |

Appendix F – Flood management assets

| Council | Asset | Location | Information |
|---------------------|--|---|---|
| South Staffordshire | Culvert inlet screen | River Penk, under The Parkway adjacent to Gainsborough Drive, Perton | Screen for fluvial debris to prevent culvert blockages |
| | Culvert inlet screen | River Penk, under The Parkway opposite the Pear and Partridge pub, Perton | Screen for fluvial debris to prevent culvert blockages |
| | Balancing pond | Upper and Lower Lakes on the River Penk | |
| | Flood meadow | Bumblehole Meadows, Wombourne | Basin shaped artificial meadow to accommodate storm volumes |
| | Balancing pond | Brownshore Lane, Essington | Balancing pond with flow regulating apparatus |
| | Balancing pond | Warstones Brook, Lower Penn | Balancing pond with flow control sluice gates |
| | Catch pit chamber | Wrottesley Park Road, Perton | Catch pit chamber on a culverted watercourse |
| | Storage channel | Sparrow's End Lane, Brewood | Storm water storage parallel to the unnamed watercourse |
| | Piped connection and large concrete culvert | Wyrley and Essington Canal, Broad Lane, Essington | Piped connection between two sections of redundant canal and a large concrete culvert on Broad Lane |
| | Pools | Baggeridge Country Park | |
| Lichfield | Trash screen/ grill | Leamonsley Brook, Beacon Park | Several trash screens throughout the park including near the concrete bridge and at the rear of the Discovery Hub |
| | Outflow grill | Minster Pool, Lichfield | |
| | Outflow grill | Stowe Pool, Lichfield | |
| | Trash screen/ grill | Darwin Park, Lichfield | |
| | Trash screen/ grill | Hawkesyard | |
| Stafford | Trash screen/ grill | Under the canal at Huddlesford | Approximately 0.5 miles north of the Plough Inn |
| | Trash screen | Barlaston Common | |
| | Swales | Vicarage Way, Hixon | |
| | Culvert | Crown Street, Stone | |
| | Balancing Pond | Newport Road, Stafford | |
| | Balancing pond | Common Lane, Stone | |
| | Trash screen | Exeter Street, Stafford | |
| | Trash screen | Aston Lodge Park, Stone | |
| | Trash screen/ balancing pond | Kingsway, Stafford | |
| | Trash screen | Peel Terrace, Stafford | |
| | Trash screen | Astonfields Reservoir, Stafford | |
| | Trash screen | Astonfields Road, Stafford | |
| | Trash screen | Lichfield Road/Jordan Way, Stone | |
| | Trash screen | St Vincent Road, Stone | |
| Trash screen | Pitt Street, Stafford | | |
| Tamworth | Concrete footbridge | Pennymoor Road, Stonydelph | |
| | Culvert | Ventura Park, between roundabout with Fazeley Road and Ventura Park Road and River Tame | |
| | Culvert | Shuttington Road | |
| | Culvert | Durlston Close | Adjacent to footpath/cycle way |
| | Culvert | Amington | West of Whitley Avenue on boundary between recreation ground and Bollehall Swifts FC |
| | Piped footpath | Wigginton Park | Pedestrian access culvert |
| | Jetty/access platform | Wigginton Park | 2 within the park |
| | Culvert | Wigginton Park | |
| | Culvert | Centurion Park | |
| | Outlet/inlet | Wilnecote Open Space | Earth dam with weir control structure within outlet structure |
| | Bridge | Wilnecote Open Space | Four within Wilnecote Open Space |
| | Weir | Rear of Orkney Drive, Wilnecote | |
| | Bridge | Rear of Shannon, Wilnecote | Concrete box culvert pedestrian access bridge |
| | Weir | Rear of Shannon, Wilnecote | Brick weir |
| | Culvert | Adjacent to Glascode lane, Wilnecote | Pipe culvert |
| | Weir | Kettlebrook Linear Park | 12 within park |
| | Bridge | Kettlebrook Linear Park | 5 within park |
| | Balancing pond | Kettlebrook Linear Park | 5 within park |
| | Offline pond | Kettlebrook Linear Park | Offline pond with pond dipping platform |
| | Penstock | Kettlebrook Linear Park | Penstock and access bridge |
| Culvert | Kettlebrook, culvert exit adjacent to 87 Celladine | Culvert under housing and industrial estate | |
| Bridge | Peelers Way | Two wooden span pedestrian bridges adjacent to Borrow Pit Lake. | |

| Council | Asset | Location | Information |
|---------------|-------------------------------------|--|--|
| Tamworth | Balancing pond | Borrow Pit Lake, adjacent to A51 | |
| | Outlet/inlet | Downstream of Stonydelph Lane | Small pipe culvert linking watercourse to pond |
| | Balancing pond | Adjacent to A5, Stonydelph | |
| | Weir | Adjacent to A5, Stonydelph | Series of weirs and reed beds |
| | Bridge | Footpath cycleway adjacent to A5, Stonydelph | Timber footbridge |
| | Balancing pond | Adjacent to A5, Stonydelph | |
| | Bridge | Footpath cycleway adjacent to balancing lake, Stonydelph | |
| | Weir | Northern end of lake, Stonydelph | |
| | Weir | Middle of lake, Stonydelph | Concrete weir |
| | Weir | Kettlebrook, adjacent to Snow Dome car park | Concrete weir |
| | Bridge | Kettlebrook, adjacent to Snow Dome entrance | Timber footbridge |
| | Brick headwall | Bolebridge Junction, near to Snow Dome | |
| | Brick headwall | Land east of A51, near Kettle Brook lake | |
| | Culvert | Borough boundary, adjacent to golf club | Concrete culvert |
| | Balancing pond | Borough boundary, adjacent to golf club | |
| | Culvert | Borough boundary, within golf course | Four within the golf course |
| | Balancing pond | Borough boundary, within golf course | Two within the golf course |
| | Culvert | Hodge Lane, beneath horse stables | Concrete culvert |
| | Culvert | Hodge Lane, adjacent to The Laurels | Concrete culvert |
| | Bridge | Dosthill Park | Three within park |
| | Culvert | Adjacent to 22 Chandlers Drive, eastern side | Concrete pipe culvert |
| | Bridge | Adjacent to Chandlers Drive, eastern side | |
| | Bridge | Warwickshire Moor, near confluence with River Anker | Timber footbridge set in concrete |
| | Culvert | Warwickshire Moor, near to railway bridge | |
| | Bridge | Warwickshire Moor, upstream of railway bridge | |
| | Bridge | Fazeley Road, giving access to car park | Road bridge |
| | Bridge | Fazeley Road linking to car park | Steel and concrete footbridge |
| | Culvert | Whitley Avenue, adjacent to Selker Drive | |
| | Culvert | Magnus, within pastureland behind Sycamore | |
| | Weir | Magnus, within pastureland behind Sycamore | Timber weir |
| | Bridge | Magnus, within pastureland behind Sycamore | |
| | Bridge | Downstream of pump house off Tamworth Road, Dosthill | Concrete access bridge |
| | Bridge | Farmer's field north of Coton Lane | Two bridges within the field, one beneath farmer's track |
| | Culvert | Rear of number 17 Melmerby | |
| | Outlet/inlet | Wilnecote Open Space | Downstream outlet for dam |
| | Penstock | Peelers Way | Two in grass verge, one between reed bed and A5 embankment |
| | Petrol interceptor | Belgrave, near A5 slip road | |
| | Petrol interceptor | Malborough Way | Two along road |
| | Petrol interceptor | Kettlebrook Park, adjacent to footpath leading to Jowett | |
| | Petrol interceptor | Stonydelph Lane, between cycle way and balancing pond | |
| Dam | Wilnecote Open Space | | |
| Culvert | By Red Lion public house, Wilnecote | | |
| Culvert | Chandlers Drive | | |
| Culvert | Maybank Cottage Hodge Lane | | |
| Penstock | Malborough Way | Two along road | |
| Penstock | Belgrave, near A5 slip road | Two near to petrol interceptors | |
| Penstock | Kettlebrook Linear Park | Three in park | |
| Penstock | Glascote Heath | | |
| Weir | Chandlers Drive open space | Two in open space | |
| Culvert | Park, Tamworth Road, Dosthill | In the park opposite 68 Tamworth Road | |
| Outlet/inlet | Rear of 12-14 Juniper | In woodland at rear of properties | |
| Bridge | River Anker bridge | Connecting lower area of castle grounds to upper area | |
| Bridge | River Drive | Footbridge linking castle grounds to Holiday Inn | |
| Bridge | Glascote Heath, upstream of canal | | |
| Weir | Hodge Lane nature reserve | | |
| Cannock Chase | Bridge | Bentley Brook, Rugeley Road, Hednesford | Brick structure |
| | Culvert | Bentley Brook, Rugeley Road, Hednesford | Concrete |
| | Open channel | Bentley Brook, within farm property off Rugeley Road, Hednesford | Earth channel and banks |

