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Flooding in Chesterfield, Bolsover and North East Derbyshire

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Locations at risk of flooding have been identified through the Environment Agency's Flood Zone maps and historical flooding records, information from each of the LPAs, Derbyshire County Council, and Severn Trent Water.

A register of flood risk locations has been created from the data collection stage. Details of each location can be found in Appendix A. A reference number on the register relates to the following drawing in Appendix D:

Drawing Name	Drawing Number
Historic Flooding, Flood Storage and Defences –Chesterfield Overview	55328/C/HF/O
Historic Flooding, Flood Storage and Defences – Chesterfield Area 01	55328/C/HF/01
Historic Flooding, Flood Storage and Defences – Chesterfield Area 02	55328/C/HF/02
Historic Flooding, Flood Storage and Defences – Chesterfield Area 03	55328/C/HF/03
Historic Flooding, Flood Storage and Defences – Bolsover Overview	55328/B/HF/O
Historic Flooding, Flood Storage and Defences – Bolsover Area 01	55328/B/HF/01
Historic Flooding, Flood Storage and Defences – Bolsover Area 02	55328/B/HF/02
Historic Flooding, Flood Storage and Defences –Bolsover Area 03	55328/B/HF/03
Historic Flooding, Flood Storage and Defences – Bolsover Area 04	55328/B/HF/04
Historic Flooding, Flood Storage and Defences – Bolsover Area 05	55328/B/HF/05
Historic Flooding, Flood Storage and Defences – Bolsover Area 06	55328/B/HF/06
Historic Flooding, Flood Storage and Defences - Bolsover Area 07	55328/B/HF/07
Historic Flooding, Flood Storage and Defences – Bolsover Area 08	55328/B/HF/08
Historic Flooding, Flood Storage and Defences – Bolsover Area 09	55328/B/HF/09
Historic Flooding, Flood Storage and Defences - Bolsover Area 10	55328/B/HF/10
Historic Flooding, Flood Storage and Defences – North East Derbyshire Overview	55328/B/NE/O
Historic Flooding, Flood Storage and Defences – North East Derbyshire Area 01	55328/NE/HF/01
Historic Flooding, Flood Storage and Defences – North East Derbyshire Area 02	55328/NE/HF/02
Historic Flooding, Flood Storage and Defences – North East Derbyshire Area 03	55328/NE/HF/03
Historic Flooding, Flood Storage and Defences – North East Derbyshire Area 04	55328/NE/HF/04
Historic Flooding, Flood Storage and Defences – North East Derbyshire Area 05	55328/NE/HF/05
Historic Flooding, Flood Storage and Defences – North East Derbyshire Area 06	55328/NE/HF/06
Historic Flooding, Flood Storage and Defences – North East Derbyshire Area 07	55328/NE/HF/07
Historic Flooding, Flood Storage and Defences – North East Derbyshire Area 08	55328/NE/HF/08

These locations have been used to add evidence to the initial Sequential Test undertaken for the potential future development sites (Appendix B).

5.1 Main River Flooding in Chesterfield

There are a number of watercourses in the Chesterfield area as follows:

- River Rother
- River Hipper
- River Drone
- River Whitting
- River Doe Lea
- Pools Brook
- Barlow Brook
- Sud Brook
- Riddings Brook
- Trough Brook

- Linacre Brook
- Holme Brook
- Bridholme Brook
- Spital Brook
- Tinker Sick
- A number of un-named watercourses

Flood Zones have been produced for parts or all of these watercourses, however only detailed modelling exists for the River Hipper, River Whitting, Holme Brook, part of River Rother, the unnamed watercourse around Storforth Lane, Pools Brook, part of River Doe Lea, and Hawke Brook. See Drawing No. 55328/C/F/01 in Appendix D for details of the Flood Zones.

In addition to the Flood Zones and data from the hydraulic models, local knowledge holders have been consulted and the EA's archived flood records sourced to supplement the risk shown on the Flood Zone maps and to identify other areas at risk from various sources of flooding.

Site specific FRAs may be required to provide more detail where the proposed development is within a broad-scale flood outline.

River Rother has been identified as the watercourse that poses the greatest flood risk in Chesterfield.

5.2 Analysis of problem areas in Chesterfield

5.2.1 *South Chesterfield - Unnamed watercourse south of Storforth Lane*

Several houses off Storforth Lane, Hartfield Close and Ingleton Road are shown to be at risk from the 1 in 100 year fluvial storm based on the hydraulic model, although are not designated as Flood Zone 3 on the EA's Flood Zone maps and there is no history of flooding at this location. Flooding is most likely to occur due to a blockage of the culvert which carries the watercourse under the railway and into the River Rother. Water would tend to pond upstream of Ingleton Road. Although there is no history of flooding at this location, the possibility should still be considered when proposing any development in this area. Flood levels, taken from the hydraulic model, should be obtained by the developer.

5.2.2 *South Chesterfield - River Rother and River Hipper*

There is a large area of washland (or designated flood storage area) stretching from the east of Birdholme Farm to the east of St Augustine's School, by Turnoaks Industrial Estate (see ID CHE225). This area floods frequently and it is important that this process is allowed to continue as not to increase flooding problems downstream.

In extreme floods the water could rise high enough to inundate the bowling complex off Storforth Lane, the church hall at the junction of Derby Road and Jawbones Hill and several houses on Heulagh Way, Herriot Drive and St Giles Close.

On the left bank, there are many properties at risk on Bridge Street, Hawthorne Street, Sherwood Street and Rother Vale Road (see CHE225, CHE116 and CHE117). These are protected by an embankment and sheet piling of 30 year design standard, but these would be overtopped in severe events.

