



Data Collection

3 Data Collection

A primary task of the SFRA is to evaluate all existing data, identifying any gaps or inadequacies in the datasets. The data collected and analysed has been used to inform the SFRA. A summary of the key data sets is presented below

3.1 Flood Zone maps

The Flood Zone maps are described in Chapter 2. These maps were obtained from each LPA in GIS format. The Flood Zone maps are supplied to the LPAs by the Environment Agency and they describe areas considered to be at a potential risk from fluvial flooding.

3.2 Topography

Light Detection and Ranging (LiDAR) data was available for all of the Chesterfield area but only small parts of the Bolsover and North East Derbyshire districts. The Environment Agency procures LiDAR data and has provided it to Faber Maunsell for use in this study. The LiDAR extent available covered the majority of the main rivers and the main urban areas.

The LiDAR data has a vertical accuracy of +/- 0.25m and the intention was to use the data to map fluvial flood extents for the climate change scenario (based on flood data provided by the Environment Agency models).

3.3 Hydraulic Models

Hydraulic models are constructed to accurately estimate flood levels within a river catchment. Existing hydraulic models available within the study area were requested in order to determine the following:

- The extent of the functional floodplain
- The extent of Flood Zone 3 (areas at risk from up to the 1 in 100 year fluvial flood)
- The extent of Flood Zone 2 (areas at risk from between the 1 in 100 and 1 in 1000 year fluvial flood)
- The likely effect of climate change.

Two separate hydraulic ISIS models are available within the study area and have been provided by Halcrow (on behalf of the EA). One model covers the River Rother upstream of Whittington gauging station, River Hipper, Holme Brook and the unnamed watercourse at Storforth Lane. The second model covers the River Doe Lea and its tributaries the Pools Brook and Hawke Brook.

The hydraulic models have been used to define the extent of the functional floodplain, where this data was available. Functional floodplain is defined as areas being at risk from the 1 in 20 year return period storm. The hydraulic models contained the 1 in 25 year return period storm, which was considered suitable for this exercise.

It was intended to use the hydraulic models to define the extent of Flood Zone 3 and predict the likely affect of climate change; by increasing the flow by 20%. The results from the hydraulic models were analysed and compared against the 100 year flood levels supplied by the EA. It was determined that the flood levels taken from the model did not correlate with the flood levels provided by the EA (in general the EA figures were significantly higher). The flood levels predicted by the Halcrow model are less conservative than those from the EA due to the incorporation of flood alleviation schemes and flood defences which change the hydraulics of the system. The EA confirmed that, as the information provided by the EA represents a more conservative estimate, this data should be used to define Flood Zone 3 and not the hydraulic models. Also, as no matching base data has been made available for comparison it has been deemed inappropriate to use the models to predict the likely affect of climate change (as the results would indicate a reduction in flood risk rather than an increase).

There was no modelling available for the 1 in 1000 year storm and, as such, the Environment Agency's Flood Zone 2 map has been used. Flood extents from the June 2007 flood were provided by Chesterfield Borough Council and it has been confirmed by the EA that these

extents will now define the Flood Zone 2 outline. However, it should be noted that the flood extents have been obtained by aerial photography only and may not take account for secondary factors such as blocked culverts etc. As such, these flood extents should be used with caution.

3.4 Flood Alleviation Schemes

The following proposed flood alleviation schemes are currently at a feasibility stage:

- Tin Wood on the River Hipper
- The Avenue Project on the River Rother

Future flood alleviation schemes should not be considered when assessing current flood risk policy as there is no guarantee they will go forward to completion or what standard of protection will be ultimately provided. It will be the responsibility of the developer to review the status of ongoing flood alleviation schemes.

In respect of the Avenue site it is proposed that there will be remediation works within the functional floodplain and eventually the construction of an earth embankment dam that will create a flood storage area.

For both the Tin Wood and Avenue site the functional flood plain could be subject to change as a result of future work.

3.5 Historic flooding

Historic flooding information has been collected from a variety of sources as follows:

- Interviews with LPA drainage engineers for Chesterfield, Bolsover and North East Derbyshire
- Environment Agency records
- June 2007 flood extents (provided by the EA)
- High level DG5 data from Severn Trent Water and Yorkshire Water (see section 3.9.3)

Details of historical flooding and flood risk locations are reviewed in Chapter 5 and Appendix A.

3.6 Defences

The Environment Agency's National Flood and Coastal Defence Database (NFCDD) is considered to be the primary source of flood defence and asset survey information. NFCDD is able to provide details of the type and location of flood defences within the catchment, together with their associated design standards of protection, age, physical condition and the parties responsible for ownership and operation.

