

Appendix B - Data sources used in the SFRA

1 Historical Flooding

Essex County Council provided recorded flood incidences and Section 19 reports in the area. The majority of recorded flood incidences are located within the city centre, although most of these records date from between 2006-2010, and the source of flooding for each incident is not recorded. 3 Section 19 reports have been completed within Chelmsford:

- Stock, July 2014- high intensity rainfall caused surface water flooding in the centre of Stock.
- Bicknacre, November 2012- intense rainfall caused surface water flooding and overtopping of an ordinary watercourse at White Elm Road, Blenheim Close and Peartree Lane.
- Danbury Vale, 2012- persistent surface water flooding due to highway drainage systems capacity being exceeded.

The Environment Agency's Historic Flood Map is also presented in Appendix A: GeoPDF Mapping.

Section 5.1 documents historic flooding records within the study area.

2 Fluvial flooding

2.1 Flood Zones 2 and 3a

Flood Zones 2 and 3a, as shown in the Appendix A mapping, show the same extent as the online Environment Agency's Flood Map for Planning (which incorporates latest modelled data) as all modelled data used in this SFRA has been fully incorporated into the EA Flood Zones.

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

2.2 Flood Zone 3b (the Functional Floodplain)

Flood Zone 3b, is based on the 3.3% AEP (1 in 30-year chance of flooding in any given year) extents produced from Environment Agency detailed hydraulic models where outputs were available .

For areas not covered by detailed EA models (or where suitable outputs were not available), 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 (or Flood Zone 3b derived from 2D generalised modelling), 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 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.

3 Climate change

Detailed Environment Agency hydraulic models were obtained under licence for the SFRA. Where previous climate change runs were not suitable these models were re-run with the latest 2021 climate change allowances for the 2080's central and/or high central estimates as required. It should be noted that the EA climate change guidance was further updated in May 2022. The following sections provide details of the models which were re-run.

Where there were no detailed models available, or the existing models could not be re-run with the updated climate change guidance, Flood Zone 2 has been used as an indication of climate change.

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

3.1 Chelmer

The River Chelmer, flowing through Chelmsford, is represented by the Environment Agency's ISIS/TUFLOW hydraulic model (2020). This model was re-run for the 3.3% and 0.1 AEP events with the updated climate change guidance released by the Environment Agency in July 2021 for the central and higher central (+25% and +38%) estimates. The existing 1% AEP scenarios (+25%, +35% and +65%) were used to inform the assessment.

3.2 Chelmer Tributaries

Tributaries of the River Chelmer (Church Hill ditch, and watercourses at Godfrey Way, Great Baddow, Olives Wood, Roxwell and Woodham Water), are represented by a series of small Environment Agency 1D-2D ESTRY-TUFLOW hydraulic models (2020). The existing 1% AEP scenarios (+25%, +35% and +65%) were used to inform the assessment. No additional scenarios were run for the Level 1 SFRA, however further events, including climate change scenarios for the 3.3% and 0.1% AEP events may be undertaken as part of the Level 2 SFRA if necessary to inform the risk to sites.

3.3 Crouch

The Environment Agency's River Crouch Model covers the River Crouch along the southern boundary of Chelmsford. The original model was a 1d ISIS model, constructed in 2007, which was then subsequently converted into a linked 1D-2d model using Flood Modeller (ISIS)- TUFLOW. The downstream boundary of the model is tidal, and climate change scenarios include an allowance of 1.24m sea level rise.

This model was re-run for the 3.3% and 0.1% AEP events with the updated climate change guidance released by the Environment Agency in July 2021 for the central and higher central (+25% and +38%) estimates. The existing 1% AEP scenarios (+25%, +35% and +65%) and 0.1% AEP (+25%) scenarios were also used to inform the assessment.

3.4 Rettendon Fen

Rettendon Fen Brook is represented by a 1D ISIS model constructed in 2014. This model was re-run for the 3.3% and 1% AEP event with the updated climate change guidance released by the Environment Agency in July 2021 for the central and higher central (+25% and +38%) allowances.

3.5 Sandon Brook

Sandon Brook is a tributary of the River Chelmer draining an area to the south and east of Chelmsford, represented by a 1D ISIS model constructed in 2015. This model was re-run for the 3.3% and 1% AEP event with the updated climate change guidance released by the Environment Agency in July 2021 for the central and higher central (+25% and +38%) allowances.