Downstream of here there is a significant area at risk from fluvial flooding at the confluence of Spital Brook and the River Rother (see CHE224, CHE209). The area at risk spans from the works on Baden Powell Road in the west to Saint Leonards Drive in the east and from Redvers Buller Road in the south to Hady Hill in the north, in addition to further areas on either side of the watercourses. This area could flood from the Rother or, if banks collapsed, from the Hipper. Floodwater from the Rother may enter this area from the west; by flowing along Hasland Road under the railway bridge. It should be noted that parts of this area are within the 5-year flood outline as predicted by the hydraulic models, based on a feasibility study carried out in 1988.

Shops on the Ravenside Retail Park are at risk of flooding from the River Hipper (see CHE211). There is an electricity substation at risk beside the river. Several other properties on Hipper

Street South are in the modelled flood outline. Queens Park and the area around the confluence of the Hipper and Holme Brook are also at risk of flooding.

5.2.3 *West Chesterfield - River Hipper.*

Where the Hipper enters the Chesterfield Borough there are several properties along Yew Tree Drive shown to be at risk from the 100 year fluvial flood according the the EA's Flood Zone maps. There is a further area along Somersall Lane which, although not located in Flood Zone 3 on the EA's Flood Zone maps, is predicted to be at risk from the 1 in 100 year fluvial flood based on the hydraulic models, and has also flooded historically (see CHE223). Flooding in this location may be due to insufficient capacity of Somersall Lane culvert.

Downstream of Somersall Lane, properties on Oakfield Avenue and Haddon Close are shown to be at risk from the 100 year flood based on the EA's maps but are not within the 100 year modelled flood extents. Historical flooding has occurred at this location (CHE10, CHE15, CHE16 and CHE17). However, it does not appear to have affected any residential areas.

In Walton, there is a small reservoir, Walton Dam, which appears to be located above the properties directly north. As such, this should be a major consideration for developers working within this area.

Further downstream is the confluence with Holme Brook. Directly upstream of Holme Brook is another significant area of flood risk spanning from Factory Street in the west to Boythorpe Road in the east and from Wheatbridge Road (A619) in the north to Dock Walk in the south. This area is located in Flood Zone 3 on the EA's Flood Zone maps, is within the 100 year modelled flood extents and has suffered from flooding historically in both August 2000 and June 2007 (CHE170). This area contains a mixture of residential, commercial and industrial properties. There are no flood defence structures located along this section of the Hipper.

5.2.4 *Ashgate - Holme Brook.*

The only notable area of flood risk is located directly upstream of Ashgate Road culvert. Several houses on Ashgate Road and Ashgate Valley Road are at risk, potentially at risk due to the restriction of the culvert under the road and petrol station. In addition, residential properties on Chester Street.

5.2.5 *East Chesterfield: area around station - River Rother.*

This area includes stables and fields by Rose Cottage and offices on the left bank upstream of Brimington Road bridge. Both are likely to be flooded frequently (CHE210). Upstream of the station, properties along Wain Avenue are also at risk. At lower risk, but still vulnerable to the 100-year flood, are the houses on Tapton Terrace and the road under the railway bridge (see ID CHE207, CHE206 and CHE166). Further downstream, the industrial area by the river, particularly on the right bank, is low-lying and at risk.

It is understood that this area is designated for regeneration by Chesterfield Waterside. It is essential that the sequential approach is used to ensure this development is safe and does not increase flood risk elsewhere. All residential development at this location must be above the flood level with safe access to dry land.

5.2.6 *Northwest Chesterfield – Barlow Brook, River Drone, River Whitting and Riddings Brook*

Several industrial and commercial properties upstream of the confluence with the River Drone on both sides of Barlow Brook are located in Flood Zone 3, however, there is no history of flooding at this location. Residential properties are at risk on Station Road from the Riddings Brook due to culvert restrictions. Also although not recently, Racecourse Road has flooded due to a blocked culvert in the past

At the confluence with the River Drone (where Barlow Brook and the River Drone join to form the River Whitting) there is a large area which has flooded in the past (CHE220) possibly due to the restriction of the culverts under the A61 and railway embankment. This mainly affects a large industrial site east of Sheepbridge Lane.

Downstream of the railway embankment, there is a large area which has suffered historical flooding (CHE217) stretching from the railway embankment to the confluence with the River Rother. There are raised man made defences located mainly along the right bank of the Whitting which seems to have offered some flood protection from the recent June 2007 floods, as only parts of this area were subject to flooding (including all of the Armytage Industrial

Estate). However, the defences are only to a 50 year design standard and, as such, all this area remains potentially at risk from severe flooding.

5.2.7 *North Chesterfield – River Rother and Tributaries*

At the confluence with the River Whitting there is a large area of washland located between the railway embankment and Chesterfield Canal. This area is subject to regular flooding, which mainly affects commercial and industrial properties.

To the west of the railway and north of the sewerage works, the area around Ashcroft Drive and Burnbridge Road has been subjected to historical flooding from a tributary to the Rother (CHE1, CHE201, CHE205 and CHE208). This area is designated as Flood Zone 1 on the EA's Flood Zone maps but would require a detailed flood risk assessment to be carried out to determine the risk and potential flood levels.

Between the River Whitting and Hawthorn Hill there are large areas of washlands on both banks of the river. Areas affected are predominantly rural with a few industrial properties in Staveley, including Staveley Clock Tower Industrial estate on Works Road and the residential property of SlittingMill Farm. Flood defences offer protection to the farm from the 30 year flood.

5.2.8 *Doe Lea catchment*

In the village of Poolsbrook, there are a few houses by the playing field that may be at risk from the River Doe Lea in a 100-year event (see CHE186) although Erin Road forms an embankment between the river and the low-lying ground within the village. The grassy area south of Poolsbrook acts as a washland. The washland area continues downstream on the right bank along the playing fields. These areas are protected by an embankment of 30 year design standard, but this will be overtopped in severe events.

