



# 5. Water & Drainage

## Overview

- 5.1 This chapter of the IDP provides an overview of water and drainage infrastructure. It is supported by updated SFRA and Water Cycle Information<sup>1</sup>. The updated SFRA incorporates new data for strategic level flood risk assessment and provides updates in relation to national policy and guidance together with Environment Agency guidance on climate change allowances. Both the updated SFRA and WCS are used extensively as part of the commentary to this chapter. For further detailed information, please refer to the original documents as part of the Council's evidence base.
- 5.2 At a local level, the Essex Local Flood Risk Management Strategy (LFRMS) was developed in 2013 providing local flood risk management co-ordination for Essex. The South Essex, North Essex and Thames Catchment Management Plans (CFMPs) provide an overview of flood risk across each river catchment and recommend ways of managing those risks now and over the next 100 years. The Thames and Anglian River Basin Management Plans (RBMPs) ensure the protection and improvement of the water quality.
- 5.3 The NPPF covers a full range of planning issues in relation to managing flood risk with further guidance available through the NPPG.
- 5.4 Essex County Council has responsibility for managing flood risk from local sources (surface water, groundwater and ordinary watercourses) and ensuring that any Sustainable Urban Drainage Systems (SuDS) are of appropriate design standards and have clear arrangements for maintenance over the development's lifespan. Flooding from main rivers, the sea and from reservoirs are the responsibility of the Environment Agency.

## Topography and Watercourses

- 5.5 The topography of the area ranges from approximately 100m Above Ordnance Datum (AOD) in the north and central regions, to approximately 10mAOD in the south of the Borough. The Brentwood Urban Area and adjoining built up area is located on gently undulating ridge. Therefore, there are no major water courses running through this built-up area. The tributaries of the River Wid flow in the shallow valley between the wider built-up

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<sup>1</sup> SFRA and WCS Updates 2018

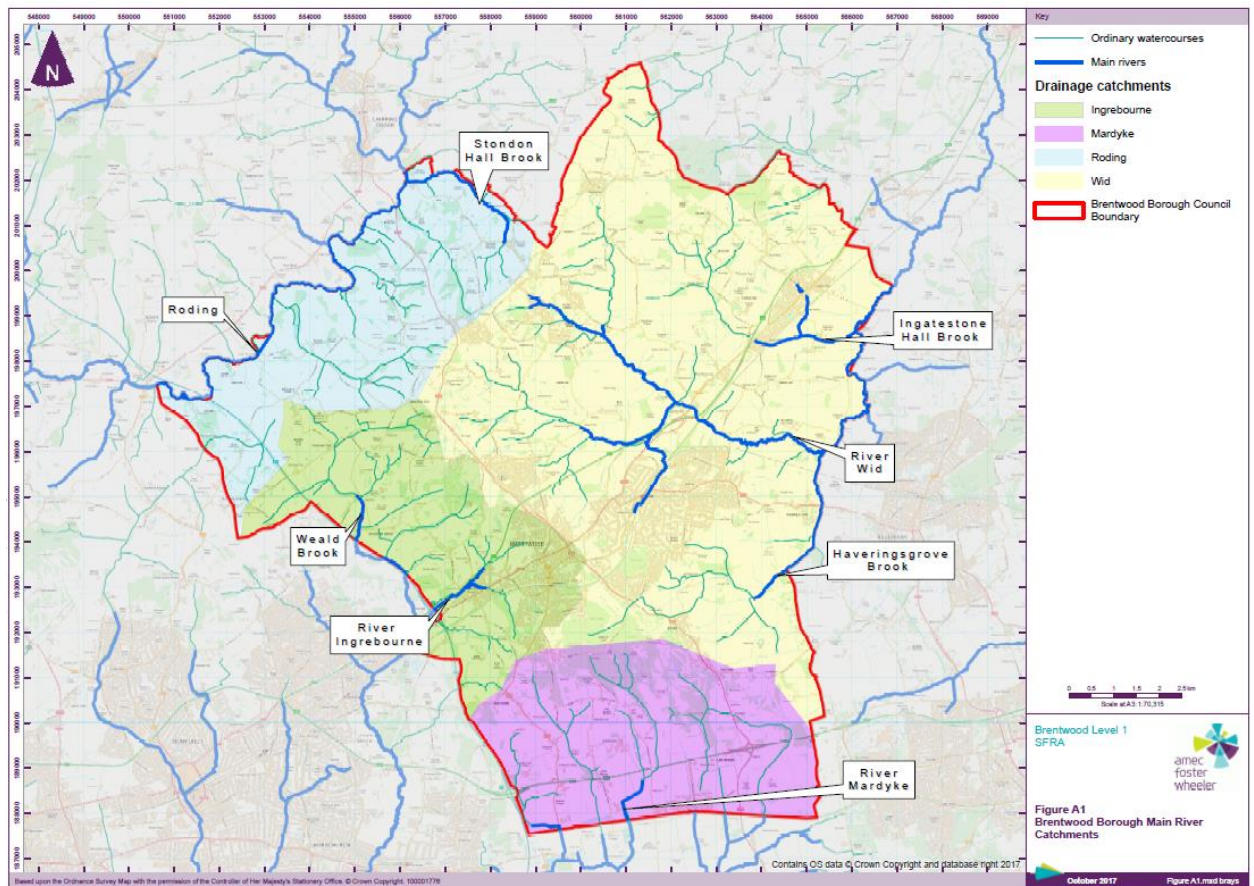
area of Brentwood and large village of Ingatestone. Therefore, there are no significant areas of fluvial flood risk within the existing built-up area.

- 5.6 The Borough forms the headwaters of four key watercourses which drain the area: the River Wid, the River Ingrebounre, the River Roding and the River Mardyke. The River Wid is the main catchment in the Borough and is located on the eastern boundary of the Borough. It flows in a south to north direction. The river eventually joins the River Can in Chelmsford, which itself joins the River Chelmer becoming the River Blackwater before entering the North Sea. The catchment of the River Wid and associated tributaries covers over 50% of the total area of Brentwood.
- 5.7 The River Roding and associated tributaries drain the west of the Borough (approximately 15% of the total Borough area) and form its north western boundary. The river flows in an approximate south westerly direction eventually joining the River Thames via Barking Creek.
- 5.8 The River Ingrebourne system drains the south-western part of the Borough (approximately 15% of the total area of the Borough). The river flows south and joins the Thames at Rainham; and the River Mardyke system which drains the extreme south of the Borough via numerous small tributaries (approximately 15% of the total area of the Borough). The Mardyke flows south then to the west and joins the Thames near Purfleet.
- 5.9 Other watercourses of interest include the Ingatestone Hall Brook in the north-east, the Stondon Hall Brook in the north-west and the Ingrebourne Brook in the west. The main watercourses in the Borough are outlined below in Figure 5.1.<sup>2</sup>

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<sup>2</sup> Further information on watercourses is available in the SFRA 2018.