| Council | Asset | Location | Information |
|---------------|---|--|--|
| Cannock Chase | Culvert | Bentley Brook, adjacent to farmland (horse gallops) and disused quarry, off Rugeley Road, Hednesford | Box culvert of concrete material and steel safety screen |
| | Culvert | Bentley Brook, Cannock Wood Road, at junction with Bradbury Lane, Hednesford | Concrete culvert |
| | Open channel | Bentley Brook, Cannock Wood Road, at junction with Bradbury Lane, Hednesford | Earth banks and channel |
| | Culvert | Bentley Brook, Walkers Rise, Hednesford | Concrete culvert with concrete headwall |
| | Open channel | Pye Green Ditch, Pye Green | Earth banks and channel |
| | Bridge | Pye Green Ditch, Pye Green | Wooden footbridge with wooden handrails and steel abutments |
| | Culvert | Pye Green Ditch, Pye Green | 2 concrete box culverts. Steel screen and brick headwalls |
| | Culvert | Pye Green Ditch, Pye Green | 2 concrete culverts and brick headwall |
| | Bridge | Pye Green Ditch, Pye Green | Brick bridge structure with concrete outfalls adjacent and a steel pipe across the channel |
| | Culvert | County Brook, rear of industrial units on Burdock Close, Cannock | Concrete culvert and concrete headwall. Steel safety screen |
| | Open channel | County Brook, rear of industrial units on Burdock Close, Cannock | Earth banks and channel |
| | Bridge | County Brook, rear of industrial units on Burdock Close, Cannock | Footbridge constructed of wood, with wooden handrails |
| | Bridge | County Brook, rear of industrial units on Burdock Close and residential properties, Cannock | Footbridge constructed of wood, with wooden handrails |
| | Open channel | County Brook, rear of industrial units on Burdock Close and residential properties, Cannock | Earth banks and channel |
| | Weir | County Brook, rear of industrial units on Burdock Close and residential properties, Cannock | Stone and concrete weir structure with brick flow control downstream |
| | Bridge | County Brook, rear of residential properties and playing field off Hemlock Way, Cannock | Wooden deck and handrails mounted on concrete abutments |
| | Outfall | County Brook, rear of residential properties and playing field off Hemlock Way, Cannock | Corrugated plastic pipe with brick and rock headwall |
| | Open channel | County Brook, upstream of footbridge at rear of playing field off Hemlock Way, Cannock | Earth banks and channel |
| | Outfall | County Brook, rear of playing field off Hemlock Way, Cannock | Clay pipe, no headwall |
| | Open channel | County Brook, rear of playing field off Hemlock Way, Cannock | Earth banks and channel |
| | Outfall | County Brook, rear of playing field off Hemlock Way, Cannock | Unable to see due to grassy vegetation |
| | Culvert | County Brook, rear of playing field off Hemlock Way, Cannock | Twin concrete culverts with stone headwall |
| | Open channel | County Brook, rear of properties on Sharon Way, Heath Hayes | Earth banks and channel |
| | Culvert | County Brook, rear of properties on Sharon Way, Heath Hayes | Concrete culvert with brick headwall and steel safety screen. |
| | Outfall | County Brook, rear of properties on Sharon Way, Heath Hayes | Concrete culvert with brick headwall and steel safety screen |
| | Weir | County Brook, behind properties on Sharon Way, Hednesford | Brick weir with stone revetment |
| | Balancing Pond | County Brook, behind properties on Sharon Way, Hednesford | 3 concrete culverts with brick headwall at outlet to balancing pond |
| | Bridge | County Brook, behind properties on Sharon Way, Hednesford | Wooden footbridge |
| | Bridge | Redmoor Brook, Hayfield Hill, Cannock Wood | Brick arch bridge and steel gate temporarily fixed as a screen |
| | Bridge | Redmoor Brook, Cumberledge Hill, Cannock Wood | Brick and concrete bridge |
| | Open channel | Redmoor Brook, Cumberledge Hill, Cannock Wood | Earth banks and channel |
| | Lock | Golly Brook, rear of Motorhouse 2000 premises, off A5, Cannock | Concrete and brick disused lock and disused access bridge of brick material |
| | Culvert | Golly Brook, rear of Motorhouse 2000 premises, off A5, Cannock | Concrete culvert with concrete headwall and steel safety screen. |
| | Open Channel | Golly Brook, adjacent to A5, boundary of Hawkins Tiles, Cannock | Earth banks. Earth channel with some pebbles |
| | Culvert | Golly Brook, adjacent to A5, boundary of Hawkins Tiles, Cannock | 4 brick arch culverts under A5 |
| | Culvert | Golly Brook, north of A5, adjacent to Nissan dealership, Cannock | Box culvert of concrete material |
| | Open channel | Golly Brook, north of A5, adjacent to Nissan dealership, Cannock | Earth channel and rock and sandbag revetment |
| | Culvert | Wash Brook, south of A5, Great Wyrley | Concrete culvert with brick headwall |
| | Open channel | Wash Brook, south of A5, Great Wyrley | Earth channel with some vegetation |
| | Culvert | Wash Brook, south of A5, Great Wyrley | Flared concrete culvert |
| Open channel | Wash Brook, south of A5, Great Wyrley | Earth channel with some vegetation | |
| Outfall | Wash Brook, south of A5, Great Wyrley | Concrete outfall and concrete retaining wall | |
| Bridge | Wash Brook, south of A5, Great Wyrley | Steel and wooden footbridge with steel handrails | |
| Revetment | Wash Brook, south of A5, Great Wyrley | Rock filled gabion baskets with concrete slab on top | |
| Open channel | Wash Brook, adjacent to A5 and lake area off Roman View, Cannock. | Metal revetment on both banks. | |
| Culvert | Wash Brook, adjacent to A5 and lake area off Roman View, Cannock. | Twin concrete culverts with brick headwall | |
| Bridge | Wash Brook, access to vacant land used by caravanners off A5, Cannock | Concrete vehicle access bridge with brick abutment | |
| Culvert | Wash Brook, adjacent to A5, east of Streetway Farm, Cannock | Concrete culvert and brick headwall | |
| Culvert | Gains Brook, south of A5, Great Wyrley | 2 concrete culverts | |
| Open channel | Gains Brook, south of A5, Great Wyrley | Earth channel and banks | |
| Culvert | Gains Brook, Gains Lane | Concrete culvert with brick headwall | |
| Open channel | Gains Brook, Gains Lane | Earth channel and banks | |
| Open channel | Gains Brook, School Lane | Earth channel and banks | |
| Culvert | Gains Brook, School Lane | Culvert not visible. Brick headwall | |
| Culvert | Gains Brook, Walsall Road | Concrete culvert with brick headwall | |
| Culvert | Gains Brook, Walsall Road | Metal culvert with concrete filled sandbags as headwall | |

