Appendix B - Data sources used in the SFRA

1 Historical flooding

Essex County Council provided information on historic flood incidents across the study area. The Environment Agency's (EA's) Historic Flood Map is also presented in Appendix A: GeoPDF Mapping and the EA's Recorded Flood Outlines dataset has also been used to understand the flood history across the study area.

Section 4.1 of the Main Report documents the historic flooding records obtained.

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 EA's Flood Map for Planning (FMfP) (which incorporates latest modelled data). 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.

The following models are included in the EA's FMfP Flood Zones 2 and 3a, and therefore have been incorporated into this SFRA:

- Upper Roding
- Upper Middle Stort
- Stort Tribs (Stickling Green Brook)
- Stansted Mountfitchet
- Chelmer - Upper
- Chelmer - Tribs
- Upper Blackwater
- Cam
- Cam Rural Model (Phase 2 Slades)

2.2 Flood Zone 3b (the Functional Floodplain)

Functional floodplain is land where water has to flow or be stored in times of flood (greater than 3.3% Annual Exceedance Probability (AEP)), and has been identified in discussions with Uttlesford District Council (UDC) and the EA.

Flood Zone 3b, as shown in Appendix A mapping, has been compiled for the study area as part of this SFRA and is based on the 3.3% AEP (1 in 30-year chance of flooding in any given year) extents produced from detailed hydraulic models, where

available, which is in line with the recent updates to the Planning Practice Guidance (PPG).

The 3.3% AEP modelled flood extents have been used to represent Flood Zone 3b, where available. 3.3% AEP extents were available for the following models:

- Chelmer
- Roding
- Blackwater
- Stort Tributaries (Stickling Green Brook)
- Chelmer Tributaries (Olives Wood and Godfrey Way in Great Dunmow)

For areas covered by detailed models, but with no 3.3% AEP output available, the 2% AEP (1 in 50 years) outputs were used as a worst-case proxy. This was the case for the following models:

- Cam Rural (including the Slade)
- Stansted Mountfitchet

For the Upper and Middle Stort model, only the 5% or 1% AEP events were available, therefore Flood Zone 3a has been used as a conservative proxy.

For areas not covered by detailed hydraulic 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 (1% AEP). If development is shown to be in Flood Zone 3a, further work should be undertaken as part of a detailed site-specific FRA to define and refine the extent of Flood Zone 3b where no detailed modelling exists. Caution should also be applied where the conservative Flood Zone 3b extent encompasses existing urban areas which would not otherwise be "designed to flood".

If the area of interest is located somewhere that shows 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 Surface water flooding

Mapping of surface water flood risk in the study area has been taken from the Risk of Flooding from Surface Water (RoFSW) maps published online by the EA. 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 EA, and any potential developers to focus their management of surface water flood risk.

The RoFSW 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 3-1: RoFSW 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.

Whilst the categories in Table 4-1 are used in the national RoFSW mapping, we have used the following approach to inform the sequential test.

To inform the Sequential test for this SFRA, surface water zones have been used to define locations at either lower or higher risk of surface water flooding based on the extent of the 1% AEP plus 40% climate change allowance surface water event:

- Zone A – lower risk of surface water flooding (lies outside the 1% AEP plus 40% climate change surface water extent)
- Zone B – higher risk of surface water flooding (lies within the 1% AEP plus 40% climate change surface water extent)

Although the RoFSW 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 EA 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.

4 Climate change

4.1 Fluvial flooding

Detailed EA hydraulic models were obtained under licence for the SFRA.

Uttlesford District falls across four different Management Catchments: Cam and Ely Ouse; Combined Essex; Roding, Beam, and Ingrebourne; and Upper Lee. As each Management Catchment has different climate change allowances, the allowances for the 2080s epoch vary for the different watercourses across the study area. This is detailed further in Section 5 of the Main Report.

A pragmatic approach to climate change was proposed to the EA for the Uttlesford L1 SFRA in 2021. No new climate change modelling has been carried out as part of this L1 SFRA based on the following justifications:

- For all EA models provided, there is at least one existing climate change model output, and for one model there are all three outputs for the 2080s pre-July 2021 allowances.
- The majority of updated 2021 catchment climate change allowances are lowered (the only increase is Chelmer and Blackwater Upper End, though the focus for FRAs is now on the Central allowance in the new guidance).
- There is a minor difference on the whole between Flood Zone 3 and Flood Zone 2 extents. Modelling climate change would show minimal difference as the extents would fall between these scenarios – all watercourses are in their headwaters with confined topography, and therefore negligible difference would be seen in the mapping. This approach was agreed in the previous L1 SFRA, and allowances have since decreased further, meaning Flood Zone 2 is a conservative indication.
- Climate change flows in the 2016 L1 SFRA were compared with the 0.1% AEP extent (Flood Zone 2) and were shown to be contained within the 0.1% AEP extent. The flows are lower again with the latest guidance.
- The focus in the latest guidance for the vulnerability of developments is on Central allowance. The previous 1% AEP +20% climate change event covers the majority of the models' Central allowances conservatively.