Figure 5.1 Water Courses



## Historic Flood Risk Events

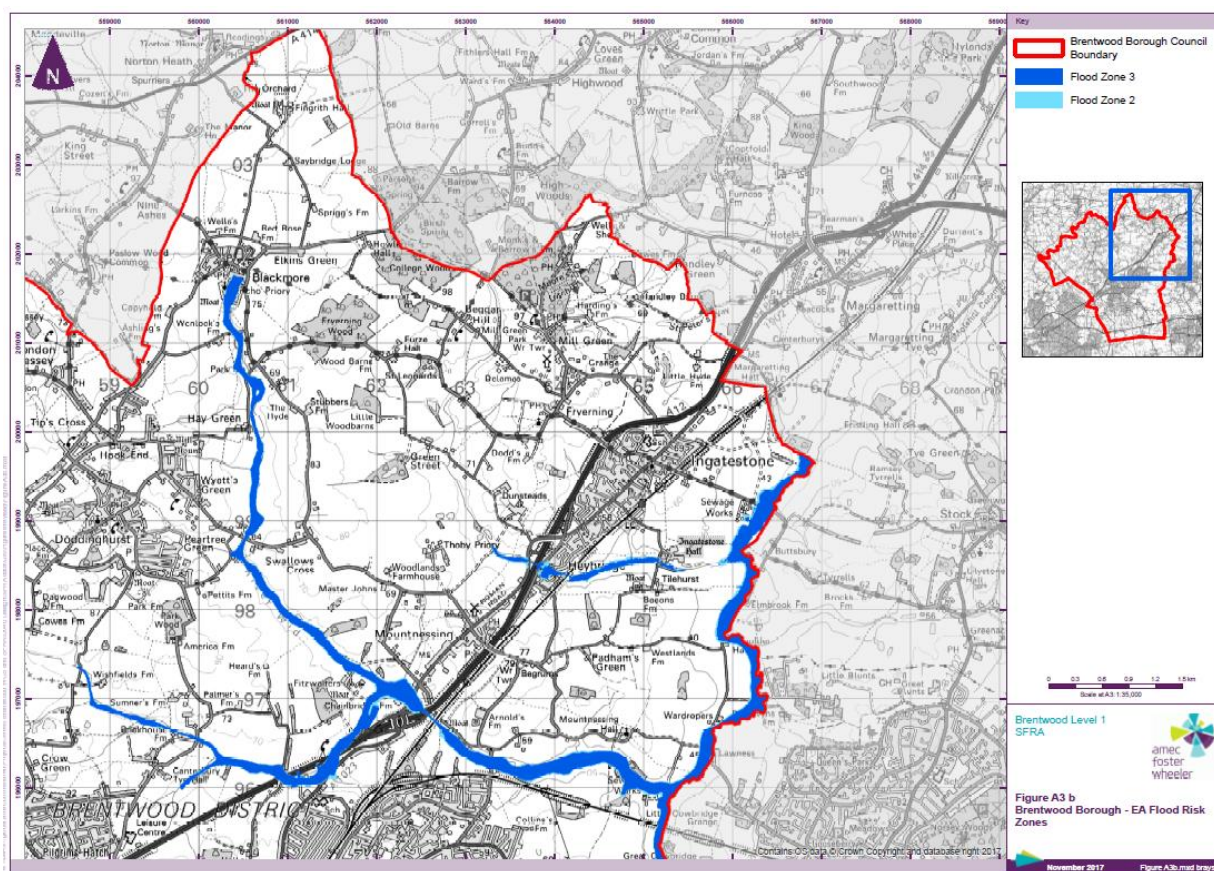
5.10 The extent of historic flooding in the Borough has generally been concentrated upon:

- rapid surface water runoff and ponding in areas such as low-lying roads;
- Multiple recorded flooding events from the River Roding in the north east of the Borough

## Flood Risk Modelling

5.11 The extent of modelling flood risk as detailed on the Environment Agency flood map for the Borough is detailed below in Figure 5.2. Overall the Flood Zones are confined close to the watercourses from which they originate and are not extensive for the Brentwood Borough. This flood zone information is generally sufficient to inform spatial planning however for site specific applications further flood risk information may also be required.

Figure 5.2: Flood Risk Zones<sup>3</sup>



- 5.12 There are also watercourses within the Borough which are not currently modelled and advice from the SFRA consultants is that it would be prudent to use the surface water maps along the watercourses of these unmodelled main rivers and all ordinary watercourses as a proxy for Flood Zone 3 in lieu of more detailed modelling or site- specific assessment.

## Tidal, Groundwater and Reservoirs

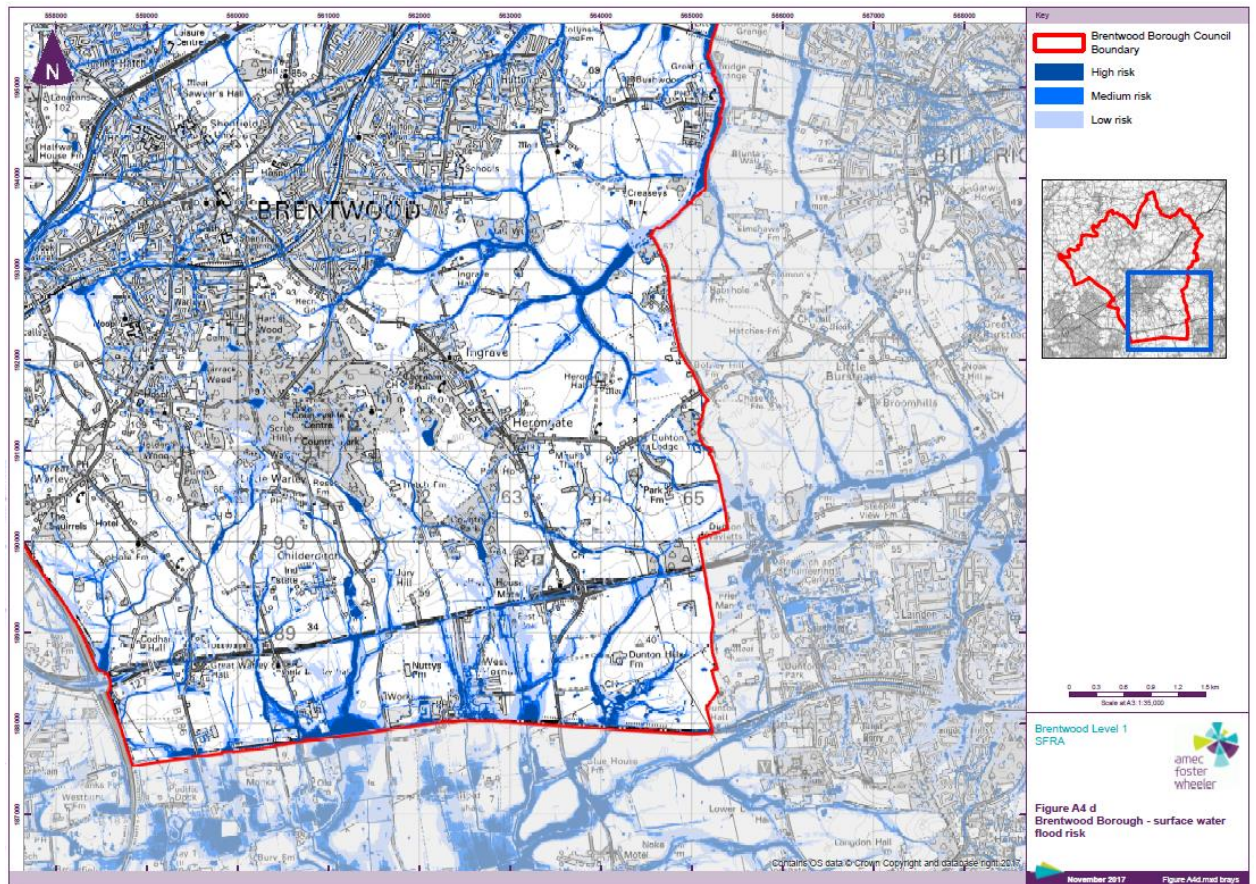
- 5.13 The Borough is not at risk from coastal flooding and there are no reported incidences of reported of groundwater flooding.