| Council | Asset | Location | Information |
|----------------|---|--|--|
| Cannock Chase | Bridge | Newlands Brook, Washbrook Lane | Concrete and brick access bridge |
| | Culvert | Newlands Brook, Newlands Lane | Concrete culvert |
| | Open channel | Newlands Brook, Newlands Lane | Earth channel and banks |
| | Culvert | Newlands Brook, Newlands Lane | Twin concrete culverts |
| | Weir | Newlands Brook, Newlands Lane | Concrete weir structure |
| | Culvert | Crane Brook, Norton East Road, Norton East. | Box culvert of brick material |
| | Open channel | Crane Brook, Burntwood Road, Norton East | Earth channel and banks |
| | Culvert | Crane Brook, Burntwood Road, Norton East | Concrete and brick culvert with brick headwall and steel safety screen |
| | Open channel | Crane Brook, adjacent to Hednesford Rd, behind properties, Norton East | Earth banks and channel |
| | Culvert | Crane Brook, adjacent to Hednesford Rd, behind properties, Norton East | Brick headwall |
| | Culvert | Shaw Brook | Corrugated plastic pipe under vehicle access to farmland |
| | Culvert | Shaw Brook, rear of Redmoor Inn, Hayfield Hill, Cannock Wood | |
| | Bridge | Ridings Brook, A5190, adjacent to station car park, downstream of Mill Green, Cannock | Brick headwall, concrete deck and steel undersupport. Brick abutment. |
| | Culvert | Ridings Brook, A5190, adjacent to station car park, downstream of Mill Green, Cannock | 2 corrugated iron half pipes with concrete headwall. |
| | Open channel | Ridings Brook, upstream of culvert under A5190, Cannock | Earth banks and channel |
| | Culvert | Ridings Brook, upstream of culvert under A5190, Cannock | Twin concrete box culverts with steel handrails. |
| | Outfall | Ridings Brook, downstream end of Mill Green, Cannock | Concrete culvert with brick headwall and steel safety screen. |
| | Culvert | Ridings Brook, downstream end of Mill Green, Cannock | Brick headwall, steel screen. |
| | Balancing Pond | Ridings Brook, balancing pond at Mill Green, Cannock | Earth banks. Some vegetation. Supports wildlife. |
| | Open channel | Ridings Brook, upstream of Mill Green, Cannock | Earth channel and banks |
| | Bridge | Ridings Brook, upstream of Mill Green, Cannock | Concrete deck with steel handrails. Brick abutments. |
| | Outfall | Ridings Brook, upstream of Mill Green, downstream of ford, Cannock | Clay pipe, no headwall. |
| | Ford | Ridings Brook, ford upstream of Mill Green, Cannock | Rock and concrete ford with steel fence to collect debris. |
| | Culvert | Ridings Brook, adjacent to Eastern Way, Hawks Green | Concrete with a concrete headwall. |
| | Outfall | Ridings Brook, upstream of ford at Mill Green, Cannock | Concrete with brick headwall. |
| | Outfall | Ridings Brook, adjacent to Eastern Way, Hawks Green | Clay pipe with concrete surround |
| | Culvert | Ridings Brook, adjacent to Eastern Way, Hawks Green | 2 box culverts |
| | Outfall | Ridings Brook, adjacent to island on Eastern Way and Hawks Green Lane, Hawks Green | Concrete culvert |
| | Culvert | Ridings Brook, adjacent to island on Eastern Way and Hawks Green Lane, Hawks Green | Concrete culvert with brick headwall and steel safety screen. |
| | Open channel | Ridings Brook, adjacent to Chase Garage on Eastern Way, Hawks Green | Earth banks and channel |
| | Outfall | Ridings Brook, adjacent to Eastern Way, Hawks Green | Concrete with concrete headwall and steel screen. |
| | Open channel | Ridings Brook, adjacent to Eastern Way, Hawks Green | Earth banks and channel |
| | Outfall | Ridings Brook, adjacent to Eastern Way, Hawks Green | Concrete culvert with brick headwall. |
| | Outfall | Ridings Brook, near junction of A4610, A460 and Eastern Way, Hawks Green | Plastic pipe with brick headwall. |
| | Culvert | Ridings Brook, near junction of A4610, A460 and Eastern Way, Hawks Green | Concrete box culvert and concrete headwall. |
| | Outfall | Ridings Brook, near junction of A4610, A460 and Eastern Way, Hawks Green | Concrete with concrete headwall. |
| | Culvert | Ridings Brook, adjacent to island junction on Eastern Way under East Cannock Road, Hawks Green | 3 no. concrete culverts with concrete headwall. |
| | Outfall | Ridings Brook, adjacent to island junction on Eastern Way under East Cannock Road, Hawks Green | Corrugated plastic pipe with brick headwall. |
| | Culvert | Ridings Brook, adjacent to island junction on Eastern Way under East Cannock Road, Hawks Green | Concrete culvert under new access road |
| | Outfall | Ridings Brook, adjacent to island junction on Eastern Way under East Cannock Road, Hawks Green | Clay pipe with brick headwall. |
| Outfall | Ridings Brook, rear of Cannons Health Club off East Cannock Road, Cannock | Clay pipe with brick headwall. | |
| Outfall | Ridings Brook, rear of Cannons Health Club off East Cannock Road, Cannock | Corrugated plastic pipe | |
| Open channel | Ridings Brook, rear of properties on Swallowfields Drive, Cannock | Earth banks and channel | |
| Outfall | Ridings Brook, rear of properties on Herondale, Cannock | Concrete pipe with brick headwall steel screen | |
| Bridge | Ridings Brook, adjacent to private car park and properties on Herondale, Cannock. | Wooden footbridge with concrete abutment | |
| Bridge | Ridings Brook, within parkland off Stagborough Way, Cannock | Wooden footbridge with wooden abutment | |
| Open Channel | Longford Brook, Old Penkridge Road, Cannock | Concrete revetment on both banks and a concrete bed | |
| Culvert | Longford Brook, Old Penkridge Road, Cannock | Concrete culvert with concrete headwall | |
| Culvert | Longford Brook, Old Penkridge Road, Cannock | Concrete culvert with brick headwall and concrete culvert overflow. | |
| Balancing Pond | Longford Brook, Old Penkridge Road, Cannock | Earth banks and channel | |
| Culvert | Longford Brook, Old Penkridge Road, Cannock | Concrete culvert | |
| Culvert | Longford Brook, Old Penkridge Road, Cannock | Concrete culvert with brick headwall | |
| Open channel | Longford Brook, Old Penkridge Road, Cannock | Earth banks and channel | |
| Bridge | Longford Brook, Old Penkridge Road, Cannock | Wooden sleepers | |