4 Surface water flooding

Mapping of surface water flood risk in the study area has been taken primarily 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 illustrate the flood risk more accurately at a site-specific scale. The latest climate change allowances have been applied to the 1% and 3.3% AEP surface water events as part of this assessment.

5 Groundwater

Mapping of groundwater flood risk has been based on the Areas Susceptible to Groundwater Flooding 2010 (AStGWF) dataset and the JBA Groundwater Flood Risk map.

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.

The JBA Groundwater Flood Risk map shows groundwater flood risk on a 5m square grid. For each grid cell, a depth range is given for modelled groundwater levels in the 100-year return period flood event. It takes into account factors including topography, groundwater recharge volumes and spatial variations in aquifer storage and transmission properties.

Section 6.5 of the Main Report explains groundwater flooding.

6 Sewers

Historical incidents of flooding are detailed by Anglian Water through their Historic Sewer Flooding Records. The Historic Sewer Flooding database records were not available for use in this study.

7 Reservoirs

The risk of inundation because of reservoir breach or failure of reservoirs within the City of Chelmsford has been mapped using the outlines produced as part of the National Reservoir Flood Mapping (RFM) study, and are shown online on the [Long-Term Risk of Flooding website](#) at the time of publication.

The Environment Agency provide two flooding scenarios for the reservoir flood maps: a 'dry-day' and a 'wet-day'. The 'dry-day' scenario shows the predicted flooding which would occur if the dam or reservoir fails when rivers are at normal levels. The 'wet-day' scenario shows the predicted worsening of the flooding which would be expected if a river is already experiencing an extreme natural flood.

Section 5.9 of the Main Report presents the reservoirs affecting the City of Chelmsford.

8 Flood Defences

The Environment Agency supplied the location of all flood defences within the district in their AIMS database, including information relating to the type of flood defence and their standard of protection. The Areas Benefitting from Defences shapefile was also considered. Chapter 6 of the Main Report provides information on flood defences and schemes.

9 Overview of supplied data

Overview of supplied data for the Stratford on Avon SFRA from stakeholders is as follows:

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
	Section 19 Reports	Essex County Council
	Historic flooding incident records	Essex County Council, Chelmsford City Council Council, Canals and River Trust, Highways, Anglian Water
Fluvial (including climate change)	Chelmer (2020)- 1D-2D FM-TUFLOW Hydraulic Model Chelmer Tributaries (2020) 1D-2D FM-TUFLOW Hydraulic Model Wid & Crouch Tributaries 2018- four Hydraulic Models: Doddinghurst and Kingsman Farm Ditch 1D-2D; Ingatestone & Shenfield 1D ISIS Sandon Brook (2015)- 1D ISIS Hydraulic Model Rettendon Fen Brook (2014) 1D ISIS Hydraulic Model Crouch (2017) 1D-2D FM-TUFLOW Hydraulic Model Crouch & Roach (2018) Coastal Model	Environment Agency
	Flood Map for Planning Flood Zones	Environment Agency
Surface Water	Risk of Flooding from Surface Water dataset	Environment Agency
Sewers	Internal and external historic drainage records	Anglian Water

Groundwater	Areas Susceptible to Groundwater Flooding dataset Bedrock geology/superficial deposits datasets (online dataset)	Environment Agency
	Groundwater Flood Risk Map	JBA
Reservoir	National Inundation Reservoir Mapping (Long term flood risk map)	Environment Agency
Flood Defences	Location and description of flood defences	Environment Agency
Cross-boundary impacts	Neighbouring authority sites and Local Plan information, to help assess cross-boundary impacts and the cumulative impact assessment	Braintree District Council, Basildon Borough Council, Brentwood Borough Council, Epping Forest District Council, Maldon District Council, Rochford District Council, Uttlesford District Council
Other datasets	Partner Data Catalogue: <ul style="list-style-type: none"> - Source Protection Zones - Aquifer Designation Maps - Areas Susceptible to Groundwater Flooding - Detailed River Network - Flood Alert Areas - Flood Warning Areas - Flood Maps for Planning - Groundwater Vulnerability - Historic Flood Map - Risk of Flooding from Rivers and Sea 	Environment Agency (via Essex County Council)