## Surface Water Flooding

- 5.14 Surface water flooding is the term used for flooding that occurs when intense rainfall overwhelms the ability of the land to infiltrate water, sewers and road drains. Figure 5.3 below highlights updated surface water flood risk data which indicates the settlements of Brentwood, Blackmore, Doddington and Ingatestone in particular may all contain areas which are potentially vulnerable to surface water flooding. Key road infrastructure such as the A12 is also shown to be vulnerable in places with a history of flooding in parts.

<sup>3</sup> Flood Risk maps are set out in the SFRA 2018 report by area. Please see report for other maps.



Figure 5.3: Surface Water Flooding<sup>4</sup>

## Climate Change

- 5.15 Managing climate change and associated heightened flood risks are a key element of the NPPF. Figures 5.4 and 5.5 below provide an indicative assessment of how climate change may impact on Flood Zone 3 and ordinary / unmodelled watercourses across the Borough.

<sup>4</sup> Surface Water Flooding Maps are set out in the SFRA 2018 report by area. Please see report for other maps.

Figure 5.4 Climate Change and Flood Zone 3

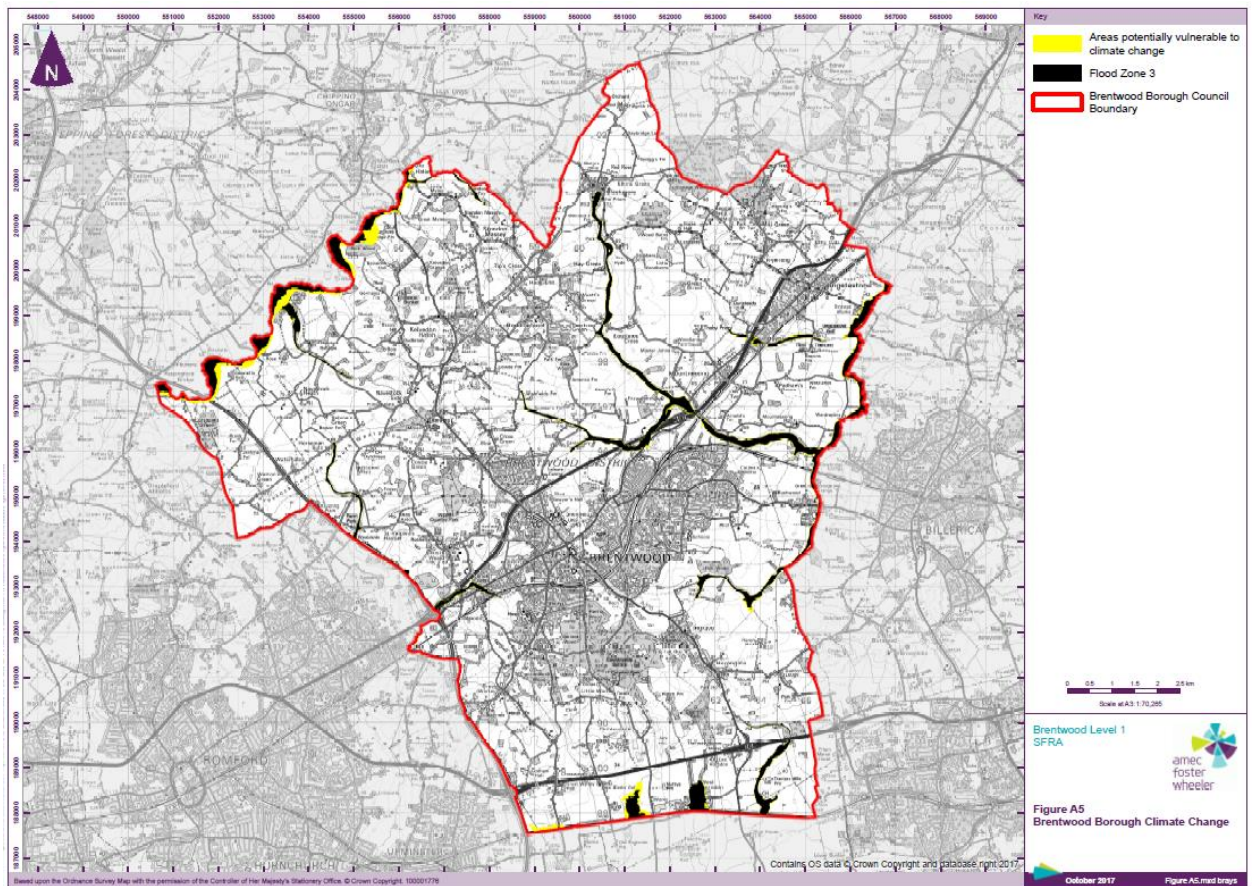
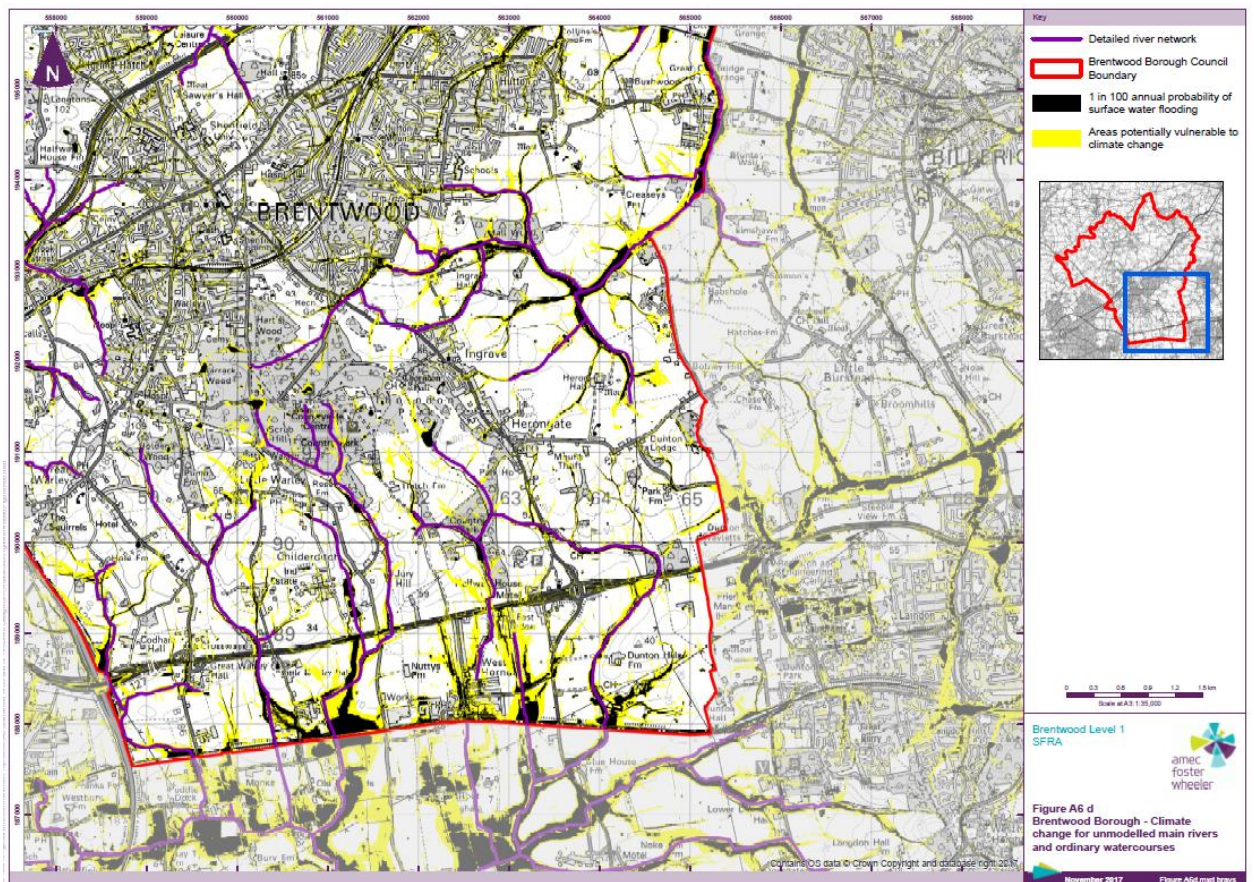




Figure 5.5 Climate Change and Ordinary / Unmodelled Watercourses<sup>5</sup>

5.16 Figure 5.6 below summarises the key messages from the updated flood risk assessment for Brentwood.

<sup>5</sup> Climate change and unmodelled watercourses maps are set out in the SFRA 2018 report by area. Please see report for other maps.