| Council | Asset | Location | Information |
|----------------|---|--|--|
| Cannock Chase | Culvert | Longford Brook, Old Penkridge Road, Cannock | 2 no. concrete culverts with brick and rock headwall and brick weirs. |
| | Weir | Longford Brook, Old Penkridge Road, Cannock | Wooden weir with wood revetment on banks of channel |
| | Bridge | Longford Brook, Old Penkridge Road, Cannock | Wooden sleepers crossing channel to form footbridge |
| | Weir | Longford Brook, Old Penkridge Road, Cannock | Wooden weir |
| | Culvert | Longford Brook, Old Penkridge Road, Cannock | Twin concrete culverts with stone and brick headwall. |
| | Weir | Longford Brook, Old Penkridge Road, Cannock | Wooden weir |
| | Culvert | Longford Brook, Old Penkridge Road, Cannock | Concrete culvert with stone headwall |
| | Weir | Longford Brook, Old Penkridge Road, Cannock | Brick weir with rock revetment |
| | Outfall | Longford Brook, Old Penkridge Road, Cannock | Concrete culvert, stone headwall and stone spillway |
| | Culvert | Longford Brook, Old Penkridge Road, Cannock | Concrete culvert with brick headwall and steel screen |
| | Open Channel | Rising Brook, near railway viaduct, in the vicinity of Rugeley Bypass, east of Power Station Road, Rugeley. | Earth banks and channel |
| | Bridge | Rising Brook, rear of the JCB Hydropower factory on the left bank, and downstream of Power Station Road, Rugeley | Concrete access bridge. |
| | Outfall | Rising Brook, downstream of Power Station Road, Rugeley | Brick culvert and brick wing walls. |
| | Weir | Rising Brook, approximately 50 metres downstream of Power Station Road, Rugeley | Rubble and debris from the demolition forming an informal weir on the right bank. |
| | Culvert | Rising Brook, culvert bridge crossing under Power Station Road, Rugeley | Concrete culvert with brickwork headwall. |
| | Culvert | Rising Brook, rear of Somerfield supermarket in Rugeley town centre. | Upstream end of previous culvert from Power Station Road. |
| | Open Channel | Rising Brook, rear of Somerfield supermarket in Rugeley town centre. | Earth channel |
| | Bridge | Rising Brook, within Rugeley town centre. | Timber construction boardwalk |
| | Culvert | Rising Brook, within Rugeley town centre. | Twin concrete culvert with timber facing. |
| | Culvert | Rising Brook, Elmore Lane, Elmore Park, Rugeley | Twin concrete culverts in a brick headwall. |
| | Weir | Rising Brook, Elmore Park, Rugeley | Stone block weir in a cascade formation. |
| | Weir | Rising Brook, Elmore Park, Rugeley | Concrete weir acting as a flow control structure for the pond. |
| | Bridge | Rising Brook, upstream end of Elmore Park, downstream of the A51, Rugeley | Timber footbridge with timber handrails and a steel girder |
| | Bridge | Rising Brook, upstream end of Elmore Park, Rugeley | Stone block arch bridge. |
| | Open Channel | Rising Brook, upstream of A51 road bridge, Rugeley | Earth banks and channel |
| | Outfall | Rising Brook, within playing fields upstream of the A51, Rugeley | Concrete pipe in a brick headwall |
| | Bridge | Rising Brook, opposite Elmore Park and adjacent to playing fields off the A51, Rugeley | Twin brick arch bridge with brick weir under the left arch and a concrete weir under the right arch. |
| | Open Channel | Rising Brook, adjacent to the playing fields off the A51, Rugeley. | Earth banks and channel |
| | Bridge | Rising Brook, adjacent to the playing fields off the A51, Rugeley. | Concrete and steel footbridge with stone abutments |
| | Weir | Rising Brook, adjacent to the playing fields off the A51, Rugeley. | Rock weir with rock revetments on banks of channel |
| | Weir | Rising Brook, adjacent to the playing fields off the A51, Rugeley. | Rock weir with rock revetment on left bank |
| | Bridge | Rising Brook, adjacent to the playing fields off the A51, Rugeley. | Concrete and steel footbridge with brick abutments |
| | Bridge | Rising Brook, adjacent to the playing fields off the A51, Rugeley. | Wooden sleeper deck with brick abutments, steel railings and steel screen. |
| | Open Channel | Rising Brook, adjacent to the playing fields off the A51, Rugeley. | Earth banks and channel |
| | Weir | Rising Brook, at High Fall, downstream of Slitting Mill. | Brick weir under a brick and stone bridge |
| | Bridge | Rising Brook, at Slitting Mill, Rugeley. | Concrete arch footbridge over the open channel |
| | Bridge | Stafford Brook, bridge underpass of Stafford Brook Road, adjacent to Stafford Brook Farm. | Brick face bridge crossing with concrete wing walls. |
| | Open Channel | Stafford Brook, adjacent to bridge underpass of Stafford Brook Road and opposite Stafford Brook Farm. | Earth banks and channel |
| | Bridge | Stafford Brook, Stafford Brook Road, to the east of Bevin's Birches. | Brick faced bridge crossing with brickwork and concrete wing walls. |
| | Open Channel | Stafford Brook, Stafford Brook Road, east of Bevin's Birches | Earth banks and channel |
| Bridge | Stafford Brook, Stafford Brook Road, near Silver Trees Caravan Park | Brickwork arch bridge crossing | |
| Open Channel | Stony Brook, adjacent to Slitting Mill Road, at confluence with Rising Brook. | Earth banks, pebbled channel | |
| Bridge | Stony Brook, adjacent to Slitting Mill Road, near the confluence with Rising Brook. | Brick arch bridge | |
| Open Channel | Golf Course Ditch, Municipal Golf Course, Cannock | Earth banks and channel | |
| Culvert | Milking Brook, western edge of playing field off Hemlock Way, Cannock | Concrete culvert with brick headwall | |
| Open channel | Milking Brook, western edge of playing field off Hemlock Way, Cannock | Earth channel, stone and concrete revetment | |
| Outfall | Milking Brook, adjacent to Hemlock Way, Cannock | 3 no. outfalls with brick headwall | |
| Bridge | Milking Brook, adjacent to Hemlock Way, Cannock | 2 no. wooden footbridges underneath Hemlock Way overbridge. | |
| Bridge | Milking Brook, adjacent to Hemlock Way, Cannock | Concrete overbridge | |
| Open channel | Milking Brook, adjacent to Hemlock Way, Cannock | Stone and concrete revetment on both banks. Earth channel | |
| Culvert | Milking Brook, end of Woodpecker Way, Cannock | Concrete culvert with brick headwall | |
| Open channel | Milking Brook, end of Woodpecker Way, Cannock | Earth banks and channel | |
| Weir | Milking Brook, downstream of balancing pond, south of Hemlock Way, Cannock | Concrete weir | |
| Balancing Pond | Milking Brook, south of Hemlock Way, Cannock | Online balancing pond with earth banks. | |

| Council | Asset | Location | Information |
|---------------|--------------|--|---|
| Cannock Chase | Outfall | Milking Brook, eastern edge of balancing pond, south of Hemlock Way, Cannock | Clay pipe with brick headwall |
| | Culvert | Milking Brook, just upstream of balancing pond, south of Hemlock Way, Cannock | Flared concrete culvert with stone headwall |
| | Outfall | Milking Brook, just upstream of balancing pond, south of Hemlock Way, Cannock | Clay pipe with brick headwall |
| | Open channel | Milking Brook, upstream of balancing pond, south of Hemlock Way, Cannock | Earth banks and channel |
| | Outfall | Milking Brook, upstream of balancing pond, south of Hemlock Way, Cannock | Concrete culvert with brick headwall |
| | Outfall | Milking Brook, upstream of balancing pond, adjacent to Asquith Drive, Cannock | Clay pipe with brick headwall |
| | Open channel | Milking Brook, upstream of balancing pond, adjacent to Asquith Drive, Cannock | Earth banks and channel |
| | Outfall | Milking Brook, upstream of balancing pond and adjacent to Elder Close, Cannock | Clay pipe with brick headwall |
| | Bridge | Milking Brook, upstream of balancing pond and adjacent to Elder Close, Cannock | Wooden footbridge |
| | Outfall | Milking Brook, adjacent to Hayes Way, Cannock | Concrete pipe with brick headwall |
| | Culvert | Milking Brook, adjacent to Hayes Way, Cannock | Concrete pipe with brick headwall |

1 Cumulative impact assessment methodology

1.1 Introduction

The combined cumulative impact for Southern Staffordshire and the Black Country has been assessed in two parts:

1. Catchments within Southern Staffordshire only
2. Catchments within the Black Country only, and border catchments that cover the Black Country and Southern Staffordshire

Catchments were generated in ArcGIS using the Arc hydrology toolset using 50m DTM.

For each assessment, proposed development and flood risk were assessed using the best available data. The methodology for each assessment has been outlined in detail in this document.

1.2 Part 1 – Southern Staffordshire catchments

1.2.1 Considering historic flood risk

The LLFA's flooding hotspot data was used. The floodspot data was provided on a postcode basis with the number of historic flood events identified for each postcode. Information regarding the number of properties affected or the nature and source of the flooding was not provided as this was sensitive data.

The catchments and the LLFA flooding hotspot data was used to determine the number of historic flood events in each catchment.

1.2.2 Considering surface water flood risk

The LLFA's communities at risk dataset identifies the number of properties at risk of flooding in the 100-year surface water event.

The catchments and the communities at risk dataset was used to determine the number of properties at risk of surface water flooding in the 100-year event.

1.2.3 Considering potential development

The Southern Staffordshire Councils provided GIS data of their potential sites and currently committed sites. This data was used to determine the area of potential development within each catchment, as a percentage of the total catchment area. The most up to date and available data that was used is set out below:

- Cannock Employment Land Availability Assessment (ELAA) and Strategic Housing Land Availability Assessment (SHLAA) sites and employment and residential site options;
- Lichfield ELAA and SHLAA sites;
- South Staffordshire potential sites, employment and housing site allocations, committed housing and employment sites, and land safeguarded for housing;
- Stafford call for sites, local plan employment and housing sites, and sites with extant planning permission;
- Tamworth employment and housing allocations.

Data from all neighbouring authorities was also used to determine the potential development area where catchments fell into multiple authorities.

1.2.4 Considering predicted flood risk from increased runoff upstream

The NRD (National Receptor Database) was intersected with the 100-year and 1,000-year surface water flood extents separately, to determine the number of properties in each.

The difference between the two was then calculated and given as a percentage of the total number of NRD points in the catchment, to give an indication of which areas are most sensitive to increases in surface water runoff from upstream.

E.g. if there were 100 NRD points in a catchment, 15 within the 1,000-year surface water extent and 5 within the 100-year surface water extent, 10% of properties in that catchment have been considered.