Downstream of Poolsbrook the Doe Lea flows to the east of Staveley to the confluence with the River Rother and mainly affects rural areas. The only urban areas at risk include part of a school site at Netherthorpe and some residential properties, a sports ground and Riverdale Park on Bent Lane.

5.2.9 *Areas of main concern*

The following areas are assessed as being at significant and/or frequent risk of flooding in Chesterfield:

- The Derby Road (St Augustines) area of Chesterfield (River Rother)
- The Rother-Hipper confluence (Rivers Rother and Hipper)
- Tapton Terrace and the area near Chesterfield station (River Rother)
- The industrial area including the Arnold Laver timber yard (River Rother)
- The Station Road area of Whittington (River Whitting).
- Staveley Works, Staveley (River Rother)
- Chatsworth Road, area near Chesterfield (River Hipper)
- Ravenside Retail Park, Chesterfield (River Hipper)
- Horns Bridge Roundabout (A617), Chesterfield (River Rother)

5.3 Main River Flooding in Bolsover

There are a number of watercourses in the Bolsover area as follows:

- River Doe Lea
- River Meden
- River Poulter
- Stockley Brook
- Milwood Brook
- Westwood Brook
- Morton Brook
- Normanton Brook
- River Erewash
- Hawke Brook
- A number of minor or un-named watercourses and land drains.

Flood Zones have been produced for most of the watercourses running through the Bolsover area although the only detailed modelling available covers part of the River Doe Lea and Hawke Brook.

River Doe Lea has been identified as the watercourse that poses the greatest flood risk in Bolsover.

5.4 Analysis of problem areas in Bolsover

5.4.1 *River Doe Lea*

The only notable area of flood risk from the River Doe Lea is at the existing industrial works either side of Buttermilk Lane (see BDC76) at the confluence with two un-named land drains. Flooding may be due to inadequate capacity in the culvert under Buttermilk Lane.

The area currently affected is low vulnerability industrial uses. However, this site is designated for redevelopment. Ideally, low vulnerability commercial, industrial, retail etc. development should be located here or the site should be sequentially tested to ensure any high vulnerability uses (such as residential) are located outside the flood extents.

5.4.2 *South Bolsover – Normanton Brook*

Minor flooding occurs along the length of Normanton Brook (see BDC87, BDC89, BDC81 and BDC85) but this only affects rural areas and is not currently designated for development.

5.4.3 *Southeast Bolsover – River Erewash*

Flooding affects properties on Beech Avenue, Alexandra Terrace or York Terrace, Pinxton and the southern parts of the Brookhill Industrial Estate. The references are (BDC 97 - 101). The area is identified as a Flood zone 2 and 3 on the Environment Agency Maps. There is no development currently proposed in the area

5.4.4 *Southwest Bolsover – Westwood Brook and Morton Brook*

There is a small residential area to the north of Station Road which is located in Flood Zone 3 on the EA's Flood Zone maps, although there are no records of historical flooding at this location. There is no development currently proposed in the area.

5.4.5 *Pleasley – River Meden*

The area between Chesterfield Road and the A617 is located in Flood Zone 3 on the EA's Flood Zone maps and has also suffered historical flooding (see BDC28, BDC88 and BDC94). There is no development currently proposed in the area.

5.4.6 *Shirebrook – Un-named Watercourse*

There is a small area at The Meadows north of Sookholme Road which is located in Flood Zone 3 on the EA's Flood Zone maps, although there are no records of historical flooding at this location. This site is currently designated for redevelopment and the developer may be expected to carry out hydraulic modelling to determine flood levels and accurately assess the flood risk at this site.

5.4.7 *Clowne – Un-named Watercourse*

An un-named watercourse flows southeast from Harlesthorpe Reservoir through the centre of Clowne and there are some minor areas on both banks designated as Flood Zone 2 or 3 with historical flooding problems (see BDC20, BDC21 and BDC22). There are multiple sites designated for redevelopment in this area and a detailed study may be required to accurately determine the flood risk. In addition to the watercourse, flood risk from the reservoir must also be taken into consideration.

5.4.8 *Barlborough – Un-named Watercourse*

All of Barlborough is designated as Flood Zone 1 but an area around Shunters Drift has flooded due to a blockage of a culvert debris screen. There is no development currently proposed at this location.

5.4.9 *Areas of main concern*

The following areas are assessed as being at significant and/or frequent risk of flooding in Bolsover:

- Alexander Terrace and York Terrace and the southern parts of the Brookhill Industrial Estate, Pinxton (River Erewash)
- Creswell Road and Station Road at Clowne, (unnamed watercourse from Harlesthorpe Dam)
- Pleasley Bridge, and factories and warehouses, Chesterfield Road, Pleasley.(River Meden)
- Pleasley Vale Mills (River Meden)

5.5 Main River Flooding in North East Derbyshire

There are a large number of watercourses in the North East Derbyshire area as follows:

- River Amber
- River Rother
- River Hipper
- River Drone
- Press Brook
- Smithy Brook
- Alfreton Brook
- Hodgelane Brook
- Smalley Brook
- Marsh Brook
- Tricket Brook
- Redleadmill Brook
- Locko Brook
- Muster Brook
- Calow Brook
- Pools Brook
- Birdholme Brook
- Birley Brook
- Linacre Brook
- Crowhole Brook
- Barlow Brook
- Dunston Brook
- Totley Brook
- The Moss
- A number of un-named watercourses

Flood Zones have been produced for most of the watercourses running through the North East Derbyshire area although the only detailed modelling available covers part of the River Hipper and River Rother.

River Rother has been identified as the watercourse that poses the greatest flood risk in North East Derbyshire. Renishaw and Eckington are areas in NEDDC that have been identified as at risk of flooding from the River Rother.