Figure 5.6: Summary of Flood Risk

Type/Source of Flooding	Risk?	Description
Fluvial Flooding	Yes	Some flooding along eastern boundary of Borough from the River Wid and from Stondon Hall Brook and the River Roding in the north west of the Borough.
Surface Water Flooding	Yes	Affects numerous areas across the Borough. Mostly consists of land drainage issues causing flooding to public highway most notably on the A12 north west of Brentwood and on roads around Ingatestone.
Groundwater Flooding	No	No historic records of this type of flooding within the Borough. Available data suggests this is not thought to be a source of flooding.
Tidal Flooding	No	Elevations put Borough outside of any tidal flood risk zone.
Artificial	No	Not at risk from reservoir sources, limited data on sewer flooding but appears to be due to surface water risk.

## Quality of Watercourses

- 5.17 It is noted that water quality of rivers, lakes and groundwater is a good indicator of their general health in terms of their ecology, biodiversity and amenity. The chemical status and status of the physico-chemical elements of ecological status are both helpful in understanding the overall water quality.
- 5.18 The Water Cycle Study (WCS) 2018 update which accompanies the Local Plan undertook an investigation into water quality in line with the Water Framework Directive objectives (WFD). The WFD is a key directive that seeks to protect and improve the water environment and its ecology. Its overarching aim is to prevent deterioration in the status of water bodies and to achieve 'Good Status' for rivers, lakes, coastal waters and groundwater by no later than 2027. Impacts on water resources were also reviewed in the WCS in line with the water companies Water Resource Management Plans.
- 5.19 The Anglian and Thames River Basin Management Plans (RBMPs) cover the Borough. To the East is the Combined Essex catchment of the Anglian RBMP, encompassing the rivers and tributaries of the Stour, Colne, Pant/Blackwater, Chelmer, Crouch and Roach, along with the smaller catchments of Sixpenny, Tenpenny, Holland and Asheldham Brook and. To the South and West the area is covered by two catchments of the Thames RBMP; the Roding, Bream and Ingrebourne and South West Essex catchments, predominantly covering the Mar Dyke. Physical modifications due to urbanisation, agricultural runoff, urban runoff, abstraction for water supply and barriers to fish movement play a key role in determining the status of rivers and lakes in these catchments.
- 5.20 Recently completed and current improvement projects linked to the main water bodies associated with the Brentwood area (none of the projects are within the Borough) include:
- River Wid – willow bank protection and other measures at Buttsbury (completed);
  - River Ingrebourne – project to tackle polluted water from an outlet;



- c. River Mardyke – improvements to the flood plain grassland and in-channel habitats within the floodplain.

5.21 The five Waste Water Treatment Works affected by future growth are located within five water bodies and within three operational catchments. The Environment Agency has indicated that all five of the waterbodies are classified as less than good in terms of ecological status. The key elements found to be less than good include: fish, invertebrates, macrophytes and phytobenthos combined, BOD, phosphate and ammonia. Further baseline data is detailed below in Figure 5.7.

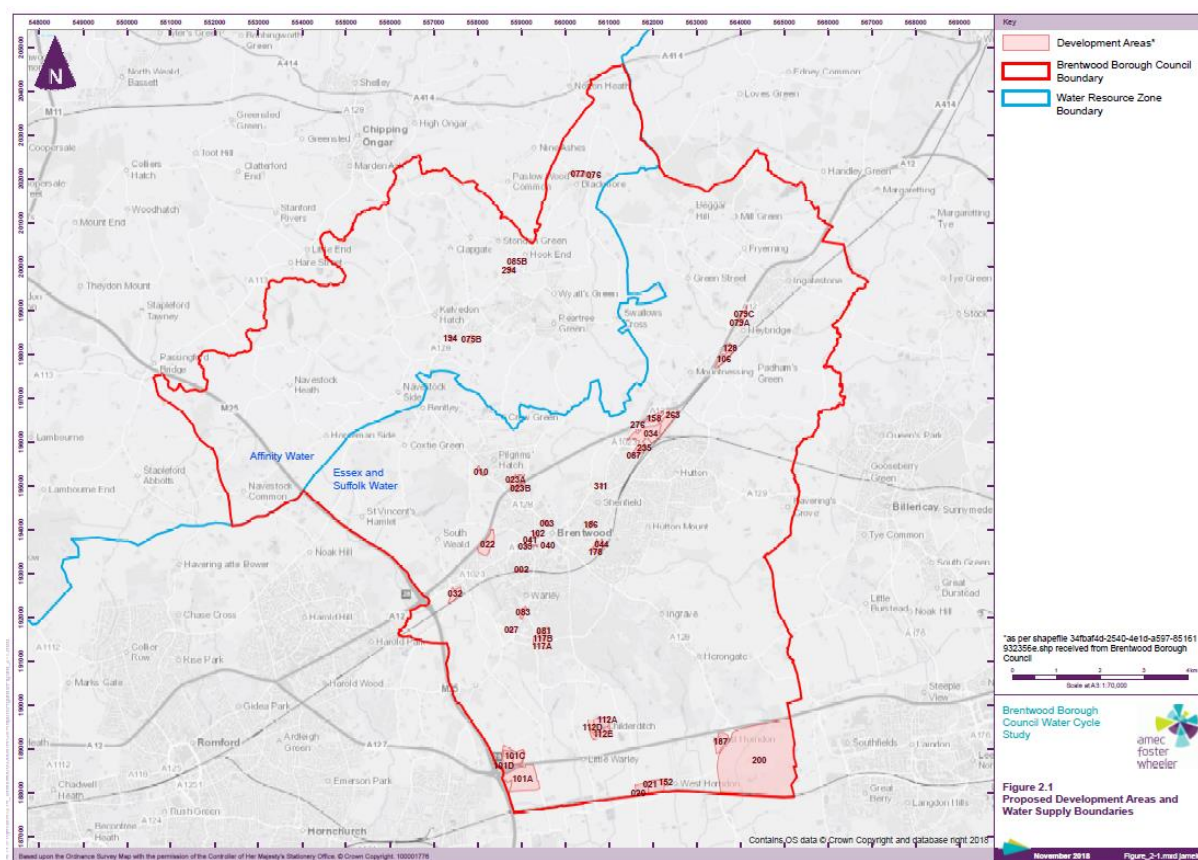
Figure 5.7: Ecology Status of Operational Catchment Area

WwTW	Water Body ID and Water Body Name	Operational Catchment	Overall Status 2016 Cycle 2
Doddinghurst	GB105037028720 - Doddinghurst Brook	Chelmer	Poor
Shenfield	GB105037028680 - Wid (Doddinghurst Brook - Shenfield STW)	Chelmer	Poor
Ingatestone	GB105037028690 - Wid (Ingatestone Hall - Margaretting Hall)	Chelmer	Moderate
Upminster	GB106037028080 - Mardyke (West Tributary)	Mardyke	Moderate
Brentwood	GB106037028130 - Ingrebourne	Roding Beam and Ingrebourne	Moderate

## Potable Water Supply

5.22 Essex as a whole is identified as an area of Serious Water Stress (Identifying Areas of Water Stress, Environment Agency 2007). Brentwood Borough is served two Water Supply Undertakers (Water Companies), Essex and Suffolk Water (ESW) accounting for three quarters of Brentwood Borough and the remainder in the northern rural area surrounding Doddinghurst and Kelvedon Hatch is served by Affinity Water (previously Veolia Water Central). Figure 5.8 provides an outline of water supply areas for the two companies.