1.2.5 Considering risk from sewer flooding

Severn Trent Water’s Hydraulic Flood Risk Register (HFFR) was used to determine the number of properties in each catchment at risk from sewer flooding.

1.2.6 Ranking the results

The results were ranked for each of the above assessments and these rankings were combined to give an overall ranking. A RAG rating was then applied to the catchments, with red being high risk, amber being medium risk and green being low risk. Regardless of the overall ranking of the catchment, if >15% of the catchment was proposed for development, at least an amber rating was given to the catchment. The RAG rating is summarised below in Table G-1:

Table G-1 Southern Staffordshire only catchments RAG rating definition

| Condition | RAG |
|---|-------|
| Catchments with overall risk ranking 1-8 (Top 9 catchments) | RED |
| Catchments with overall risk ranking 9-20 | AMBER |
| Catchments with >15% area proposed for development | AMBER |
| Red/amber rated catchments on the River Trent or River Tame (see section 1.4) | GREEN |
| All other catchments | GREEN |

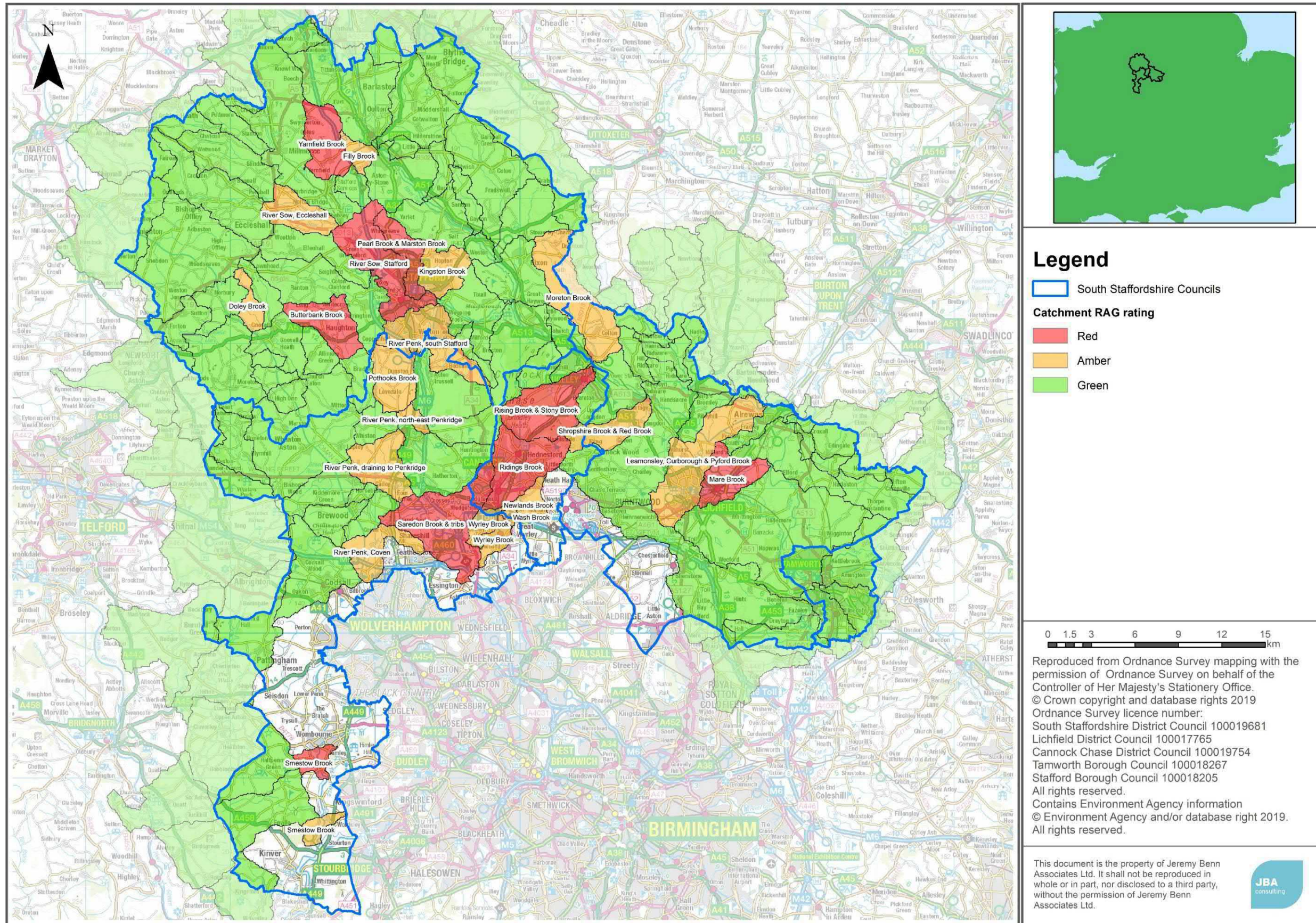
A map of the RAG rating for each catchment is shown in Figure G-1, and a summary of the results of the red and amber rated catchments are shown in Table G-2.

Table G-2 High and medium risk catchments

| Catchment name | Number of historic flood incidents | Number of communities at risk from surface water flooding | % area of proposed development | % properties at risk from increased runoff upstream | Properties at risk of sewer flooding | Final combined ranking | RAG score |
|---|------------------------------------|---|--------------------------------|---|--------------------------------------|------------------------|-----------|
| Ridings Brook, Cannock | 35 | 342 | 10.4% | 4.76% | 87 | 1 | RED |
| Saredon Brook and tributaries, west Cannock to Standeford | 49 | 2111 | 16.36% | 3.75% | 15 | 2 | RED |
| Mare Brook, east Lichfield | 2 | 228 | 32.23% | 5.18% | 1 | 3 | RED |
| Rising Brook and Stony Brook, draining towards Rugeley | 22 | 186 | 7.92% | 4.41% | 8 | 4 | RED |
| Pearl Brook and Marston Brook, Stafford | 21 | 86 | 53.27% | 3.23% | 9 | 5 | RED |
| River Sow, Stafford | 28 | 160 | 20.16% | 2.76% | 30 | =6 | RED |
| Butterbank Brook | 8 | 0 | 14.09% | 7% | 2 | =6 | RED |
| Yarnfield Brook, Yarnfield | 6 | 10 | 11.59% | 8.06% | 2 | 7 | RED |
| Smestow Brook, Smestow to Swindon | 6 | 63 | 9.72% | 5.05% | 1 | 8 | RED |
| Doley Brook, draining towards Gnosall | 5 | 0 | 20.4% | 4.05% | 0 | 9 | AMBER |
| River Penk, draining towards Penkridge | 15 | 0 | 30.13% | 3.51% | 0 | 10 | AMBER |
| Smestow Brook Spittle Brook to River Stour | 6 | 0 | 11.93% | 5.31% | 0 | 11 | AMBER |
| Leamonsley, Curborough and Pyford Brook, Lichfield to Alrewas | 11 | 469 | 16.28% | 2.65% | 13 | =12 | AMBER |
| River Penk, north-east Penkridge | 16 | 0 | 34.49% | 3.31% | 1 | =12 | AMBER |
| Wyrley Brook, Cheslyn Hay and Great Wyrley | 11 | 203 | 11.2% | 2.97% | 42 | 13 | AMBER |
| Newlands Brook | 7 | 126 | 36.34% | 2.78% | 4 | =14 | AMBER |

| Catchment name | Number of historic flood incidents | Number of communities at risk from surface water flooding | % area of proposed development | % properties at risk from increased runoff upstream | Properties at risk of sewer flooding | Final combined ranking | RAG score |
|---|------------------------------------|---|--------------------------------|---|--------------------------------------|------------------------|-----------|
| Filly Brook, draining towards Stone | 4 | 11 | 24.19% | 3.64% | 1 | =14 | AMBER |
| River Penk, south Stafford | 9 | 332 | 15.1% | 2.26% | 43 | 15 | AMBER |
| River Penk and tributary, Coven | 6 | 0 | 14.40% | 3.93% | 0 | 16 | AMBER |
| River Sow, Eccleshall draining towards Little Bridgeford | 14 | 10 | 7.51% | 3.77% | 14 | 17 | AMBER |
| Shropshire Brook and Red Brook, draining towards Armitage and Handsacre | 15 | 88 | 8.78% | 3.14% | 14 | 18 | AMBER |
| Moreton Brook and tributaries, draining towards Rugeley | 13 | 28 | 4.28% | 6.69% | 0 | 19 | AMBER |
| Wyrley Brook, Cheslyn Hay and Churchbridge | 4 | 46 | 26.39% | 2.95% | 10 | 20 | AMBER |
| Kingston Brook, Stafford | 3 | 38 | 23.09% | 2.91% | 1 | 24 | AMBER |
| Pothooks Brook and tributaries, draining towards the River Penk south of Stafford | 7 | 0 | 16.51% | 2.98% | 0 | 30 | AMBER |
| Wash Brook, Leacroft and Great Wyrley | 4 | 18 | 18.81% | 2.06% | 13 | 33 | AMBER |

Figure G-1 RAG rating of catchments in Southern Staffordshire (excluding shared catchments with the Black Country Authorities)



1.3 Part 2 – Black Country only catchments and shared Southern Staffordshire and Black Country border catchments

1.3.1 Considering potential development

The Black Country Authorities provided GIS data of their potential sites and some of their currently committed sites. This data was used to determine the area of potential development within each catchment, as a percentage of the total catchment area.