5.6 Analysis of problem areas in North East Derbyshire

5.6.1 *South of NE Derbyshire – River Amber, Smithy Brook and Alfreton Brook*

There are areas of Flood Zone 3 and historical flooding downstream of Ogston Reservoir (See NEDDC52) but these affect rural areas only and there are currently no development proposals at this location.

Upstream of the confluence of River Amber and Alfreton Brook there are large areas, including part of the Amber Mill and Brook Farm (see NEDDC52 and NEDDC54) within 1 in 100 years flood outline. Part of the fields adjacent to Halls Plantation at Alfreton is protected by embankment in the right river bank of 1 in 100year standard of protection (see NEDDC54).

5.6.2 *South of NE Derbyshire – Morton Brook*

There is an area of Flood Zone 2 and 3 at the confluence of Morton Brook and Westwood Brook, directly adjacent to a proposed development site. The developer may have to carry out hydraulic modelling to determine flood levels and accurately assess the flood risk.

5.6.3 *Clay Cross – River Rother*

There is a small area of Flood Zone 2 and 3 to the east of Clay Cross, adjacent to some proposed development sites. There are no modelled or historical flood levels at this location and may have to be determined by the developers.

5.6.4 *Holymoorside – River Hipper and Tributaries*

The River Hipper flows to the southeast of Holymoorside with a tributary joining from the northwest. Residential areas around the junction of New Road and Loads Road are located in

Flood Zone 2 and 3 according to the EA's Flood Zone maps. There are currently no development sites at this location but any sites should consider the risk from the River Hipper and its tributary. In addition, Old Mill pond appears to be elevated and could also pose a threat.

5.6.5 *Dronfield and Unstone - River Drone*

The River Drone passes through the centre of Dronfield. The main area at risk is along Mill Lane, which is located in Flood Zone 2 and 3. There are some defences which offer protection to a 50 year standard but these are likely to be overtopped during a severe flood. This area is not covered by a hydraulic model and, as such, levels would have to be confirmed by the developers as part of a detailed flood risk assessment.

Downstream of Mill Lane is Dronfield Sewage Treatment works and an adjacent disused tip. This area is located in Flood Zone 3 and was subjected to flooding in June 2007. This area is also designated for development. As this area is subject to flooding it is providing valuable flood storage area and any development proposals must not remove this without providing compensation storage, as this would increase downstream flood risk.

Further downstream is the village of Unstone. There are a few properties on the right bank of the Drone located in Flood Zone 3. Developers in this area may have to confirm flood levels by carrying out hydraulic modelling.

5.6.6 *Renishaw, Eckington and Killamarsh – River Rother*

The largest part of the area consists of fields, many designated as washlands (see NEDDC48, NEDDC43 and NEDDC51). Around Renishaw, downstream of the confluence of the River Rother and Doe Lea, there is a large area at risk including parts of Renishaw Park (see NEDDC34) and a few properties in Eckington (see ID NEDDC48).

Further downstream, on the right bank of the Rother, a number of properties along Sheffield Road are at risk.

There are no modelled flood levels for this area but the situation should be confirmed by detailed flood risk assessments for sites at potential risk.

5.6.7 *Areas of main concern*

The following areas are assessed as being at significant and/or frequent risk of flooding in NE Derbyshire

- Rotherside Road Industrial Estate, Eckington
- Emmett Carr Lane, Reninshaw and downstream industrial land
- Mansfield Road, Corbriggs (unnamed watercourse),
- Bridge Street, Pilsley (culvert).

5.7 **Sewer Flooding**

Incidents of sewer flooding have been identified by the Severn Trent Water (STW) and Yorkshire Water (YW). These incidents tend to be isolated in nature and do not generally affect a large number of properties. Measures to deal with flooding problems in the study area associated with sewers are the responsibility of STW. The water companies have a register of properties flooded by sewers (DG5 register) and are charged with reducing the flood risk from sewers. It is believed that flooding of sewers within the study area is not related to water backing up in the system due to high water levels in the rivers in the catchment but more due to inadequate capacity or maintenance problems (e.g. blockages).

Severn Trent Water and Yorkshire Water have provided relevant extracts from their DG5 register for the Chesterfield, Bolsover and NE Derbyshire areas.

5.7.1 *Sewer Flooding in Chesterfield*

Isolated locations within the council area have been identified by YW that have been at risk of sewer flooding in the past and include their risk status; however the mechanism for most of the locations is unknown. These locations are listed in Table 6 and shown on Drawing Nos. 55328/C/HF/O, and 55328/C/HF/01 to /03 in Appendix D.