As well as raised defences (e.g. earth embankments) the NFCDD information received also holds spatial and descriptive data on culverts, flood defence structures (e.g. weirs), maintained channels and non flood defence structures (e.g. pipe crossings). The natural river banks for the main rivers are also given a return period standard of protection (see glossary) and in some cases a bank height.

The location and extent of raised man-made flood defences across the catchment are illustrated on the following drawings:

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

The remaining assets and structures are shown on the following drawings:

Drawing Name	Drawing Number
Assets - Chesterfield	55328/C/AS/O
Assets - Bolsover Overview	55328/B/AS/O
Assets - Bolsover Area 01	55328/B/AS/01
Assets - Bolsover Area 02	55328/B/AS/02
Assets - North East Derbyshire Overview	55328/NE/AS/O
Assets - North East Derbyshire Area 01	55328/NE/AS/01

The majority of the defences are along the River Whitting, River Hipper, River Rother and River Doe Lea, and are located at the main flood risk areas such as Chesterfield. The types of defences include steel piled walls, concrete walls, retaining walls, flood walls, and concrete or earth embankments.

The majority of the defences within the study area have an indicative standard of protection (SoP) of either 30 or 50 years, which means that none of these defences meet the 1 in 100 year standard of protection from fluvial flooding. As such, in planning terms, developments behind these defences, which are located in Flood Zone 3, cannot be treated any differently due to the presence of the flood defence (as they are still at risk from the 1 in 100 year flood). However, the defences will reduce the frequency of flooding at these development sites.

The NFCDD data provided by the Environment Agency needs to be treated with extreme caution. This system has a vast amount of data that has been uploaded but will require verification. The Standard of Protection (SoP) is a target standard for maintenance and inspection of man-made structures or raised ground. In some cases the input data for the SoP is displayed as a 1 in 100 year standard, which is a system default unless altered. Examples of this error are on Aftreton Brook and the River Drone in NEDDC area. For site-specific FRAs verification must be sought from the Environment Agency for any SoP value displayed in this SFRA.

3.7

Flood warning

The Environment Agency operates a fluvial flood warning service for the River Rother covering Chesterfield, the western part of Bolsover and the northern part of North East Derbyshire. A study reviewed the flood warning arrangements for the River Rother catchment and proposed new Flood Warnings was prepared by the EA in November 2003 and was updated in light of June 2007 flooding. During the course of the study, telemetry stations were installed. The Upper Rother study mapped outlines for return periods as short as 5 years. Trigger levels for Flood Watch, Flood Warning and Severe Flood Warning have been set using hydrographs from the Don Catchment Flood Model.

The flood warning service includes the following watercourses: River Rother upstream of Whittington, River Hipper, Holme Brook and River Doe Lea and tributaries upstream of Staveley, River Erewash and Pinxton. The flood warning area extends between Birdholme and Killamarsh and consists of properties, industrial units, and agricultural land. This fluvial flood warning area ends before Meadowgate Lake at Killamarsh.

Table 5 summarises the Flood Warning service provided by the Environment Agency in the CBC, BDC and NEDDC areas, with the locations shown on the EA Figures in Appendix D.

Table 5: Flood Warning Areas in Chesterfield, Bolsover and NE Derbyshire

Flood Warning Area Code	Flood Warning Area	River/Brook	Return Period
RW477U	Holme Brook at Ashgate	Holme Brook	100
RW476U	River Hipper at Central Chesterfield	River Hipper	100
RW463U	River Rother at Tapton	River Rother	100
RS462	River Rother at Central Chesterfield	River Rother	50
RS469	River Rother at Killamarsh	River Rother	100
RS475	River Hipper at Brampton	River Hipper	75
RW460	River Rother at Birdholme	River Rother	100
RW461	River Rother at Central Chesterfield	River Rother	10
RW463	River Rother at Tapton	River Rother	10
RW464	River Rother at Brimington	River Rother	100
RW465	River Rother at Staveley Business Centre	River Rother	100
RW466	River Rother at Renishaw	River Rother	100
RW467	River Rother at Killamarsh	River Rother	100
RW476	River Hipper at Central Chesterfield	River Hipper	25
RW477	Holme Brook at Ashgate	Holme Brook	25
RW478	River Whitting at Old Whittington	River Whitting	100
RW479	River Drone at Dronfield and Unstone	River Drone	100
RW480	River Doe Lea at Bolsover Coking Works	River Doe Lea	5
034 FVF ER1	River Erewash at Pinxton	River Erewash	5

Telemetered river gauging sites are linked to the fluvial flood warning service. Information gathered from these gauges informs the flood warnings issued via Floodline Warnings Direct (FWD) to emergency services, Parish Councils, businesses and households in flood-prone locations.

