Appendix B - Data sources used in the SFRA

1 Historical flooding

Hertfordshire County Council provided a database of locations of historic flood incidents across the Borough. The Environment Agency's Historic Flood Recorded Flood Outlines dataset has also been used to understand the flood history across the Borough.

Appendix C of the main report documents the historic flooding records obtained.

2 Fluvial flooding

2.1 Flood Zones 2 and 3a

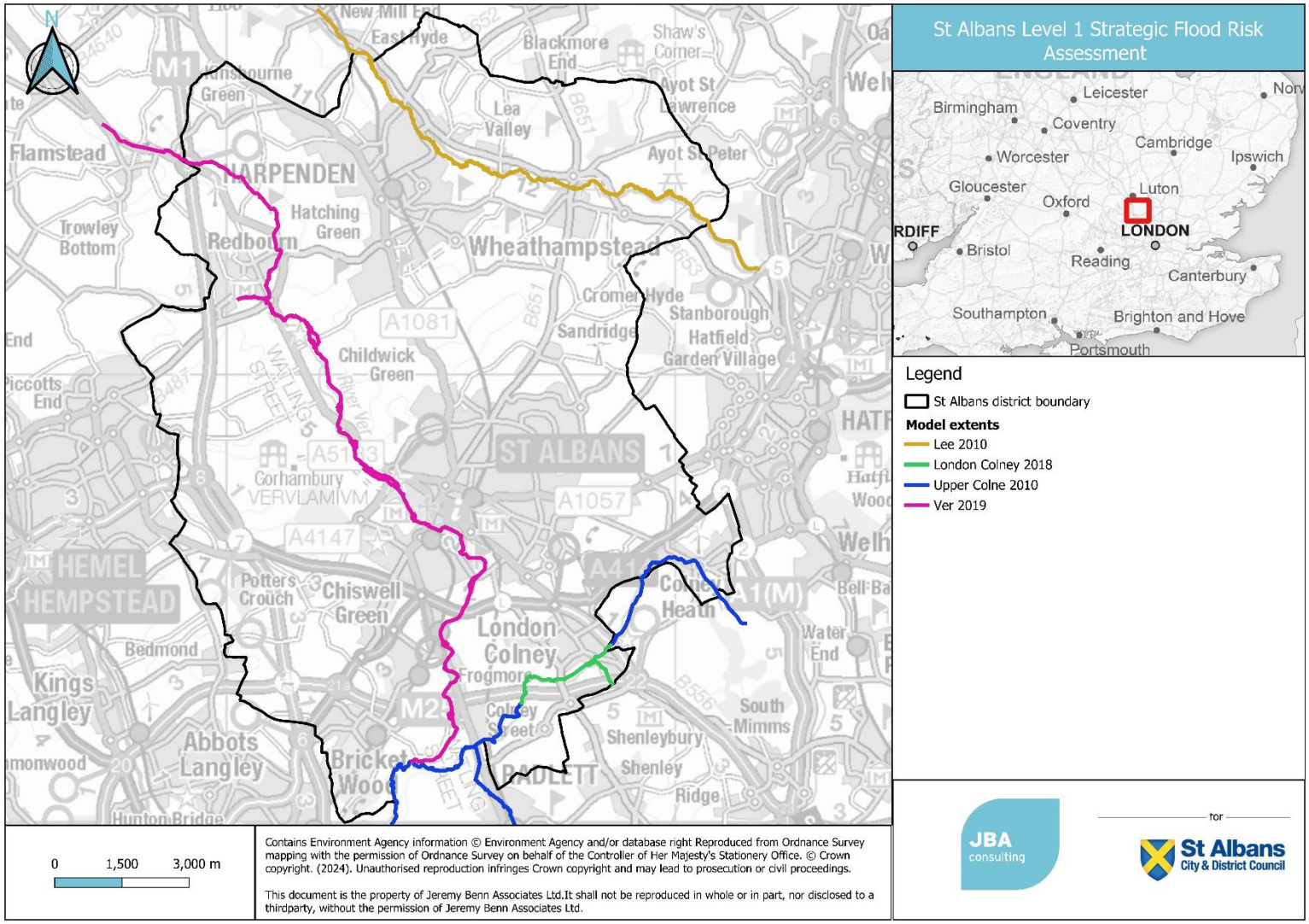
Flood Zones 2 and 3a, as shown in the Appendix E mapping, show the same extent as the online Environment Agency's Flood Map for Planning (FMfP) (which incorporates latest modelled data). The most recent detailed modelling available at the time of this study has been incorporated into the FMfP, so these extents were maintained. It should be noted that the following models are currently being updated by the Environment Agency:

- Upper Colne (2010)
- Lee (2010)

The extents of these models are shown in Figure 2-1. It is expected that Flood Zones 2 and 3a will be updated once these are available. 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 sequential test can be carried out using the Flood Map for Planning for present day low (Flood Zone 1), medium (Flood Zone 2) and high risk (Flood Zone 3a and 3b). Where detailed modelling is available, future Flood Zones 2 (0.1% AEP event), 3a (1% AEP event) and 3b (now the 3.3% AEP) have been assessed with climate change allowances. Generalised modelling (JFlow) is used to delineate Flood Zones where there is no detailed mapping but does not include climate change data or risk mapping. The Environment Agency fluvial Flood Zones do not cover all catchments or ordinary watercourses with areas <3km^2. As a result, whilst the fluvial Flood Zones may show an area is in Flood Zone 1, there may be a flood risk from smaller watercourses not shown in the Flood Zones. In the cases the 0.1% AEP surface water extent can be used as an indication of risk to smaller watercourses.

Figure 2-1: Extents of the hydraulic models used in this SFRA



2.2 Flood Zone 3b (the Functional Floodplain)

Flood Zone 3b, as shown in Appendix D 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). 3.3% AEP extents were available for the following models:

- River Ver
- London Colney

For areas covered by detailed models, but with no 3.3% AEP output available, the 2% and 1% AEP outputs were used as a proxy for the Upper Colne and Lee models respectively.

As this is quite a conservative approach, the 5% AEP outputs have been used to identify areas where the Flood Zone 3b extent is likely to be similar/considerably different from the 1% AEP output and this has been used to inform the site screening process. The extents of the models used in this assessment are shown in Figure 2-1.

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 Flood Risk Assessment to define the extent of Flood Zone 3b.

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 primarily from the Risk of Flooding from Surface Water (RoFSW) 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 EA, and any potential developers to focus their management of surface water flood risk. Mapping is based on a generalised modelling methodology and is generally suitable for showing surface water flow routes at different probability flood events (3.3%, 1% and 0.1% AEP), although the uncertainty associated with the predicted outlines is high.

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. The pattern of flooding is unlike river or sea flooding where inundation produces more continuous flood extents. 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. Unlike the Zone maps for river and sea flooding the surface water mapping makes an allowance for local drainage using a standard loss rate, However, this does not always include drainage features such as culverts and can over or underestimate flooding where there are linear features such as embankments.

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.

Although the RoFSW offers improvement on previously available dataset, there is a variability in the resolution of ground level data used. Additionally, as property thresholds are not factored in, the results should not be used to understand flood risk for individual properties. The results are most suitable for high level assessments such as SFRAs for local authorities.

It is likely that in many circumstances surface water flood risk zones based on the surface water mapping could affect a relatively small proportion of a proposed allocation site, but in practical terms this might not in itself be a factor that demonstrates that the principle of development could not be supported. 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

Detailed Environment Agency hydraulic models were obtained under licence for the SFRA. Where climate change was not available a conservative proxy was used, these were deemed suitable to use following discussions with the EA taking into account the practicalities of re-running models and the associated time and cost versus a marginal change in allowance. 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. As the St Albans district falls across two different EA management catchments which each have different climate change allowances the central and higher central allowances for the 2080s epoch vary for the different watercourses. This is detailed further in Section 4 of the Main Report.