Table 6: CBC Sewerage flooding

ID	Problem Location	Sub-catchment	Description of problems\comments
CHE230	Boythorpe Road	Chesterfield	External flooding recorded for 1 property, probability 1 in 10 years
CHE231	Brimington Road	Chesterfield	External flooding recorded for 1 property, probability 1 in 10 years
CHE232	Calow Lane	Hasland	External flooding recorded for 1 property, probability 1 in 10 years
CHE233	Clayton Street	Chesterfield	External flooding recorded for 1 property, probability 1 in 10 years
CHE234	Dale Close	Staveley	External flooding recorded for 2 properties, probability 1 in 10 years
CHE235	Harvey Road	Chesterfield	External flooding recorded for 1 property, probability 1 in 10 years
CHE236	Hasland Road	Hasland	External flooding recorded for 1 property, probability 1 in 10 years
CHE237	Hazelhurst Lane	Stonegravels	External flooding recorded for 1 property, probability 1 in 10 years
CHE238	Lincoln Street	Birdholme	External flooding recorded for 1 property, probability 1 in 10 years
CHE239	Linden Avenue	Hasland	External flooding recorded for 1 property, probability 1 in 10 years
CHE240	Litton Close	Staveley	External flooding recorded for 1 property, probability 1 in 10 years
CHE241	Manor Road	Brimington	External flooding recorded for 2 properties, probability 1 in 10 years
CHE242	May Avenue	Old Whittington	External flooding recorded for 1 property, probability 1 in 10 years
CHE243	Morley Avenue	Ashgate	External flooding recorded for 1 property, probability 1 in 10 years
CHE244	Off Meltham Lane	Brimington	External flooding recorded for 1 property, probability 1 in 10 years
CHE245	Park Lane	Newbold	External flooding recorded for 1 property, probability 1 in 10 years
CHE246	Pottery Lane East	Whittington	External flooding recorded for 2 properties, probability 1 in 10 years
CHE247	Queens Park	Chesterfield	External flooding recorded for 1 property, probability 1 in 10 years
CHE248	Riber Close	Inkersall	External flooding recorded for 1 property, probability 1 in 10 years
CHE249	Sheffield Road	Whittington Moor	External flooding recorded for 4 properties, probability 1 in 10 years
CHE250	St Augustines Road	St Augustines	External flooding recorded for 6 properties, probability 1 in 10 years
CHE251	Station Lane	Old Whittington	External flooding recorded for 1 property, probability 1 in 10 years
CHE252	Station Road	Old Whittington	External flooding recorded for 1 property, probability 1 in 10 years
CHE253	Station Road	Hollingwood	External flooding recorded for 3 properties, probability 1 in 10 years
CHE255	The Green	Hasland	External flooding recorded for 1 property, probability 1 in 10 years
CHE256	Walton Crescent	Chesterfield	External flooding recorded for 1 property, probability 1 in 10 years
CHE257	Wellington Street	New Whittington	External flooding recorded for 1 property, probability 1 in 10 years
CHE258	Bacons Lane	Birdholme	External flooding recorded for 1 property, probability 1 in 20 years
CHE259	Barrow Hill	Staveley	External flooding recorded for 1 property, probability 1 in 20 years

ID	Problem Location	Sub-catchment	Description of problems\comments
CHE260	Derby Road	St Augustines	External flooding recorded for 4 properties, probability 1 in 20 years
CHE261	Hasland By-Pass/Derby Rd Jn	Hasland	External flooding recorded for 1 property, probability 1 in 20 years
CHE262	Milldale Close	Ashgate	External flooding recorded for 1 property, probability 1 in 20 years
CHE263	Moorland View Road	Tapton	External flooding recorded for 1 property, probability 1 in 20 years
CHE264	Pottery Lane West	Whittington	External flooding recorded for 1 property, probability 1 in 20 years
CHE265	Sheffield Road	Whittington Moor	External flooding recorded for 4 properties, probability 1 in 20 years
CHE266	Station Road	Brimington	External flooding recorded for 2 properties, probability 1 in 20 years
CHE267	Hawthorne Street	Birdholme	External flooding recorded for 2 properties, probability 1 in 30 years
CHE268	Hazel Drive	Walton	External flooding recorded for 1 property, probability 1 in 30 years
CHE269	Ingleton Road	Hasland	External flooding recorded for 1 property, probability 1 in 30 years
CHE270	Kingsmede Avenue	Walton	External flooding recorded for 1 property, probability 1 in 30 years
CHE271	Moorland View Road	Tapton	External flooding recorded for 1 property, probability 1 in 30 years
CHE272	Sycamore Road	Hollingwood	External flooding recorded for 1 property, probability 1 in 30 years
CHE273	Derby Road	St Augustines	External flooding recorded for 1 property, probability 2 in 10 years
CHE274	Middlecroft Road	Staveley	External flooding recorded for 1 property, probability 2 in 10 years
CHE275	Newbridge Drive	Brimington	External flooding recorded for 5 properties, probability 2 in 10 years
CHE276	North Crescent	Duckmanton	External flooding recorded for 2 properties, probability 2 in 10 years
CHE277	St Augustines Road	St Augustines	External flooding recorded for 4 properties, probability 2 in 10 years
CHE278	Station Lane	Old Whittington	External flooding recorded for 1 property, probability 2 in 10 years
CHE279	Storforth Lane	Hasland	External flooding recorded for 1 property, probability 2 in 10 years
CHE280	The Grove	Poolsbrook	External flooding recorded for 1 property, probability 2 in 10 years
CHE281	Chatsworth Road	Brampton	Internal flooding recorded for 1 property, probability <1 in 30 years
CHE282	Hartington Road	Dronfield	Internal flooding recorded for 1 property, probability <1 in 30 years
CHE283	Market Street	Eckington	Internal flooding recorded for 1 property, probability <1 in 30 years
CHE284	New Street	Chesterfield	Internal flooding recorded for 1 property, probability <1 in 30 years
CHE285	Park Road	Chesterfield	Internal flooding recorded for 3 properties, probability <1 in 30 years
CHE286	Pottery Lane East	Whittington	Internal flooding recorded for 1 property, probability 1 in 10 years
CHE287	Wharf Lane	Chesterfield	Internal flooding recorded for 1 property, probability 1 in 10 years
CHE288	Chatsworth Road	Brampton	Internal flooding recorded for 3 properties, probability 1 in 10 years
CHE289	Chester Street	Brampton	Internal flooding recorded for 1 property, probability 1 in 20 years