The areas at risk are identified by the Environment Agency's Flood Zone maps, current flood warning areas can be seen on the EA Figures in Appendix D.

3.8

Other related plans and strategies

The LPA's policies, proposals and development sites within the DPD should aim to be consistent with a range of other related plans and strategies. Further details will be contained on the LPA's Sustainability Appraisal Scoping Report. In terms of flood risk, the key additional plans that should be considered are:

3.8.1

Catchment Flood Management Plans

Catchment Flood Management Plans (CFMPs) are high-level strategic planning tools through which the Environment Agency works with other key decision-makers within a river catchment to identify and agree policies for sustainable flood risk management. Ultimately all areas within England and Wales will have a long-term flood risk management policy.

The Environment Agency is preparing CFMPs for all river catchments within England. These set out the broad level of flood risk posed to development, communities and assets and also apply a broad scale policy for managing this risk in each catchment in the short, medium and long term.

CFMP for Don Valley (neighbouring council) has been published.

The EA stated there is no CFMP covering the CBC, BDC and NEDDC currently available.

3.8.2

River Basin Management Plans

The Water Framework Directive requires the production of River Basin Management Plans (RBMPs) across the UK. These plans require assessment under the Strategic Environmental Assessment Directive (2001/42/EC) to identify wider effects on the environment.

The Environment Agency is also responsible for preparation of RBMPs in accordance with the Water Framework Directive. These documents are a critical source of information for spatial planners considering the flood risk implications of new development.

The EA stated there is no RBMP covering the CBC, BDC and NEDDC currently available.

3.8.3 *Strategic Flood Risk Assessments (SFRA)*

A SFRA for the neighbouring council of Mansfield is currently being undertaken and could become a planning consideration for future developments. The Peak District National Park Authority is also commissioning a SFRA jointly with Derbyshire Dales District Council and High Peak Borough Council.

3.9 **Data collection for other sources of flood risk**

Different bodies were contacted for information on other sources of flood risk:

3.9.1 *Groundwater Flooding*

The Environment Agency does not have any records of historical flooding from ground water. However, they were able to provide a plan showing an outcrop of magnesium limestone in the area, which can be susceptible to groundwater flooding. This plan can be found in Figure 6.

3.9.2 *Land Drainage*

This information was obtained from engineers from within Chesterfield Borough Council, Bolsover District Council and North East Derbyshire District Council.

3.9.3 *Sewerage*

Severn Trent Water and Yorkshire Water were contacted for information on historical flooding from sewers. Both water companies maintain a register of locations that have experienced sewer flooding, called a DG5 register. Severn Trent Water is responsible for sewerage of parts of North East Derbyshire and Bolsover within the study area with Yorkshire Water responsible for Chesterfield, and parts of North East Derbyshire and Bolsover. Severn Trent is responsible for water supply only.

It should be noted that water companies carry out a programme of upgrades based on their DG5 register and, as such, properties currently on the register may already be subject to mitigation works, which would alleviate the flooding problems.

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

3.9.4 *Canals*

British Waterways (BW) were contacted for information on flood risk from canals. BW stated that they do not own or maintain any of the canals in Derbyshire and they have no records relating to Chesterfield Canal.

The Derbyshire County Council were contacted for information on Chesterfield Canal and other water bodies. The Canal is owned by the Derbyshire County Council and is maintained and protected by the Chesterfield Canal Partnership. The Chesterfield Canal Trust is a founder member of the Chesterfield Canal Partnership. This is made up of:

- Derbyshire County Council,
- Chesterfield Borough Council,
- North East Derbyshire District Council,
- Rotherham Metropolitan Borough Council,
- Bassetlaw District Council,
- Nottinghamshire County Council,
- British Waterways,
- statutory and non-statutory bodies,
- the voluntary sector and private enterprise.

There is a short and unconnected stretch of the former Cromford Canal at Pinxton within Bolsover District. There is a mix of Derbyshire County Council (DCC), British Waterways, private landowners, wildlife trusts and British Coal who are the landowners throughout the length of the canal from Cromford to Langley Mill, and up the arm to Pinxton. DCC have

managed the canal since the mid 1970's. Since then, there has been only one overtopping incident which was in 1989 at a point approximately two miles south of Cromford. Fortunately this did not result in a breach of the canal, but a breach did occur here in the 1920s.