Table 4-1 details the climate change allowances used for each model for the central and higher central allowances, which are shown in Appendix F. If development is proposed in areas where suitable climate change runs are not available, these may need to be run as part of a site-specific Flood Risk Assessment.

Table 4-1: Allowance used to represent central and higher central climate change for each modelled watercourse.

Model	Management Catchment	Central climate change allowance used	Higher central climate change allowance used
River Ver	Colne	21%	35%
London Colney		21%	35%

4.2 Surface water

Modelled Climate Change uplifts for the 3.3% and 1% AEP events were included as part of the addendum in Appendix I and J for the following events and scenarios:

- 3.3% AEP plus 35% CC
- 1% AEP plus 40% CC

The limitations of the RoFSW datasets so also apply to these outputs, which should be regarded as indicative future surface water flood risk.

5 Groundwater

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. Five zones are defined to describe the risk of groundwater being:

- Category 4: at or very near ground surface;
- Category 3: between 0.025m and 0.5m below the ground surface;
- Category 2: between 0.5m and 5m below the ground surface;
- Category 1: at least 5m below the ground surface; and
- No category: negligible risk of groundwater flooding.

The analyses performed to prepare the mapping are all for a 1% AEP event and so provide a risk of groundwater emergence to the surface as they are based on predicted difference between groundwater level and the ground surface. JBA groundwater map does potentially enable a risk-based approach to be taken as it depicts different levels of risk. However, this is also based on the risk of emergence of groundwater and not surface flooding due to groundwater recharge volumes and spatial variations in aquifer storage and transmission properties.

Due to the limitations of this dataset, it could not be used with confidence unless supported by more detailed local studies. The mapping provides an indication of where risk might be higher, but it would not be easy to defend sequential decisions based on the available mapping. Historic flood data is available from Hertfordshire County Council; however, this does not always attribute events to the source of flooding. In addition, it is often difficult to distinguish between groundwater and surface water flooding. There is no climate change mapping available for groundwater and in view of the uncertainty in the present-day data it is unlikely that such mapping will be available in the near future.

6 Sewers

Thames Water provided a record of flooding incidents relating to public foul, combined or surface water sewers including which properties suffered flooding. This was provided to cover incidents in the period from January 2000 until May 2022. For confidentiality, this data is only included within this SFRA using truncated postcodes.

Section 5.6 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 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. This mapping also includes a flood extent with river flooding added to the 'wet day' scenario, which can be used to determine where fluvial flooding exacerbates reservoir flooding. Neither set of mapping describes a risk-based scenario as it does not provide the probability of a dam failure but are intended to describe a “worst credible case”.

The mapping could be used to direct proposed new development away from locations that could potentially be affected by reservoir flood risk. However, this dataset is not conceptually similar mapping available for river and sea flooding and further assessment would be required to understand the magnitude of the potential hazard. Additionally, this mapping does not include climate change impacts on future flood risk and the provision of such mapping is unlikely based on the existing methodology.

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. 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 this addendum.

Table 9-1: Summary of supplied to inform the SFRA addendum

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)	Historic flooding incident reports	Hertfordshire County Council
Fluvial (including climate change)	Lee (2010) 1D ISIS model (with 2018 climate change re-runs) Upper Colne (2010) 1D-2D ISIS-TUFLOW model (with 2018 climate change re-runs) London Colney (2018) 1D-2D Flood Modeller-TUFLOW model Ver (2019) 1D-2D Flood Modeller-TUFLOW	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
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
Other datasets	Source Protection Zones Detailed River Network Flood Alert and Flood Warning areas Groundwater Vulnerability Risk of Flooding from Rivers and Sea	Environment Agency

Source of flood risk	Data used to inform the assessment	Data supplier
	National Receptor Dataset	
	BGS Geology 625K datasets (Bedrock Geology and Superficial Deposits)	British Geological Survey