ID	Problem Location	Sub-catchment	Description of problems\comments
CHE290	Dale Close	Staveley	Internal flooding recorded for 1 property, probability 1 in 20 years
CHE291	Fieldhead Way	Newbold	Internal flooding recorded for 1 property, probability 1 in 20 years
CHE292	Harvest Way	Ashgate	Internal flooding recorded for 1 property, probability 1 in 20 years
CHE293	Kirkstone Road	Newbold	Internal flooding recorded for 1 property, probability 1 in 20 years
CHE294	Manor Road	Ashgate	Internal flooding recorded for 1 property, probability 1 in 20 years
CHE295	Stand Road	Newbold	Internal flooding recorded for 1 property, probability 1 in 20 years
CHE296	Wharf Lane	Chesterfield	Internal flooding recorded for 1 property, probability 1 in 20 years
CHE297	Barn Close	Newbold	Internal flooding recorded for 2 properties, probability 1 in 20 years
CHE298	Cranborne Road	Newbold	Internal flooding recorded for 4 properties, probability 1 in 20 years
CHE299	Old Road	Brampton	Internal flooding recorded for 1 property, probability 1 in 30 years
CHE300	Worksop Road	Mastin Moor	Internal flooding recorded for 2 properties, probability 1 in 30 years
CHE301	Calow Lane	Hasland	Internal flooding recorded for 3 properties, probability 1 in 30 years
CHE302	Kingsmede Avenue	Walton	Internal flooding recorded for 3 properties, probability 1 in 30 years
CHE303	North Crescent	Duckmanton	Internal flooding recorded for 1 property, probability 2 in 10 years
CHE304	Brook Drive	Brimington	External flooding recorded for 1 property, probability 1 in 10 years
CHE305	Cromford Drive	Staveley	External flooding recorded for 1 property, probability 1 in 10 years
CHE306	Derby Road	St Augustines	External flooding recorded for 1 property, probability 1 in 10 years
CHE307	Dunston Road	Newbold Moor	External flooding recorded for 1 property, probability 1 in 10 years
CHE308	Tapton Way	Calow	External flooding recorded for 2 properties, probability 1 in 10 years
CHE309	Whitehouses	Hasland	External flooding recorded for 1 property, probability 1 in 10 years
CHE310	White House	Hasland	External flooding recorded for 1 property, probability 1 in 20 years
CHE312	Whitehouses	Hasland	External flooding recorded for 1 property, probability 2 in 10 years
CHE311	Brearley Road	New Whittington	External flooding recorded for 1 property, probability 2 in 10 years

5.7.2 *Sewer Flooding in Bolsover*

Isolated locations have been identified by STW and YW that have been prone to sewer flooding in the past; however the mechanism for most of the locations is unknown. For most of these locations, external gardens and roads were affected. These locations are listed in Table 7 and shown on Drawing Nos. 55328/B/HF/O, and 55328/B/HF/01 to /10 in Appendix D.

Table 7: BDC Sewerage flooding

ID	Problem Location	Sub-catchment	Description of problems\comments
BDC37	East View	Langwith Junction	Highway
BDC38	The Bassett	Langwith Junction	External Garden

ID	Problem Location	Sub-catchment	Description of problems\comments
BDC39	Vaughan Place	Langwith Junction	External Garden
BDC41	Central Road	Shirebrook	Highway
BDC42	Chatsworth Avenue	Shirebrook	External Garden
BDC43	Church Drive	Shirebrook	External Garden
BDC44	Elm Tree Avenue	Shirebrook	External Garden
BDC45	Market Close	Shirebrook	Highway & External Garden
BDC46	Portland Road/Market Street	Shirebrook	Highway
BDC48	Recreation Road	Shirebrook	Internal Domestic
BDC49	Gloves Lane	Blackwell	External Public Open Space
BDC50	Victoria Drive	Blackwell	External Garden
BDC51	Barlborough Road	Clowne	Highway
BDC52	Church Lane	Clowne	Public Open Space
BDC53	Hollin Hill Road	Clowne	Highway External Non Domestic
BDC54	Neale Street	Clowne	Highway
BDC55	Southfields	Clowne	Highway & External Garden
BDC56	Elmton Road	Cresswell	External Garden
BDC57	Skinner Street	Cresswell	Highway
BDC58	Devonshire Drive	Langwith	Highway
BDC60	Pool Close	Pinxton	External Garden
BDC61	Church Lane	Pleasley	External Garden
BDC62	Rotherham Road	Scarcliffe	Highway
BDC63	Station Road	Scarcliffe	External Public Open Space
BDC64	Alfreton Road	South Normanton	Highway
BDC65	Birchwood Lane	South Normanton	Highway & External garden
BDC66	Downing Street	South Normanton	External Garden & Internal
BDC67	George Street	South Normanton	External Garden
BDC69	North Close	South Normanton	External Garden & Internal
BDC70	North Street	South Normanton	Highway
BDC71	Brook Street	Tibshelf	Highway & External garden
BDC72	High Street	Tibshelf	External Garden
BDC73	Tibshelf Road	Westhouses	Highway & External Garden
BDC74	Station Road	Whitwell	External Public Open Space
BDC109	Carr Vale Road	Bolsover	External flooding recorded for 1 property, probability 1 in 10 years
BDC105	Main Street	Palterton	External flooding recorded for 1 property, probability 1 in 10 years
BDC104	Manor Court Road	Bolsover	External flooding recorded for 3 properties, probability 1 in 10 years
BDC106	Rylah Hill	Palterton	External flooding recorded for 1 property, probability 1 in 10 years
BDC108	Sutton Hall Road	Bolsover	External flooding recorded for 4 properties, probability 1 in 10 years
BDC107	The Hill	Glapwell	External flooding recorded for 2 properties, probability 1 in 10 years
BDC103	Manor Court Road	Bolsover	Internal flooding recorded for 1 property, probability 1 in 10 years

5.7.3 *Sewer Flooding in North East Derbyshire*

Isolated locations have been identified by STW and YW that have been prone to sewer flooding in the past; however the mechanism for most of the locations is unknown. For most of these locations, external gardens and roads were affected. These locations are listed in Table 8 and shown on Drawing Nos. 55328/NE/HF/O, and 55328/NE/HF/01 to /08 in Appendix D.