Figure 5.8: Water Supply



- 5.23 ESW and Affinity Water apply a twin tracked approach to maintaining water supplies through a combination of demand management and water supply schemes and initiatives.
- 5.24 The water resources within the ESW area includes the Rivers Chelmer, Blackwater, Stour and Roman River which support pumped storage reservoirs at Hanningfield and Abberton and treatment works at Langford, Langham, Hanningfield and Layer. The remaining water sourced from inside the Essex resource zone (approximately 3% of total water supplied in the zone) is derived from groundwater via Chalk Well and additional sources in the south and south west of the zone at Linford, Stifford, Dagenham and Roding, each with on-site treatment.
- 5.25 Water transferred into the Essex supply area from outside the area come from two main sources, the Chigwell raw water supply from Thames Water Utilities and the Ely Ouse to Essex Transfer Scheme (EOETS). In a dry year, up to a third of the water supplied in Essex is derived from the Ely Ouse to Essex Transfer Scheme, which transfers water from Denver in Norfolk via pipelines and pumping stations to the headwaters of the River Stour and River Pant / Blackwater. The EOETS is owned and operated by the Environment Agency (EA).
- 5.26 Another significant water resource in Essex has been the granting of a permanent discharge consent for the Langford Recycling scheme. It has the capacity to increase the water availability for Essex by 8%. This scheme involves the indirect recycling of effluent from the Chelmsford sewage treatment works for re-use as a potable resource. The Langford recycling plant has the capacity for tertiary treatment of up to 40M/d of effluent.

- 5.27 ESW published its Final Water Resources Management Plan (fWRMP) in October 2014 in which it confirmed that the Company forecasts a surplus of supply to demand in all Water Resource Zones (Essex and Suffolk) over the 25-year planning horizon. Essex & Suffolk Water has invested £150million to complete The Abberton Scheme, which has secured supplies of water to one and a half million people in Essex for many years into the future. The scheme, which includes the enlargement and enhancement of Abberton Reservoir, not only provides a vital new water resource but has also transformed the site into a natural wetland.
- 5.28 The Affinity Water Final Water Resources Management Plan (June 2014) also expresses confidence in supplying and managing water resources over a 25-year time horizon, but the 2014 Plan is substantially different from previous plans as there is no longer have a surplus of resources and it means that the company will have to replace lost resources by managing the demand for water or developing new resources and bringing in new supplies.

## Wastewater Treatment and Sewerage

- 5.29 The Borough of Brentwood is served by two wastewater treatment and sewerage companies – Anglian Water (AW) and Thames Water (TW) with the boundary of these areas dissecting Brentwood's Urban Area. Sewerage refers to the infrastructure that conveys sewage i.e. sewers, pumping stations to wastewater treatment works. Anglian Water deals with just over half of the Borough's area to north and east including Shenfield and Hutton and Thames Water to the south and west including Warley.
- 5.30 Anglian Water is responsible for water and water recycling services to more than six million customers in the east of England. The business looks after over 38,000 KM of water mains, 76,000KM of sewers, 140 water treatment works and 1,123 water recycling centres. Its main corporate plan covers the period 2015-2020<sup>6</sup>, and highlights a number of key priorities:
- a. Fair profits – a financially responsible, efficient business earning fair profits;
  - b. Investing for tomorrow – Provide the service customers expect over the long-term through responsible stewardship;
  - c. Caring for communities – working responsibly with communities;
  - d. A smaller footprint – leading by example on reducing emissions and conserving the world's natural resources;
  - e. Flourishing environment – a flourishing environment for nature and everyone;
  - f. Satisfied customers – ensuring customer satisfaction;
  - g. Fair charges – bills balance fairness, affordability and value for money;
  - h. Safe clean water – drinking water is safe, clean and acceptable;

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<sup>6</sup> Anglian Water – Our Plan for 2015-2020



- i. Resilient services – services can cope with disruptive events, and
  - j. Supply meets demand – manage and meet the growth in demand for sustainable and reliable water and water recycling services.
- 5.31 The Anglian Water Annual Integrated Report 2016 <sup>7</sup>, provides more specific information on infrastructure planning including a focus upon:
- a. Improving the resilience of the Ruthamford (Rutland – Grafham – Pitsford) supply system in the west of their operational region to improve resilience against drought;
  - b. Investing in groundwater assets to maintain output and performance, and
  - c. Prioritising Water Recycling Centres for investment, taking a phased approach based upon expected population growth.
- 5.32 Anglian Water has a statutory responsibility to provide water and water recycling services to new homes and businesses. The company has witnessed an increase in the number of developers requesting planning advice using a voluntary pre-planning capacity service, which can assist with promoting better quality planning applications and setting out how developments can connect to the Anglian Water network without increasing the risk of sewer flooding, pollution and low water pressure. Where necessary, Anglian Water can request appropriate planning conditions for surface and foul water drainage to ensure connections do not result in increased flooding or pollution. Anglian water also own a considerable amount of land – much of which is of value to wildlife and can play a positive role in Green Infrastructure planning.
- 5.33 The Anglian Water, Water Resources Management Plan (WRMP) 2015 reports on long term planning relating to the development of water resources over a period of 25 years and identifies investment in water resources schemes to meet additional demand related to population growth and changes in per capita consumption of water. The plan for maintaining the supply-demand balance combines an extension of the Ardleigh trading agreement (continuation of the current 70/30 agreement with Affinity Water to trade the resources of the Ardleigh Reservoir) with additional leakage control and water efficiency savings.
- 5.34 Thames Water is the UK's largest water and wastewater services provider with 15 million customers. In terms of sewerage infrastructure, the company has 350 sewage works, treating more than 4.4bn litres per day of wastewater; 67,000 miles of sewer, 2530 pumping stations and 1.2 million manholes. Thames Water also runs two sludge-powered generators and 19 combined heat and power plants generating.
- 5.35 The Thames Water five-year plan 2015-20 provides a number of key priorities, including:
- a. Providing a better customer service;
  - b. Helping customers pay bills;
  - c. Improving the sewage system so that no one should suffer the threat of sewage flooding their home;

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<sup>7</sup> Anglian Water Services Limited – Engaging with Customers – Annual Integrated Report 2016

- d. Introducing major flood relief work in West London;
- e. Ensuring that sewage works and pumping stations cope with the demands of a growing population.
- f. Generating 33% of own power needs from renewable sources, and
- g. The development of the Tideway Tunnel to upgrade London's sewage infrastructure and improve the water quality of the River Thames.