Derbyshire County Council gave a general description for the flooding history of the Chesterfield Canal. The Chesterfield Canal Trust has restored a section between Chesterfield and Staveley. The restored Chesterfield Canal commences at St Helena's Weir in Chesterfield (immediately north of the Arnold Laver site). A weir and secondary overflow weirs regulate the water depth here. A single flood gate adjacent to St Helena's Bridge controls entry to the canal. This flood gate is normally kept closed and water is admitted to the canal via a penstock and culvert with a controlling water regulator. The gate opens into the water flow so it is forced shut by floodwater and thus cannot be opened under flood conditions.

The Canal then follows the eastern edge of the River Rother flood plain for the rest of its journey to Staveley. It accommodates the fall of the river valley floor by means of five locks. These are located at Tapton, Wheeldon Mill (Brimington), Bluebank, Dixons and Hollingwood. At no point is the canal more than 2 to 3 m above the river level and there is no settlement between the canal and the river. The River Rother water abstracted at Chesterfield is returned to the River Rother via a side weir at Staveley. An additional storm flow weir can be found at Tapton (discharging to the Tinker Sick and thence to the Rother).

The canal has no history of flooding. During the major flood events of 2007 the canal did take exceptional volumes of water. Some did come via the flood gate at St Helena's which was overtopped for a very brief period, however, the vast majority came directly from rainfall and from surface water (overland) flow into the canal channel. During the period the by weirs of the canal performed well taking excess water around the locks as they are designed to. No damage was recorded to the lock structures although some of the by weir channels suffered scour and bank undercutting and required remedial work. At no point did the canal overtop and create flooding in the surrounding areas.

Since restoration commenced in the 1990 there was only one breach on the canal – at Tinker Sick in November 2007. This was caused by partial failure of a culvert which was already on the "to be replaced list". The water discharged into the Tinker Sick brook and no damage was done to landscape or property. The majority of the canal between Chesterfield and Staveley has been rebuilt since 1998 and is well maintained.

The LPAs were contacted for information on other sources of flood risk. This information is summarised in Chapter 5.

3.10

Data deficiencies

A register of all the data collected can be found in Appendix C. The database provides information of where the data has come from, type of data, date and the owner of the data. Some information is also provided on the quality and relevance of the data.

The SFRA aims to use the best available data to undertake a strategic assessment of levels and extents of flood risk. Some locations in the UK have more detailed and extensive data than has been produced in the past.

Below is a summary of the major pieces of information on flooding which are missing from the study area and recommendations of future work that could be undertaken to address some data deficiencies.

3.10.1

Catchment Flood Management Plan (CFMP)

A CFMP was requested from the EA but it was confirmed that there are none currently available for the study area. The EA are producing CFMPs for the whole country and this information should be reviewed when it becomes available.

3.10.2

River Basin Management Plan

Again, this was requested from the EA but not provided as part of the study. Once this information becomes available it should be assessed to see if there are any likely impacts on development along the river corridors.

3.10.3

Hydraulic Models

The existing models provided by the EA cover the majority of the main rivers in the catchment; River Rother, River Hipper, River Whitting, River Doe Lea. In addition, they also provide flood levels for some minor watercourses such as sections of the River Drone, Pools Brook, Riddings Brook, Holme Brook and Barlow Brook.

All the major watercourses in Chesterfield are covered by hydraulic models with the exception of the reach of the River Rother downstream of Works Road and the reach of the River Drone upstream of The Brushes. Also, there are several minor watercourse and land drains such as Trough Brook and sections of Barlow Brook and Riddings Brook where no flood level data exists.

In Bolsover, the only available model data covers the River Doe Lea and an un-named tributary north of Shuttlewood.

The only available model data for North East Derbyshire includes the section of the River Hipper through Holymoorside.

The following areas have proposed developments but little or no hydraulic modelling information:

- Chesterfield – Most areas covered
- Bolsover – Clowne
- North East Derbyshire – Dronfield and Unstone, Eckington, Renishaw and Killamarsh

Hydraulic modelling will be required for these areas to confirm flood levels and required finished floor levels.

3.10.4

Reservoirs and Canals

PPS25 requires an assessment of flood risk from all sources. Many potential developments will have to assess flood risk for un-modelled artificial sources such as reservoirs and canals.

Detailed reservoir Flood Risk Assessments may be a requirement in the near future. These assessments will help assess flood risk to potential developments downstream of reservoirs.