Table 8: NEDDC Sewer flooding

ID	Problem Location	Sub-Catchment	Description of problems\comments
NEDDC12	Moor Road	Ashover	Internal Domestic
NEDDC13	Strettea Lane	Higham	Internal Domestic
NEDDC14	Harewood Crescent	Old Tupton	External Garden
NEDDC15	Padley Wood Lane	Pilsley	Internal Domestic
NEDDC16	A61	Shirland	External Public Open Space
NEDDC17	Hallfieldgate Lane	Shirland	External Public Open Space
NEDDC18	Pit Lane	Shirland	External Garden
NEDDC20	Temperance Hill	Woolley Moor	External Garden
NEDDC58	North Crescent	Killamarsh	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC59	Netherthorpe Lane	Killamarsh	External flooding recorded for 6 properties, probability 1 in 20 years
NEDDC60	Netherthorpe Lane	Killamarsh	External flooding recorded for 1 property, probability 1 in 20 years
NEDDC61	Spooner Drive	Killamarsh	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC62	Royale Close	Eckington	External flooding recorded for 2 properties, probability 1 in 10 years
NEDDC63	Campion Drive	Killamarsh	External flooding recorded for 1 property, probability 1 in 20 years
NEDDC64	Southgate	Eckington	External flooding recorded for 1 property, probability 1 in 20 years
NEDDC65	Royale Close	Eckington	External flooding recorded for 1 property, probability 2 in 10 years
NEDDC66	Carr Lane	Dronfield	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC67	Eastfield Road	Dronfield	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC68	Holmley Lane	Dronfield	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC69	Mill Lane	Dronfield	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC70	Mill Lane	Dronfield	External flooding recorded for 2 properties, probability 2 in 10 years
NEDDC71	Green Lane	Dronfield	Internal flooding recorded for 2 properties, probability 1 in 20 years
NEDDC72	Stubley Lane	Dronfield	Internal flooding recorded for 1 property, probability 1 in 30 years
NEDDC73	Carlton Close	Danesmoor	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC74	Cemetery Road	Danesmoor	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC75	Guildford Close	Danesmoor	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC76	Hazel Drive	Wingerworth	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC77	High Street	Claycross	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC78	Market Street	Clay Cross	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC79	Mill Lane	Wingerworth	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC80	Northside	New Tupton	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC81	Shakespeare Street	Holmewood	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC82	Staveley Road	Duckmanton	External flooding recorded for 2 properties, probability 1 in 10 years
NEDDC84	Top Road	Calow	External flooding recorded for 3 properties, probability 1 in 10 years
NEDDC85	Williamthorpe Close	North Wingfield	External flooding recorded for 1 property, probability 1 in 10 years

ID	Problem Location	Sub-Catchment	Description of problems\comments
NEDDC86	Williamthorpe Road	North Wingfield	External flooding recorded for 1 property, probability 1 in 10 years
NEDDC87	Birkin Lane West	Grassmoor	External flooding recorded for 1 property, probability 1 in 20 years
NEDDC88	Bridge Street	Clay Cross	External flooding recorded for 1 property, probability 1 in 20 years
NEDDC89	Joseph Fletcher Drive	Wingerworth	External flooding recorded for 8 properties, probability 1 in 20 years
NEDDC90	Linden Avenue	Clay Cross	External flooding recorded for 1 property, probability 1 in 20 years
NEDDC91	Cemetery Road	Danesmoor	External flooding recorded for 2 properties, probability 2 in 10 years
NEDDC92	Linden Avenue	Clay Cross	External flooding recorded for 1 property, probability 2 in 10 years
NEDDC93	Nethermoor Road	New Tupton	External flooding recorded for 1 property, probability 2 in 10 years
NEDDC94	Northside	New Tupton	External flooding recorded for 2 properties, probability 2 in 10 years
NEDDC95	Pilsley Road	Danesmoor	External flooding recorded for 1 property, probability 2 in 10 years
NEDDC96	Williamthorpe Road	North Wingfield	External flooding recorded for 2 properties, probability 2 in 10 years
NEDDC97	Park Row	Clay Cross	Internal flooding recorded for 1 property, probability 1 in 10 years
NEDDC98	Williamthorpe Road	North Wingfield	Internal flooding recorded for 1 property, probability 1 in 10 years
NEDDC99	Main Road	Cutthorpe	Internal flooding recorded for 1 property, probability 1 in 20 years
NEDDC100	Mansfield Road	Hasland	Internal flooding recorded for 1 property, probability 1 in 30 years
NEDDC101	Williamthorpe Close	North Wingfield	Internal flooding recorded for 1 property, probability 2 in 10 years
NEDDC102	Top Road	Calow	External flooding recorded for 1 property, probability 2 in 10 years

5.8 Groundwater flooding and Surface Water Run-off

The EA do not have any details of historical flooding relating to groundwater. However, they were able to provide a plan showing the location of an outcrop of magnesium limestone (Figure 6, page 48) which is susceptible to groundwater flooding.

> The Environment Agency Midlands Region's East Area does not have any information relating to groundwater flooding issues within the area.

Surface water runoff from natural springs causing flooding to public open space, gardens and paths have been identified in Barlborough and Bolsover (see BDC11, BDC15 and BDC17).

Bainbridge Road in New Bolsover has suffered historical groundwater flooding to grass public open space, footpath & bus shelter areas (see BDC17).

5.8.1 *River Hipper Catchment*

The catchment is predominantly underlain with impermeable rocks of lower and middle coal measures with small area of Millstone Grit in the upper catchment. The catchment standard percentage runoff (SPRHOST) is given as 26.0. The Base Flow Index derived from the hydrology of Soil Types (BFIHOST) is 0.554 (Environment Agency, River Hipper Pre Feasibility Study, March 2005) and is a measure of the proportion of the flow in the river that is attributed to the base flow (i.e. flow in dry weather). A groundwater driven catchment would have a high index and a runoff driven catchment would have a low index. The soil that dominates the Hipper catchment is slowly permeable and seasonally water logged, it suggests the potential for relatively high percentage runoffs. The remaining soils are a mixture of well drained and less well drained soils. The relatively low SPRHOST value given is therefore slightly incongruous.