5.36 The Thames Water long-term strategy 2015-2040 includes a focus upon wastewater collection, key elements of the strategy in addition to the Thames Tideway Tunnel include:

- a. Reducing the input of rainfall to sewers - in some areas, sewers operate as a combined system, with rainwater and foul sewage carried in the same network. High volumes of rainfall can therefore fill the system to capacity, causing untreated sewage to overflow, potentially leading to flooded properties and polluted watercourses.
- b. Tackling problems caused by heavy rainfall, pumping station failures and structural problems caused by tree roots.
- c. Minimising the improper disposal of unsuitable non-flushable items.
- d. Working with local authorities and the Environment Agency on promoting and installing Sustainable Drainage Systems.
- e. Installation of real time-controlled monitoring systems.
- f. Targeted maintenance programmes to reduce costs on the long term.
- g. Up to the year 2020 address remedial action at nine pollution hotspots identified by the Environment Agency and also target 200 polluted surface water outfalls, again identified by the Environment Agency, where sewage enters a watercourse through pipework that is meant only to carry surface water.
- h. Large parts of the sewerage network can be affected by high groundwater levels and infiltration following prolonged rainfall - 15 locations have been identified covering 65 sub-catchments where there is an intention to make improvements by 2020
- i. Continue to work with the Environment Agency to identify situations where foul drainage has been wrongly connected to pipes intended to take only surface water run-off. These misconnections cause pollution of rivers, lakes and streams.

# Infrastructure and Projects

## Flood Risk Mitigation

- 5.37 Major development sites located within Critical Drainage Areas (CDAs), as identified in the adopted Brentwood Surface Water Management Plan (SWMP) (JBA, 2014) or any subsequent updates, would need to comply with the stated mitigation measures outlined in the SWMP document or recommendations outlined during consultations with Essex County Council Lead Local Flood Authority (LLFA) in line with the ECC SuDS Design Guide. The justification for this is the implication of Critical Drainage Areas (CDAs) which have been defined as ‘discrete geographic areas (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, Main River and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure’. As a Lead Local Flood Authority, ECC is required to conduct and report Preliminary Flood Risk Assessments, through the EU Floods Directive, once every 6 years which in turn result in the update of any existing SWMPs and CDAs identified.

## Watercourse Enhancement<sup>8</sup>

- 5.38 According to the Anglian River Basin District Management Plan (2015), the priority river basin management issues to tackle in the Combined Essex catchment are physical modifications, point source and diffuse pollution leading to elevated phosphate levels and changes to the natural flow and levels of water. Future aims for the Combined Essex catchment (River Wid) partnership area include:
- a. Measures with £100,000 per year
    - i. Securing existing staff time to manage the partnership and support initiatives underway and develop additional phases of completed projects;
    - ii. Engaging with landowners and support restoration projects on riparian local wildlife sites, and
    - iii. Create a network of rural sustainable urban drainage systems.
  - b. Ideas for additional measures with £1,000,000 per year (as above plus the following):
    - i. Identify 2-3 major riparian habitat management projects to address ecological status, improve flood alleviation capacity and contribute to Biodiversity 2020 targets, and
    - ii. Development of a catchment wide project to deal with invasive non-native species.

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<sup>8</sup> Information on Watercourse Priorities and Projects may need to be reviewed and updated where necessary.



- 5.39 At a more specific project-based level there are a number of projects identified as having potential to improve the River Mardyke, which include improving drainage and sewerage infrastructure; habitat and fenland creation; removal of invasive species; and public access improvements.<sup>9</sup>
- 5.40 Thames21 is the partnership group host for the Roding, Beam and Ingrebourne catchments as detailed in the Thames River Basin Management Plan (December 2015)<sup>10</sup>. The priority issues in the catchment are pollution and poor water quality from urban and agricultural run-off and physical modifications for urbanisation and flood protection. Contributions to environmental outcomes by 2021 include reducing phosphates, ammonia, heavy metals and silt from urban run-off entering the Ingrebourne Marshes SSSI. Future aims include:
- a. Additional Measures with £100,000 per year
    - i. Connecting Communities; encouraging communities to take ownership of water quality in their area. Practical conservation days, training events, misconnection awareness and littering prevention campaigns, water quality monitoring and an Ingrebourne Valley mobile app.
    - ii. Development and implementation of a water body wide invasive species identification, monitoring and eradication programme. Surveying for invasive non-native species (INNS) such as mink, Himalayan balsam, floating pennywort and Japanese knotweed.
    - iii. Promote and encourage the use of sustainable drainage systems (SuDS) in new developments and retrofitting to existing sites within the catchment to reduce the impacts of urban diffuse pollution and phosphate run-off from fertilisers and herbicides
  - b. Ideas for additional measures with £1,000,000 per year (as above plus):
    - i. Implementation of the Havering Wildlife Project Ingrebourne Restoration Plan. Flood management using natural processes, climate change adaptation, reconnecting people to the environment, improved recreation access and enhanced habitats. This project will improve the status of fish, macrophytes and invertebrates and improve amenity and recreational value.
    - ii. Modelling and design proposals for the Harrow Lodge Park Restoration Plan on the Ravensbourne. Ultimately, this will improve the status of fish, invertebrate and macrophyte populations and amenity and recreational value.
    - iii. Development and implementation of a water body wide culvert awareness and removal programme. Promoting alternatives to culverting, influencing planning policy and encouraging sustainable development without culverts. This will resolve failures in fish and invertebrates, increase recreational opportunities and contribute to biodiversity.

<sup>9</sup> Information obtained from: <http://www.essexrivershub.org.uk/index.php/project-lists/river-mardyke-projects>.

<sup>10</sup> Environment Agency / Department for Environment, Food and Rural Affairs – Part 1: Thames river basin district – River basin management plan Updated: December 2015.

- 5.41 The Essex Rivers Hub is a partnership initiative led by Essex Wildlife Trust, Essex Biodiversity Project and the Environment Agency. A number of potential projects have been identified earlier in this report and are publically accessible via the Hub's website, but are subject to securing appropriate levels of funding. A range of local partnership priorities / projects have also been identified by the catchment partnership for the Roding, Beam and Ingrebourne as detailed in the Thames River Basin Management Plan, and earlier in this report. These projects will be subject to securing appropriate levels of funding.

## Potable Water

- 5.42 There are no planned major infrastructure upgrades scheduled for potable water supply infrastructure within the Brentwood Borough.