4.1.1 3.3% AEP (Functional floodplain - Flood Zone 3b)

Where model data is present for the 3.3% AEP event with climate change scenario (e.g. the River Chelmer), this has been used in preference.

Where there is no available 3.3% AEP event with climate change, a pragmatic proxy approach has been used in agreement with the EA. Where model data was available, this involved looking at the model inflows, and aligning a 3.3% AEP + CC (Central) event with the nearest representative return period output, to act as a more accurate proxy, rather than defaulting to FZ3a which may be more conservative. As the table shows below, in some cases this better aligned with a 2% or 1.3% AEP event. Chapter 5 of the L1 SFRA and Chapter 4 of the L2 SFRA provide details of the events chosen for each model. The flood extents of the chosen return period events were merged to form a composite proxy.

Where there was no modelling present, the proxy defaults to Flood Zone 3a of the EA's FMfP, and for Ordinary Watercourses where there is no national mapping available, the 1% RoFfSW dataset has been used as a proxy to infer risk.

It should be noted that at site-specific Flood Risk Assessment stage, detailed hydraulic modelling may be needed to confirm the effects of climate change on the functional

floodplain, but this is deemed a pragmatic approach for the strategic assessment of sites.

4.1.2 1% AEP (Flood Zone 3a)

Where model data is present for the 1% AEP event with climate change scenario, this has been used in preference. Table 5-4 below shows a summary of which event has been used for each model. For some models where only the +20% allowance was available, this was replicated for both the Central and Higher Central allowance. This means for the Central allowance, the +20% allowance is conservative for some models and more closely represents the Higher Central allowance. The Chelmer, Chelmer Tributaries and Blackwater have more representative allowances already run. For the Roding model, as the Central allowance (+26%) was above an acceptable tolerance to use the existing +20% output, the EA requested that Flood Zone 2 was used to represent climate change.

These outputs have been merged to form composite extents for the 1% Central and Higher Central climate change events.

In the absence of detailed hydraulic modelling, but where the EA's national Flood Map for Planning is available, Flood Zone 2 has been used as a proxy. This is appropriate given the Higher Central/ Upper End climate change extents are often similar to the Flood Zone 2 (0.1% AEP) extents.

For Ordinary Watercourses where there is no national mapping available, the 0.1% RoFfSW dataset has been used as a proxy to infer risk.

A site-specific Flood Risk Assessment will need to model Flood Zone 3a+CC at a site if this data is not already available.

Table 4-1: Climate change allowances for various locations within the study area

Model	Existing data/ Proxy for Central CC	Central (2080s) Uplift	Existing data/ Proxy for Higher Central CC	Higher Central (2080s) Uplift
Upper Roding	Flood Zone 2 (0.1% AEP)	26%	Flood Zone 2 (0.1% AEP)	36%
Upper Middle Stort	1% AEP +20%	10%	1% AEP +20%	22%
Stort Tribs (Stickling Green Brook)	1% AEP +20%	10%	1% AEP +20%	22%
Stansted Mountfitchet	1% AEP +20%	10%	1% AEP +20%	22%

Model	Existing data/ Proxy for Central CC	Central (2080s) Uplift	Existing data/ Proxy for Higher Central CC	Higher Central (2080s) Uplift
Chelmer - Upper Chelmer	1% AEP +25%	25%	1% AEP +35%	38%
Chelmer Tribs (Godfrey Way Olives Wood)	1% AEP +25%	25%	1% AEP +35%	38%
Upper Blackwater	1% AEP +25%	25%	1% AEP +38%	38%
Cam Rural	1% AEP +20%	9%	1% AEP +20%	19%
Cam Rural (Slades 2012)	1% AEP +20%	9%	1% AEP +20%	19%

4.1.3 0.1% AEP (Flood Zone 2)

Where model data is present for the 0.1% AEP event with climate change scenario (e.g. the River Chelmer - Central allowance +25%), this has been used in preference. Where there is no available 0.1% AEP event with climate change, the EA's FMfP Flood Zone 2 can be used to represent this.

For Ordinary Watercourses where there is no national mapping available, the 0.1% RoFfSW dataset has been used as a proxy to infer risk.