The most up to date and available data that was used is set out below:

- Black Country Call for Sites;
- Wolverhampton committed sites (housing);
- Sandwell committed sites (housing);
- Walsall committed sites (housing and employment);
- Dudley proposed housing sites.

Site data for Southern Staffordshire was used as outlined in section 1.2.3.

Data from all the neighbouring authorities was also used to determine the potential development area where catchments fell into multiple authorities.

1.3.2 Considering predicted flood risk from increased runoff upstream

The NRD data was intersected with the 100-year and 1,000-year surface water flood separately, to determine the number of properties in each.

The difference between the two was then calculated and given as a percentage of the total number of NRD points in the catchment, to give an indication of which areas are most sensitive to increases in surface water runoff from upstream.

E.g. if there were 100 NRD points in a catchment, 15 within the 1,000-year surface water extent and 5 within the 100-year surface water extent, 10% of properties in that catchment have been considered.

1.3.3 Considering risk from sewer flooding

Severn Trent Water’s Hydraulic Flood Risk Register (HFFR) was used to determine the number of properties in each catchment at risk of flooding from sewers.

1.3.4 Historic flooding data

The level of detail of the historic flooding data varied greatly between each of the Black Country Authorities and against the Southern Staffordshire data, and therefore historic flooding data could not be simply be ranked by number of events/hotspots and used in the final combined ranking, as results would be biased towards the areas with better quality data.

The following data was therefore normalised as set out below:

- Wolverhampton Surface Water Management Plan (SWMP) hotspots (identified using outputs from the 1 in 30-year surface water event)
- Walsall flooding data from May 2018 (number of properties affected)
- Walsall LLFA flooding hotspots (contains data up to 2012)
- Sandwell flooding hotspots (internal flooding hotspots only)
- Dudley flood events

To normalise the data, the total number of hotspots/events/properties for each dataset was taken, and then number of hotspots/events/properties in each catchment was taken as a percentage of this for each dataset. The catchments were then ranked from high to low on percentage for each dataset and these rankings were then added together and an "average" ranking was taken, by dividing the total ranking by the number of datasets covering the catchment.

An example is shown below (note this is not indicative of the actual results)

- Catchment A is within Wolverhampton and Walsall (3 datasets: 1 Wolverhampton and 2 Walsall)
- Catchment B is entirely in Sandwell (1 dataset)
- Catchment C is in Sandwell and Dudley (2 datasets)
- Catchment D is in Walsall and Sandwell (3 datasets)
- Catchment E is entirely in Dudley (1 dataset)
- Catchment F is in Wolverhampton and Dudley (2 datasets)

| Catchment | Number of datasets covered | % of total Dudley flood events in catchment | Rank | % of total Sandwell hotspots in catchment | Rank | % of total Wolverhampton hotspots in catchment | Rank | % of total Walsall hotspots in catchment | Rank | % of total houses flooded in May 2018 in catchment | Rank | Total rank | Average rank | Overall historic rank |
|-----------|----------------------------|---|------|---|------|--|------|--|------|--|------|------------|--------------|-----------------------|
| A | 3 | - | - | - | - | 60% | 1 | 35% | 2 | 20% | 2 | 6 | 2 | =2 |
| B | 1 | - | - | 20% | 3 | - | - | - | - | - | - | 3 | 3 | 4 |
| C | 2 | 30% | 2 | 30% | 2 | - | - | - | - | - | - | 4 | 2 | =2 |
| D | 3 | - | - | 50% | 1 | - | - | 65% | 1 | 80% | 1 | 3 | 1 | =1 |
| E | 1 | 50% | 1 | - | - | - | - | - | - | - | - | 1 | 1 | =1 |
| F | 2 | 20% | 3 | - | - | 40% | 2 | - | - | - | - | 5 | 2.5 | 3 |

The overall historic ranking was used to inform the cumulative impact assessment.

1.3.5 Ranking the results

The results were ranked for each of the above assessments and these rankings were combined to give an overall ranking. A RAG rating was then applied to the catchments, with red being high risk, amber being medium risk and green being low risk. Due to the known flood risk issues and the urban nature of the Black Country, it was deemed appropriate to change green rated catchments to yellow, to highlight that while the risk in these catchments is lower than the red and amber catchments, there is still a notable risk.

Regardless of the overall ranking of the catchment, if >15% of the catchment was proposed for development, at least an amber rating was given to the catchment.

For catchments that are also within Southern Staffordshire, the LLFA historic flooding information and communities at risk (as described in section 1.2.1 and 1.2.2) were also used. The number of historic flood events and number of properties in the communities at risk dataset for each catchment partially located in Southern Staffordshire were taken and compared with the results of the Southern Staffordshire only catchments. Where the results of the border catchments fell within the top 10 rank of the Southern Staffordshire only catchments, the border catchment was given a RAG rating of red. Where the results of the border catchments fell within the top 11-20 rank of the Southern Staffordshire only catchments, the border catchment was given a RAG rating of amber.

The RAG rating is summarised below in Table G-3.

Table G-3 Black Country and border catchments RAG rating definition

| Condition | RAG |
|---|--------|
| Catchments with overall risk ranking 1-5 (Top 5 catchments) | RED |
| Catchments where the number of historic flood events (Southern Staffs data) ranked in the top 10 of all Southern Staffs catchments | RED |
| Catchments where the number of properties in the communities at risk (Southern Staffs data) ranked in the top 10 of all Southern Staffs catchments | RED |
| Catchments with overall risk ranking 6-12 | AMBER |
| Catchments where the number of historic flood events (Southern Staffs data) ranked in the top 11-20 of all Southern Staffs catchments | AMBER |
| Catchments where the number of properties in the communities at risk (Southern Staffs data) ranked in the top 11-20 of all Southern Staffs catchments | AMBER |
| Catchments with >15% area proposed for development | AMBER |
| All other catchments | Yellow |

A map of the RAG rating for each catchment is shown in Figure G-2, and a summary of the results of catchment rankings are shown in Table G-4.

A map of the RAG rating of all the Southern Staffordshire catchments (within Southern Staffordshire only, and the border catchments with the Black Country) are shown in Figure G-3.