A detailed reservoir assessment may be required if any of the following statements are true:

- Reservoir is just below 25,000m³ threshold and, as such, is not covered by the Reservoir Act (1975)
- Proposed development downstream of the reservoir is sufficient to increase the class of reservoir (i.e. would put more people at risk than the current design allows);
- Unknown or riparian owner unlikely to maintain to required standards;
- Evidence of potential structural failure or instability.

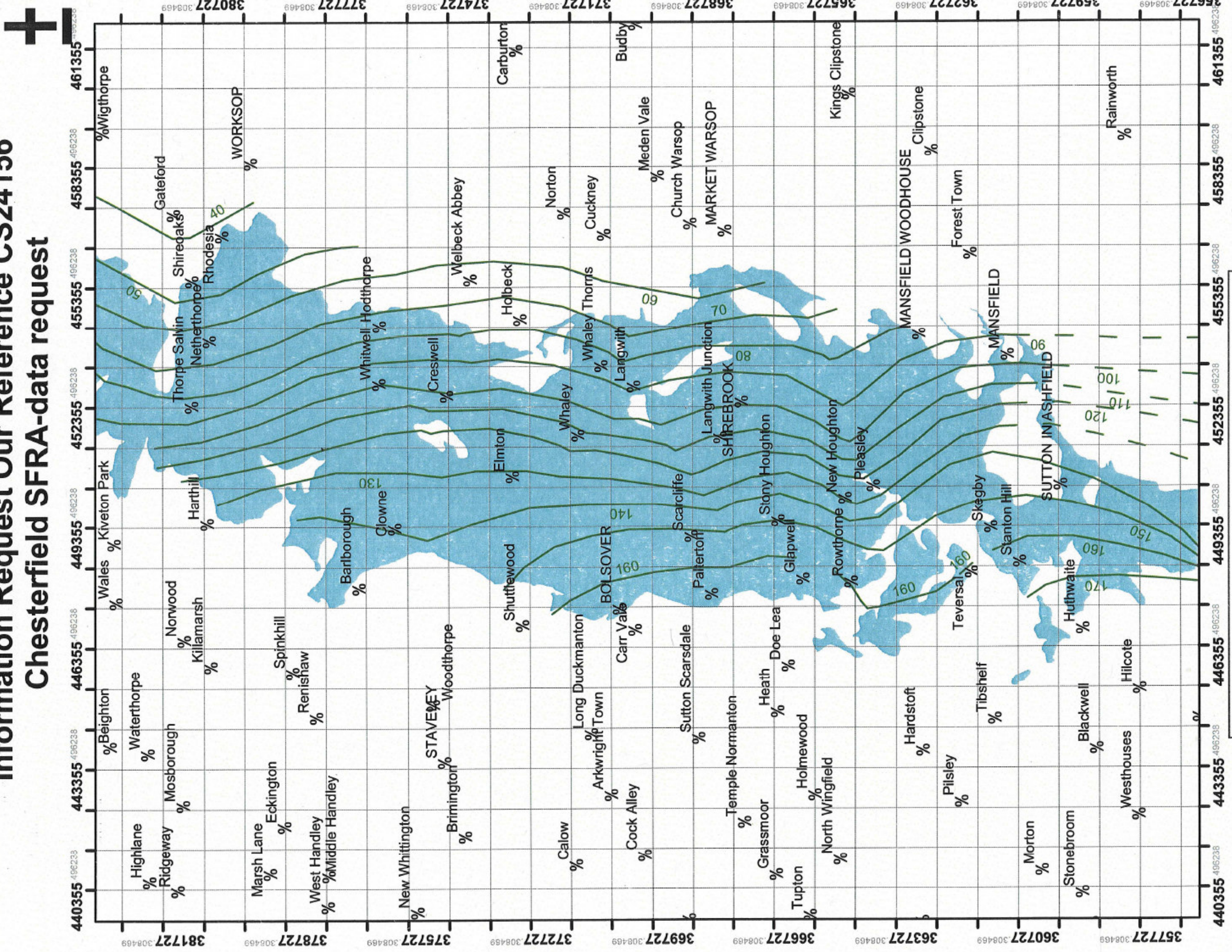
3.10.5

Additional Information

Where other agencies have not provided data, they will continue to be consulted as a statutory consultee in the LDF process. These agencies will have the opportunity to bring forward additional data in due course. This information could be used to inform future updates of this SFRA.

Figure 6: Groundwater Vulnerability Plan

Information Request Our Reference CS24156 Chesterfield SFRA-data request



Legend

- Unconfined Magnesian Limestone
- - - Confined Magnesian Limestone
- Magnesian Limestone Outcrop Area as determined by Groundwater Management Units

Scale 1:125,000

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