Most hydraulic models are not built to run events of this magnitude, and often present instabilities and an inability to run. Given that generally across the district the floodplain topography is confined, climate change allowances have lowered, and the Upper End climate change extents are often similar to the Flood Zone 2 extents, it is not expected that there would be significant differences from the 0.1% AEP event.

This may need to be considered further at a Level 2 assessment or for a site-specific Flood Risk Assessment.

4.2 Surface water flooding

The 0.1% AEP surface water extent can be used as an indication of surface water risk, and risk to smaller watercourses that are too small to be covered by the EA's Flood Zones.

Modelled Climate Change uplifts for the 3.3% and 1% AEP events were included as part of this SFRA and are presented in in Appendix A: GeoPDFs as 'SW Climate Change Uplifts' for the following events and scenarios:

Management Catchment	3.3% AEP 2050s upper end	1% AEP 2050s upper end	3.3% AEP 2070s upper end	1% AEP 2070s upper end
Cam and Ely Ouse	35%	40%	35%	40%
Combined Essex	35%	45%	35%	40%
Roding, Beam, and Ingrebourne	35%	40%	35%	40%
Upper Lee	35%	40%	35%	40%

5 Groundwater

Two datasets were used to assess potential areas that are likely to be at higher risk of groundwater flooding:

- The EA's Areas Susceptible to Groundwater Flooding 2010 (AStGWF) dataset, showing the degree to which areas are susceptible to groundwater flooding based on geological and hydrogeological conditions on a 1km square grid. It does not show the likelihood of groundwater flooding occurring, i.e., it is a hazard, not risk, based dataset. 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 JBA groundwater emergence map, showing the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels on a 5m square grid. For each grid cell, a depth range is given for modelled groundwater levels in the 1% AEP event. It takes account of factors including topography, groundwater recharge volumes and spatial variations in aquifer storage and transmission properties.

Section 4.6 of the Main Report details the approach adopted in this SFRA to assess the risk of groundwater flooding.

6 Sewers

Records of flood incidents relating to public foul, combined or surface water sewers between 2021 and 2023 have been provided by Thames Water. Data from Anglian Water was not received for the 2024 study; however, data received as part of the 2021 SFRA has also been detailed. For confidentiality, this data was only provided on a 3-digit postcode basis.

Section 4.5 of the Main Report presents this data.

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 Reservoir Flood Mapping (RFM) study and are shown online on the Long-Term Risk of Flooding website at the time of publication.

The EA 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 4.11 of the Main Report presents the reservoirs affecting Uttlesford.

8 Flood defences

The EA 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 2014 coastal defence dataset from the National Network of Regional Coastal Monitoring Programmes was also used. Section 6 of the Main Report provides information on flood defences and schemes.

9 Overview of supplied data

Table 9-1 below provides an overview of the supplied data from stakeholders which has been used to inform the Uttlesford District SFRA.

Table 9-1: Summary of supplied to inform the Fylde Authorities SFRA.

Source of flood risk	Data used to inform the assessment	Data supplier
Historic (all sources)	Historic flood map Recorded flood outlines	Environment Agency
Historic (all sources)	Section 19 Flood Investigation Reports	Essex County Council
Fluvial (including climate change)	Upper Roding (2016) Upper Middle Stort (2010) Stort Tribs (Stickling Green Brook) (2015) Stansted Mountfitchet (2015) Chelmer - Upper (2020) Chelmer Tribs (2020) Upper Blackwater (2016) Cam (2012) Cam Rural Model (Phase 2 Slades) (2014)	Environment Agency
Fluvial (including climate change)	Flood Map for Planning	Environment Agency
Surface water (including climate change)	Risk of Flooding from Surface Water dataset	Environment Agency
Sewers	Internal and external historic drainage records	Thames Water and Anglian Water
Groundwater	Areas Susceptible to Groundwater Flooding dataset	Environment Agency
Groundwater	Groundwater Emergence map	JBA
Reservoir	National Inundation Reservoir Mapping (Long term flood risk map)	Environment Agency
Flood defences	AIMS Spatial Flood Defences dataset	Environment Agency
Cross-boundary impacts	Neighbouring authority sites and Local Plan information, to help assess cross-boundary impacts and the cumulative impact assessment	Planners at neighbouring authorities (South Cambridgeshire, Braintree,

Source of flood risk	Data used to inform the assessment	Data supplier
		Chelmsford, Epping Forest, East Hertfordshire, North Hertfordshire)
Other datasets	Source Protection Zones Aquifer Designation maps (Bedrock Geology and Superficial Deposits) Detailed River Network Flood Alert and Flood Warning areas Groundwater Vulnerability Risk of Flooding from Rivers and Sea National Receptor Dataset	Environment Agency (via Uttlesford District Council)