Table G-4 Black Country and border catchments ranking

| Catchment name | % area of proposed development | % properties at risk from increased runoff upstream | Properties at risk of sewer flooding | Council historic flood information* | RAG score |
|--|--------------------------------|---|--------------------------------------|---|-----------|
| River Penk, including Perton, Tettenhall, Bilbrook and Oxley | 20.94% | 4.97% | 63 | 1 WCC SWMP hotspot 441 SCC communities at risk 25 SCC historic flood events | RED |
| River Stour, Stourbridge and Brierley Hill | 10.69% | 4.11% | 85 | 1 DC flood event 24 SCC historic flood events | RED |
| Smestow Brook, including Kingswinford | 12.62% | 4.45% | 47 | 4 SCC historic flood events 1 DC flood event | RED |
| Smestow Brook and Black Brook, Wolverhampton and Seisdon | 8.17% | 3.55% | 134 | 13 SCC historic flood events 11 SCC communities at risk 5 WCC SWMP hotspots 1 property flooded May 2018 (WC data) | RED |
| Gains Brook and Wash Brook, including Norton Canes | 20.96% | 3.90% | 13 | 33 SCC historic flood events 202 SCC communities at risk 3 WC flood hotspots | RED |
| Crane Brook, Burntwood, draining towards Shenstone | 13.28% | 2.42% | 14 | 18 SCC historic flood events 291 SCC communities at risk 8 WC flood hotspots | RED |
| Tipton Brook | 8.51% | 5.35% | 53 | 1 DC flood event 1 property flooded May 2018 (WC data) 11 SMBC flood hotspots | RED |
| River Tame East Wolverhampton and Willenhall | 5.78% | 3.63% | 119 | 8 SCC historic flood events 15 SCC communities at risk 1 WCC SWMP hotspot 36 properties flooded May 2018 (WC data) 60 WC flood hotspots | AMBER |
| Ford Brook and tributaries, Brownhills and Walsall | 7.49% | 3.32% | 94 | 2 SCC historic flood events 54 properties flooded May 2018 (WC data) | AMBER |

| Catchment name | % area of proposed development | % properties at risk from increased runoff upstream | Properties at risk of sewer flooding | Council historic flood information* | RAG score |
|---|--------------------------------|---|--------------------------------------|--|-----------|
| | | | | 138 WC flood hotspots | |
| Mousesweet Brook and Black Brook, including Rowley Regis, Blackheath and south Dudley | 7.71% | 5.06% | 31 | 12 SMBC flood hotspots 1 DC flood event | AMBER |
| River Tame source to Tipton Brook, including Oldbury and Dudley | 4.30% | 4.79% | 64 | 2 properties flooded May 2018 (WC data) 42 SMBC flood hotspots | AMBER |
| Tributaries of the Smestow Brook, draining towards Hinksford | 10.41% | 6.37% | 32 | 6 SCC historic flood events 17 SCC communities at risk | AMBER |
| Wom Brook and Penn Brook, draining towards Wombourne | 10.25% | 3.82% | 46 | 21 SCC historic flood events 176 SCC communities at risk | AMBER |
| River Stour, including Kinver and Dunsley, draining towards Kidderminster | 2.53% | 1.76% | 3 | 25 SCC historic flood events 90 SCC communities at risk | AMBER |
| Footherley Brook, draining towards Shenstone | 25.76% | 2.70% | 30 | 9 SCC historic flood events 85 SCC communities at risk 22 properties flooded May 2018 (WC data) 5 WC flood hotspots | AMBER |
| Watershead and Featherstone Brook, draining towards Coven | 24.45% | 3.37% | 10 | 8 SCC historic flood events 17 SCC communities at risk 2 WCC SWMP hotspots 6 properties flooded May 2018 (WC data) | AMBER |
| River Tame Bilston and Darlaston | 5.22% | 4.07% | 63 | 1 WC flood hotspot 12 SMBC flood hotspot | AMBER |
| River Tame, Wednesbury, draining towards West Bromwich | 5.11% | 3.32% | 35 | 89 SMBC flood hotspots | YELLOW |
| River Stour, Halesowen and Cradley Heath | 4.35% | 3.43% | 45 | 1 SMBC flood hotspot 3 DC flood events | YELLOW |

| Catchment name | % area of proposed development | % properties at risk from increased runoff upstream | Properties at risk of sewer flooding | Council historic flood information* | RAG score |
|---|--------------------------------|---|--------------------------------------|--|-----------|
| Plants Brook, including Streetly and Sutton Coldfield | 3.14% | 4.45% | 19 | 2 SCC historic flood event 10 SCC communities at risk 7 properties flooded May 2018 (WC data) 4 WC flood hotspots | YELLOW |
| River Tame, draining towards Birmingham | 3.38% | 3.65% | 3 | 4 WC flood hotspots | YELLOW |
| Hockley Brook, Smethwick and Birmingham draining towards Aston | 6.77% | 3.27% | 24 | 5 properties flooded May 2018 (WC data) 16 SMBC flood hotspots | YELLOW |
| River Tame, draining towards Handsworth | 3.52% | 3.35% | 11 | 2 WC flood hotspots 28 SMBC flood hotspots | YELLOW |
| Sneyd Brook, including Bloxwich | 7.14% | 1.96% | 10 | 6 SCC historic flood events 10 communities at risk 14 properties flooded May 2018 (WC data) 14 WC flood hotspots | YELLOW |
| Bourne Brook, Birmingham | 1.50% | 4.10% | 10 | 1 SMBC flood hotspots | YELLOW |
| Full Brook, south-east Walsall | 2.52% | 3.26% | 11 | 1 property flooded May 2018 (WC data) 17 WC flood hotspots 2 SMBC flood hotspots | YELLOW |
| Blakedown Brook and tributaries, including Hagley and Blakedown | 6.46% | 2.23% | 0 | 2 SCC historic flood events | YELLOW |

*Council abbreviations

WCC – Wolverhampton City Council

WC – Walsall Council

SMBC – Sandwell Metropolitan Borough Council

DC – Dudley Council

SCC – Staffordshire County Council

Figure G-2 RAG rating of catchments in Black Country and border catchments with Southern Staffordshire