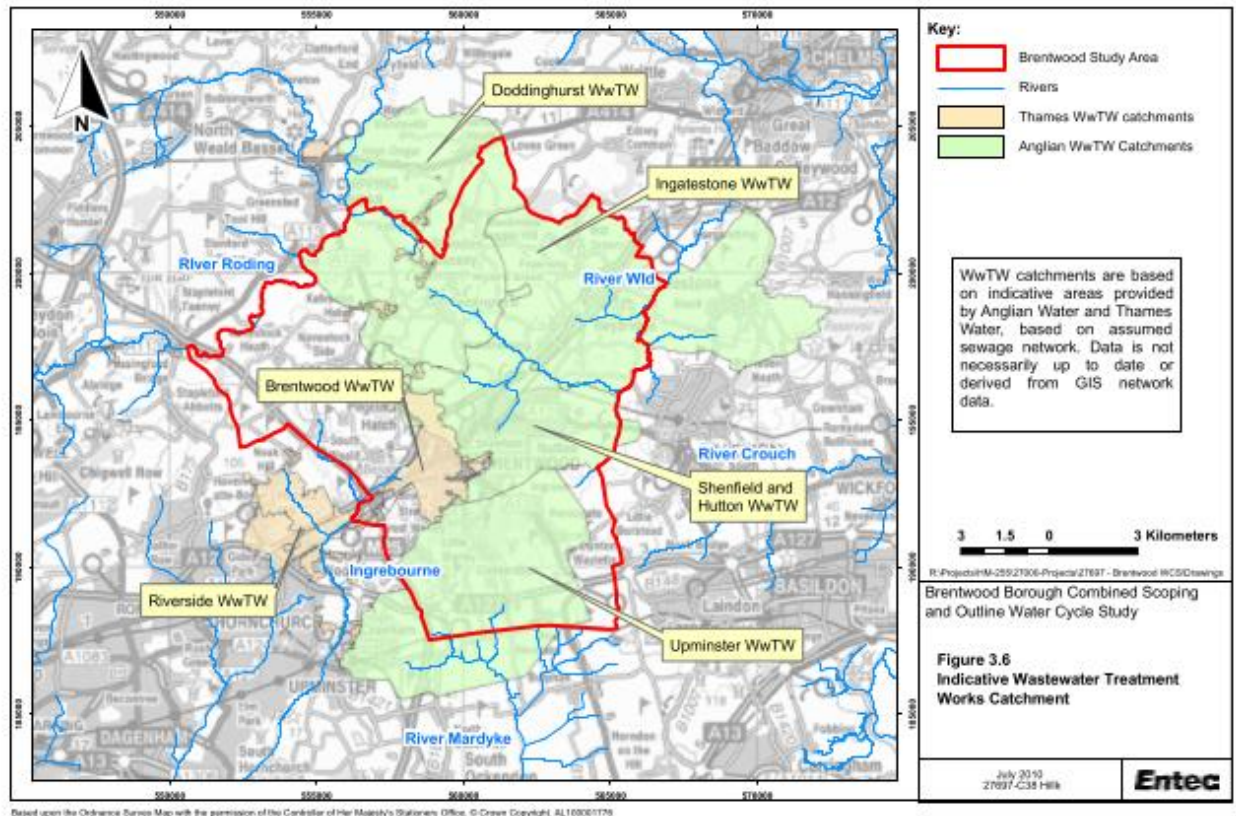
## Wastewater Treatment Works

- 5.43 There are six Wastewater Treatment Works (WwTW) serving Brentwood Borough. A plan setting out the indicative WwTW catchment areas is detailed in Figure 5.9<sup>11</sup>:
- i. Doddinghurst WwTW (Anglian Water)
  - ii. Ingatestone WwTW (Anglian Water)
  - iii. Shenfield and Hutton WwTW (Anglian Water)
  - iv. Brentwood WwTW (Thames Water)
  - v. Upminster WwTW (Anglian Water)
  - vi. Riverside WwTW (serves a small area near Brook Street Interchange) (Thames Water).

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<sup>11</sup> Image reproduced from Brentwood Scoping and Outline Water Cycle Study – Final Report January 2011

Figure 5.9: Wastewater Treatment Works Catchments



# Implications of Growth

## Flooding

- 5.44 The main implications of the Local Plan allocation sites in relation to flooding are summarised within Figure 5.9 below. It can be noted from the table, that key conclusions include:
- site specific flood risk assessment and site layout and design around flood risk for both Officer's Meadow and Dunton Hills Garden Village.
  - site specific flood risk assessments for approximately an additional 33 sites;
  - drainage impact assessments for the remaining 12 proposed allocations.
- 5.45 There will also be a need to refer to the site-specific recommendations with the Essex SWMP
- 5.46 At a more general level, the SFRA update includes a series of recommendations which are summarised below and are likely to have cost implications as part of the development process for various sites:



- sites around non-modelled main river and ordinary watercourses should use the surface water flood risk maps as a proxy for fluvial flood risks, with hydraulic assessments required of the likely flood risks from currently non-modelled main river and ordinary watercourses;
- design in fluvial floodplains on sites, and
- all new development should attempt to reduce surface water run-off by sustainably managing run-off on site.

5.47 The Strategic Flood Risk Assessment identifies one location in the Brentwood Borough where there is a risk of flooding caused by sewer blockage/capacity issue. The assessment refers to a possible flood event at Ingatestone High Street, at a low point, due to sewer flooding at Whadden Chase. The potential flooding would occur for a 1 in 100 year annual probability event. This area drains into the Ingatestone WwTW and as such represents a potential constraint to housing growth with regard to sewerage network capacity.