5.8.2 *River Whitting Catchment*

The catchment standard percentage runoff (SPRHOST) is given as 25.1. The Base Flow Index is 0.536 (Jacobs Babtie flood study audit trail FEH pooling group analysis, River Whitting at Sheepbridge). The geology is Lower Coal Measure sandstones and shales. The FEH catchment descriptors indicate a fairly permeable catchment. The UK Soils map shows the catchment is mainly characterised by slowly permeable seasonally waterlogged soils and disturbed soils, with only some pockets of well-drained soils.

5.8.3 *Barlow Brook Catchment*

The catchment standard percentage runoff (SPRHOST) is given as 29.0. The Base Flow Index is 0.498 (Jacobs Babtie flood study audit trail FEH pooling group analysis, Barlow Brook at Cobnar Wood). The majority of the soils are classed as 'Bardsey Stagnogley Soils' originating from carboniferous mudstone with interbedded sandstone. The soil is described as slowly permeable and seasonally waterlogged in the Soil Survey of England and Wales, suggesting the potential for high percentage runoffs.

This would suggest that the risk of groundwater flooding is low/medium.

5.8.4 *Riddings Brook Catchment*

The catchment standard percentage runoff (SPRHOST) is given as 29.7. The Base Flow Index is 0.454 (Jacobs Babtie flood study audit trail FEH pooling group analysis, Riddings Brook at Newbold moor). The majority of the soils are classed as 'Bardsey Stagnogley Soils' originating from carboniferous mudstone with interbedded sandstone. The soil is described as slowly permeable and seasonally waterlogged in the Soil Survey of England and Wales. The geology of the region is Lower Coal Measure sandstones and shales.

This would suggest that the risk of groundwater flooding is low/medium.

5.8.5 *River Drone Catchment*

The catchment standard percentage runoff (SPRHOST) is given as 18.7. The Base Flow Index is 0.615 (Jacobs Babtie flood study audit trail FEH pooling group analysis, River Drone at Footbridge). The geology is Lower Coal Measure sandstones and shales. The FEH catchment descriptors indicate a faily permeable catchment. The UK Soils map shows the catchment mainly characterised by slowly permeable seasonally waterlogged soils and disturbed soils, with only some pockets of well-drained soils.

This would suggest that the risk of groundwater flooding is low/medium.

5.8.6 *River Doe Lea Catchment*

The soils in the catchment are mainly slowly permeable of mudstone and sandstone origin, with substantial areas of disturbed soil where there are restored opencast coal workings and slagheaps. The density of the drainage network is relatively sparse, perhaps a reflection of the shallow relief, geology and soil type. The flow regime is affected by mine drainage, with a net import of water.

This would suggest that the risk of groundwater flooding is low/medium.

5.8.7 *East of Bolsover*

The principal groundwater bearing geology in the section of the survey area within the Environment Agency East Area Groundwater Team's geographical area are the Cadeby Formation, the Carboniferous Coal Measures and the fluvioglacial deposits, associated with the areas river network. The Cadeby Formation, formerly known as the Lower Magnesian Limestone, is exposed in outcrop in the east of the search area and covers most of the specified survey area in the Environment Agency Midlands Region's East Area geographical area. The Carboniferous Coal Measures are exposed in outcrop to the west of the Cadeby Formation. The geological beds dip from west to east at an angle somewhere between 1 – 3 degrees such that the Cadeby Formation is underlain by the Coal Measures.

This would suggest that the risk of groundwater flooding is medium/high.

The Environment Agency does not monitor groundwater levels within the Carboniferous Coal measures and therefore has no groundwater level data for them. The Environment Agency does record groundwater level data for the Cadeby Formation and groundwater contours for this are presented on the map in Figure 6.

5.9 Other sources of flooding

Locations at risk of other sources of flooding including artificial sources, surface water run-off, land drainage, flooding form structure failures, flooding form highways and a combination of any of the above sources has been identified within Chesterfield, Bolsover and North East Derbyshire. Details of each location can be found in Appendix A. A reference number on the register relates to the historical flooding drawings in Appendix D.

5.9.1 *Other Sources of Flooding in Chesterfield*

Throughout Chesterfield there are many locations at risk of land drainage (see CHE162, CHE163, CHE159). Staveley Road in Poolsbrook (see CHE165) can be flooded due to land drainage runoff. The mechanism is unknown

There are lots of locations flooded due to inadequate capacity of culverts causing flooding to road and properties (see CHE1, CHE4, CHE5).

5.9.2 *Other Sources of Flooding in Bolsover*

Shirebrook at the east of Bolsover is an area that has historically been at risk of flooding from surface water run-off (see BDC40). East of Shirebrook excessive surface water run-off from the former coal tip often forces the closure of Sookholme Road and presents problems for the farming community at Sookholm (see BDC08). Runoff from fields and highways caused flooding problems to properties on Elm Tree Avenue in November 2000 and June 2007 (see BDC30).

In South Normanton (south Bolsover) there were incidents of surface water runoff from playing fields and public open spaces causing flooding to several properties (see BDC31). Inadequate capacity and blockages of culverts also presented problems to open spaces and car parks in the area (see BDC32, IBDC33 and BDC27).

In Clowne, the flooding problems appear to be related to inadequacies with the culverts and are, therefore, fluvial in nature. There are a number of sewer related flooding incidents as discussed above. In addition, there is a potentially significant risk from Harlesthorpe Dam.

5.9.3 *Other Sources of Flooding in North East Derbyshire*

In NEDDC there were not many incidents of flooding from other sources. The majority of them were due to surface water runoff (see NEDDC19, NEDDC10, NEDDC08).