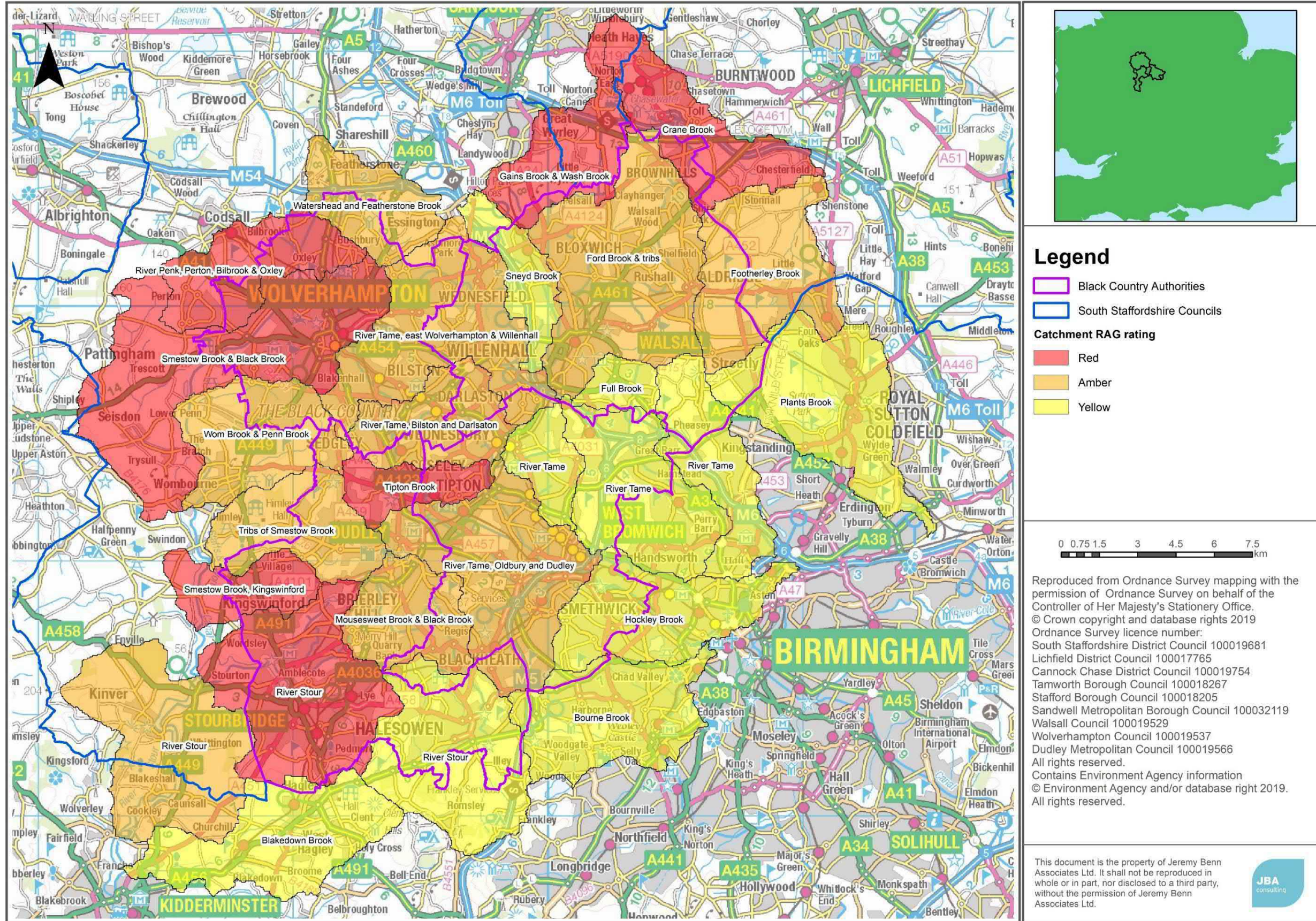
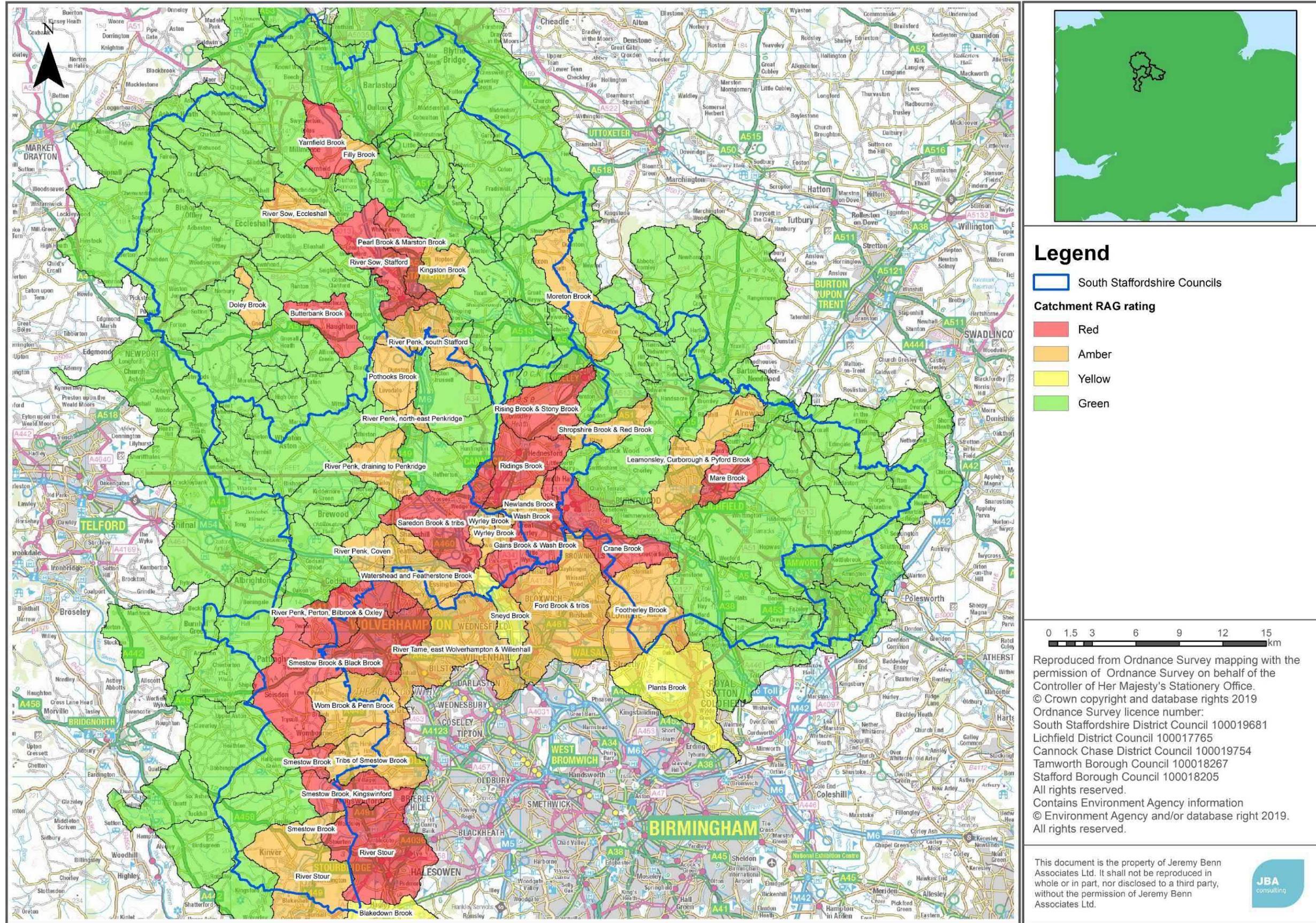


Figure G-3 RAG rating of all Southern Staffordshire catchments



1.4 Additional considerations

Catchments on the border of the study area

The catchment of the Lyme Brook, north of Stafford Borough only had a very small amount of the catchment within the study area and while the catchment was rated as amber in the assessment, this catchment was discounted from the assessment, as measures to reduce flood risk in this catchment would largely be the responsibility of neighbouring authority (Newcastle-under-Lyme Borough Council). Development and flood-risk from neighbouring authorities is considered in more detail in the cross-boundary issues section.

High risk catchments on main rivers

Several catchments were ranked as medium or high risk and were located along the River Trent and River Tame. Any small-scale developments draining into these watercourses are unlikely to have a significant impact on flows on these rivers due to the relative size of the catchment draining in from upstream. For this reason, the River Trent, and River Tame catchments in Southern Staffordshire that were ranked as medium or high risk were given a final ranking of low.

This approach was not taken for the River Tame catchments in the Black Country. The source of the River Tame is within the Black Country authorities and as the river is in its upper reaches, it is more likely to be affected by changes in flows from development, than it is downstream within Southern Staffordshire.

1.5 Assumptions

A number of assumptions had to be made for the cumulative impact assessment, and these are outlined in Table G-5.

1.6 Planning policy recommendations for Southern Staffordshire

The planning policy recommendations from the cumulative impact assessment can be found in chapter 10 of the main SFRA report.

Table G-5 Assumptions of the cumulative impact assessment

| Assessment aspect | Assumption made | Details of limitation in method | Justification of method used |
|--|--|---|--|
| Historic flood risk – LLFA flooding hotspot data | Location of flooding incidents | The number of flooding incidents was provided on a postcode basis in the form of polygons. This meant that in some places one flooding hotspot would fall into multiple catchments. As the exact locations of the flooding events were unknown, the total number of flooding incidents per flooding hotspot was used in the sum for each individual catchment, regardless of the number of catchments the hotspot covered. This may lead to an overestimate of historic flood risk. | It was considered most conservative to take the number of flooding incidents per flooding hotspot and add that to the sum for each individual catchment, regardless of the number of catchments the hotspot covered. For example, if one flooding hotspot denoting 4 historic flooding incidents covered 3 separate catchments, 4 historic incidents would be added to the total number of historic events for each of the catchments the hotspot covered. |
| Communities at risk | Number of properties flooded | Only areas where >10 properties fall within the 100-year surface water flood extent were included in the assessment. | The communities at risk data supplied by Staffordshire County Council only included areas where >10 properties were flooded in the 100-year surface water flooding event. |
| Sensitivity of catchments to an increase in flood risk that may be influenced by new development | NRD representative of current housing | The NRD was last updated in 2014 and therefore may not include all new build houses since that time. This could therefore result in an inaccuracy of the number of properties at risk of surface water flooding from increased flows. | This was the most consistent data that was available across all of the Southern Staffordshire and Black Country authorities and was therefore chosen as the best method of assessment. |
| Development scenarios | Inclusion of all sites provided by the Black Country Authorities and the Southern Staffordshire Councils | The study assessed the potential impact of all sites received during the Local Plan process. This included sites which may not be suitable for allocation, as well as more strategic development areas which are often developed in phases. As a result, it presents a 'worst case' assessment of | Although the method was a very conservative estimate, it identified settlements and catchments with the greatest potential for growth. |

| Assessment aspect | Assumption made | Details of limitation in method | Justification of method used |
|-------------------|---|---|--|
| | | growth which is likely to overestimate the risk within each catchment. | |
| | Assumption of housing density and impermeable areas | As potential development densities were not known for all of the sites, it was assumed that the entire area of the site would contribute surface water runoff to the wider catchment. In reality, landscaping and requirements for SuDS within sites lessen the impacts of new development. | The assessment considered the 'worst case' development scenario, if surface water runoff was not controlled from new developments. With housing densities and proportions of undeveloped areas not known, the approach was conservative. |

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