Figure 5.11: Summary of Flooding Issues – Local Plan Sites

Site	Site Name	Proposed Use	Total Site Area (ha)	Fluvial Flood Zone						Surface water risk			In Critical Drainage Area?	Development Viability
				Flood Zone 1 Area	% of site	Flood Zone 2 Area	% of site	Flood Zone 3 Area	% of site	High Risk	Medium Risk	Low Risk		
112A	Childerditch Industrial Estate	Employment Site	11.25	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
102	William Hunter Way car park, Brentwood	Mixed Use	1.2	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	No	site specific FRA required
087	Land at Alexander Lane, Shenfield	Housing Site	1.73	100.00	100.00	0.00	0.00	0.00	0.00	No	No	Yes	Yes	site specific FRA required - within CDA so should refer to the site specific recommendations in the SWMP
003	Wates Way Industrial Estate, Ongar Road, Brentwood	Mixed Use	0.99	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	permitted subject to LPA/LLFA consultation, requires Drainage Impact Assessment
21	Horndon Industrial Estate, Station Road, West Horndon	Mixed Use	10	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	Yes	site specific FRA required - within CDA so should refer to the site specific recommendations in the SWMP
39	Westbury Road Car Park, Westbury Road, Brentwood	Housing Site	0.27	100.00	100.00	0.00	0.00	0.00	0.00	No	No	No	No	permitted subject to LPA/LLFA consultation, requires Drainage Impact Assessment
40	Chatham Way/Crown Street Car Park, Brentwood	Housing Site	0.33	100.00	100.00	0.00	0.00	0.00	0.00	No	No	No	No	permitted subject to LPA/LLFA consultation, requires Drainage Impact Assessment
41	Land at Hunter House, Western Road, Brentwood	Housing Site	0.21	100.00	100.00	0.00	0.00	0.00	0.00	No	No	No	No	permitted subject to LPA/LLFA consultation, requires Drainage Impact Assessment
81	Council Depot, The Drive, Warley	Housing Site	3.2	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
83	Land west of Warley Hill, Pastoral Way, Warley	Housing Site	2.21	100.00	100.00	0.00	0.00	0.00	0.00	No	No	Yes	No	site specific FRA required
085B	Land adjacent to Tipps Cross Community Hall, Blackmore Road, Tipps Cross	Housing Site	0.33	100.00	100.00	0.00	0.00	0.00	0.00	No	No	No	No	permitted subject to LPA/LLFA consultation, requires Drainage Impact Assessment
2	Brentwood railway station car park	Housing Site	1.07	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	Yes	site specific FRA required - within CDA so should refer to the site specific recommendations in the SWMP
10	Sow & Grow Nursery, Ongar Road, Pilgrims Hatch	Housing Site	1.2	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
079A	Land adjacent to Ingatestone by-pass (part bounded by Roman Road, south of flyover)	Housing Site	1.39	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	Yes	site specific FRA required - within CDA so should refer to the site specific recommendations in the SWMP
77	Land south of Redrose Lane, north of Woollard Way, Blackmore	Housing Site	3.3	100.00	100.00	0.00	0.00	0.00	0.00	No	No	Yes	No	site specific FRA required
76	Land south of Redrose Lane, north of Orchard Piece, Blackmore	Housing Site	1.69	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
20	West Horndon Industrial Estate, Childerditch Lane, West Horndon	Mixed Use	6.45	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	Yes	site specific FRA required - within CDA so should refer to the site specific recommendations in the SWMP
22	Land at Honeyput Lane, Brentwood	Housing Site	10.93	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
023A	Land off Dodinghurst Road, either side of A12, Brentwood	Housing Site	5.99	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
32	Land east of Nags Head Lane, Brentwood	Housing Site	5.88	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	No	site specific FRA required
34	Officer's Meadow, land off Alexander Lane, Shenfield	Housing Site	20.8	20.34	97.79	0.39	1.88	0.07	0.34	Yes	Yes	Yes	Yes	consider site layout and design around flood risk - within CDA so should refer to the site specific recommendations in the SWMP
44	Land at Priests Lane (west), Brentwood	Housing Site	4.51	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	Yes	site specific FRA required - within CDA so should refer to the site specific recommendations in the SWMP
27	Land adjacent to Carmel, Mascall Lane, Warley	Housing Site	0.34	100.00	100.00	0.00	0.00	0.00	0.00	No	No	No	No	permitted subject to LPA/LLFA consultation, requires Drainage Impact Assessment
079C	Land adjacent to Ingatestone by-pass (part bounded by Roman Road)	Employment Site	2.06	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	Yes	site specific FRA required - within CDA so should refer to the site specific recommendations in the SWMP
128	Ingatestone Garden Centre, Roman Road, Ingatestone	Housing Site	3.45	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	No	site specific FRA required
152	Land East of Horndon Industrial Estate	Mixed Use	0.8	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	No	permitted subject to LPA/LLFA consultation, requires Drainage Impact Assessment
158	Land North of A1023 Chelmsford Road, Shenfield	Mixed Use	4.45	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	Yes	site specific FRA required - within CDA so should refer to the site specific recommendations in the SWMP
178	Land at Priests Lane (east) adjacent Bishops Walk, Brentwood	Housing Site	0.61	100.00	100.00	0.00	0.00	0.00	0.00	No	No	Yes	Yes	permitted subject to LPA/LLFA consultation, requires Drainage Impact Assessment
186	Land at Crescent Drive, Brentwood	Housing Site	1.54	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	Yes	site specific FRA required - within CDA so should refer to the site specific recommendations in the SWMP
187	Land south of East Horndon Hall	Employment Site	8.7	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
112D	Childerditch Industrial Estate	Employment Site	2.34	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
194	Brizes Corner Field, Blackmore Road, Kelvedon Hatch	Housing Site	0.87	100.00	100.00	0.00	0.00	0.00	0.00	No	No	Yes	No	permitted subject to LPA/LLFA consultation, requires Drainage Impact Assessment
106	Site adjacent to Ingatestone Garden Centre (former A12 works site)	Housing Site	4.65	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	No	site specific FRA required
235	Land to the north of Alexander Lane, Shenfield	Housing Site	1.36	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	Yes	site specific FRA required - within CDA so should refer to the site specific recommendations in the SWMP
263	Land east of Chelmsford Road, Shenfield	Housing Site	9.85	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	Yes	site specific FRA required - within CDA so should refer to the site specific recommendations in the SWMP
276	Oak Hurst, Chelmsford Road, Shenfield	Housing Site	0.55	100.00	100.00	0.00	0.00	0.00	0.00	No	No	No	No	permitted subject to LPA/LLFA consultation, requires Drainage Impact Assessment
294	Chestnut Field, Backmore Road, Hook End	Housing Site	0.33	100.00	100.00	0.00	0.00	0.00	0.00	No	No	No	No	permitted subject to LPA/LLFA consultation, requires Drainage Impact Assessment
311	The Eagle and Child Public House, Chelmsford Road, Shenfield	Housing Site	0.24	100.00	100.00	0.00	0.00	0.00	0.00	No	Yes	Yes	Yes	permitted subject to LPA/LLFA consultation, requires Drainage Impact Assessment
117B	Ford Warley - Northern Site	Housing Site	1.28	100.00	100.00	0.00	0.00	0.00	0.00	No	No	Yes	No	site specific FRA required
117A	Ford Warley - Southern Site	Housing Site	6.81	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
075B	Land off Stocks Lane, Kelvedon Hatch	Housing Site	2.15	100.00	100.00	0.00	0.00	0.00	0.00	No	No	Yes	No	site specific FRA required
112E	Childerditch Industrial Estate	Employment site	7.05	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
101A	Brentwood Enterprise Park (M25 Works Site at A127/M25 junction 29)	Employment site	35.47	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
023B	Land off Dodinghurst Road, either side of A12, Brentwood	Housing Site	2.2	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
101C	Codham Hall Farm	Employment	9.62	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
101D	Codham Hall Farm	Landscaping Area	8.01	100.00	100.00	0.00	0.00	0.00	0.00	Yes	Yes	Yes	No	site specific FRA required
200	Dunton Hills Garden Village	Mixed Use	257	231.28	89.99	2.36	0.91	23.37	9.08	Yes	Yes	Yes	No	site specific FRA required, consider site layout and design around flood risk

## Wastewater Treatment and Water Quality<sup>12</sup>

- 5.48 The assessment of DWFs undertaken in the WCS update indicate that Doddinghurst WwTW, Shenfield & Hutton WwTW and Upminster WwTW are not predicted to discharge a volume of effluent greater than the consented limit for any epoch, under any tested scenario.
- 5.49 The assessment also indicates that Brentwood WwTW is already discharging a volume of effluent greater than its consented limit. Additionally, the review indicated that Ingatestone WwTW has less than 10% capacity left. By 2020 it is predicted that both Ingatestone and Brentwood WwTWs will be discharging at a greater volume than the current consent limit.
- 5.50 The assessments of impacts on water quality and the WwTW show future housing growth will not cause any significant deterioration in water quality and that WwTWs and their associated sewer networks are not likely to need upgrading by 2036. However, it has been identified that there may need to be some consideration to sewerage network upgrade evidenced by modelled flooding of Ingatestone High Street during a 1 in 100 year annual event due to capacity of sewer network in the area.
- 5.51 Consent limits may need to be revised for Brentwood and Ingatestone WwTWs as DWF has been predicted to exceed the current consent limits. This applies to both single house occupancy of 5 people and single house occupancy of 2.5 people. Permit levels may also need to be revised for ammonia at Doddinghurst WwTW, to prevent WFD class deterioration.

## Water Supply<sup>13</sup>

- 5.52 Affinity Water - It is clear from the forecast supply-demand balance and the main Water Resources Management Plan (WRMP14) that the resource situation in this area is constrained by environmental water availability, and that with growth forecast, if there were no interventions security of supply would be at risk. The WRMP14 forecast takes into account that over 33,020 new properties will be built in WRZ5 by the end of the planning period in 2040. There are 169 homes scheduled in the Affinity Water WRZ5. Due to the low volume of development in the WRZ5 growth plans set out by Brentwood Borough Council certainly have the potential to be accommodated within the overall Affinity Water WRZ5 WRMP, however, further confirmation from Affinity Water will be required to firstly assess demands developments occurring outside of the Brentwood area and to ensure that the individual developments proposed have been fully incorporated into each WRMP.
- 5.53 Essex and Suffolk Water projections have shown a supply between the 2014 WRMP and 2040 under current forecasts. The forecast takes account that 136,504 properties will be built by 2030 and the household population is expected to expand from 1.628 million to 1.866 million people. There are up to 9686 homes forecast in the Essex WRZ under growth plans (including windfall) set out by Brentwood Borough Council. Given that the forecast takes into account almost 15 times that figure, and the water resource zones is surplus it

<sup>12</sup> Information extracted and summarised in part from WCS Update – further technical information is available within the main publication.

<sup>13</sup> Information extracted and summarised in part from WCS Update – further technical information is available within the main publication.

appears that Essex and Suffolk Water have sufficient capacity to meet the demands of future developments.

## Financial Considerations

5.54 The financial considerations arising from this chapter are detailed in Part B of the IDP.