

Eastleigh Surface Water Management Plan



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Hampshire Surface Water Management Plans (SWMP) - Eastleigh

Executive Summary

This is one of a suite of Surface Water Management Plans being prepared for districts in Hampshire. By 2015 it is anticipated that there will be full coverage of all Hampshire districts with SWMPs.

The document has been prepared by Hampshire County Council in conjunction with stakeholder and partner organisations through a stakeholder officer group comprising representatives from the relevant district council and adjoining authorities, the Environment Agency and the water companies.

The document focuses on surface water flood risk in Eastleigh borough. It should be read alongside the Strategic Overview and Background Information SWMP document which provides a context for this report and the others to be prepared in future.

The document describes the topography, geology and hydrology of Eastleigh borough and describes other significant features which can impact on surface water flood risk. It collates and assesses historic data on surface water flood events in Eastleigh and uses Defra / Environment Agency mapping data and projections to determine likely future flood risk taking into account the impacts of climate change.

This data is described and assessed by Parish (including the un-parished area of Eastleigh town itself) looking at each area's susceptibility to flooding based on information from past flood events and the likelihood of future flooding based on national modelling data.

This allows a hierarchy of flood risk in the borough to be identified along with surface water flooding 'hotspots' where further, more detailed work may be required into the causes of, and possible responses to, flood risk. It highlights what solutions may be required to address and/or mitigate flood risk in those 'hotspot' areas and where further investigation is recommended.

Flood risk management responses are proposed which cover a range of areas including effective communication, policy responses and physical works. Ultimately the aim of identifying hotspots is to bring these areas to the attention of all parties who may be able to influence and reduce flood risk.

This SWMP report will continue to evolve as flood risk is better understood and as additional flood risk areas are identified, ultimately leading to a reduction in the risk of flooding as well as an increase in the understanding of flood risk across the borough.

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Hampshire Surface Water Management Plans (SWMP) Eastleigh

1. Introduction

This document is one of a suite of intermediate level Surface Water Management Plans (SWMPs) being prepared for individual districts in Hampshire. It should be read alongside the Surface Water Management Plan Strategic Assessment and Background Information document which provides generic background and supporting information relevant to each of the district SWMPs.

The overall aim of this SWMP study is to ensure that all flood risk partners work together to understand the locations, causes and effects of flooding within the borough of Eastleigh and to identify measures to mitigate against flooding in the form of an Action Plan (see Appendix E). Once in place, this Action Plan should be reviewed and updated on a regular basis, in accordance with Defra guidance.

The scope of this report is to expand on the strategic assessment carried out under the Flood Risk Regulations, in the form of the Preliminary Flood Risk Assessment and to carry out an intermediate assessment, within Eastleigh.

2. Background

In 2009, Defra produced a National Rank Order of Settlements Susceptible to Surface Water Flooding, ranked by the estimated number of properties susceptible to surface water flooding resulting from severe rainfall. This rank order was populated using a new national methodology indicating the relative effect between settlements if each was subjected to a similar severe rainfall event.

This ranked list of settlements was developed using the Environment Agency's Areas Susceptible to Surface Water Flooding maps. These maps indicate areas considered to be susceptible to flooding from surface water, categorised within three bandings; less, intermediate and more susceptible.

The Areas Susceptible to Surface Water Flooding map was produced using a simplified modelling technique that assumes underground sewerage and drainage systems, and smaller over ground drainage systems are full to capacity so preventing surface water draining from the surface. The impacts of buildings are not considered. This method uses a single rainfall event with a 1 in 200 chance of occurring in any year.

Priority locations within Hampshire were identified by Defra where evidence indicating the risk and potential impact of surface water flooding could be highest and where SWMPs would be most effective to understand and manage flooding. Using this assessment, as well as historic flooding information, Defra identified a need for SWMPs to be produced for three

areas: - Rushmoor, Basingstoke and the central Hampshire chalk catchment (groundwater flooding).

In addition to this, Eastleigh, ranked just outside of the initial funded SWMPs at no. 102, was also deemed to require a SWMP. This SWMP will initially consider the risk of flooding across the entirety of the borough of Eastleigh to enable better understanding of the flood risk in this area and to assess potential mitigation options for areas determined to be at a high risk of flooding.

The first stage of any SWMP is data collection, involving consultation with key partners and stakeholders to obtain all relevant data and information relating to historic and current flooding, alongside information on flood receptors and flood consequences.

Following completion of the data collection phase, the surface water flooding information is assessed in order to identify 'hotspot' areas that have a history of flooding incidents. These are prioritised for further investigation initially. However, sites considered being at a potential future risk of flooding will also be considered and the information used to inform the planning process and the future location of new development.

It should be borne in mind, however, that this is one in a series of intermediate SWMPs planned across the county. Areas identified as a priority in Eastleigh will, in due course, need to be considered alongside priority areas identified in future SWMPs covering other districts. Similarly, the order in which potential flood alleviation / mitigation schemes are identified and progressed will be considered in this broader context rather than on a district by district basis. Another determinant of which, how and when schemes are progressed will be the availability of funding to implement such works.

Flooding arising from a combination of sources, and flooding incidents involving interaction between different flood types, will fall to the Lead Local Flood Authority (Hampshire County Council) to investigate, and therefore these types of flood incident will be considered within the scope of this SWMP.

This report aims to consider all hydraulic flooding incidents in Eastleigh but does not address sewer flooding where it occurs as a result of operational issues as this is the responsibility of the water companies.

It should also be noted that the compilation of flooding events within the borough does include some flooding solely due to main rivers, responsibility for which falls to the riparian landowner and is under the supervision of the Environment Agency. Therefore, further investigation of these occurrences is considered to be outside the remit of this report. Coastal flooding is also beyond the scope of this report and falls within the remit of the Environment Agency and, by agreement, District, Borough and City councils.

3. Aims & Objectives

Within the overarching SWMP document, a number of generic objectives have been developed which should be considered as the basis for any SWMP.

These objectives are to:

- Map historic flood incident data;
- Map flooding locations influenced by surface water;
- Identify surface water flooding 'hotspot' areas;
- Assess, compare and prioritise 'hotspot' areas for detailed assessment;
- Identify measures where appropriate, assess options and confirm preferred mitigation options for identified 'hotspots';
- Engage with partners and stakeholders; and
- Make recommendations for the next stages of assessment.

In addition to these, specific objectives for the Eastleigh SWMP are as follows:

- To identify and record known drainage assets in high risk areas, including information on condition, ownership and maintenance requirements; and
- To ensure the results of the SWMP link into both development planning and emergency planning policies and procedures.

This report will also refer to, and take into account, information and recommendations made within the following key documents:

- Partnership for Urban South Hampshire (PUSH) Strategic Flood Risk Assessment produced by Halcrow,
- Test & Itchen Catchment Flood Management Plan, published by the Environment Agency.
- South East Catchment Flood Management Plan, published by the Environment Agency
- River Basin Management Plan: South East River Basin District;
- North Solent Shoreline Management Plan, Selsey Bill to Hurst Spit

4. The Study Area

4.1. General

Eastleigh Borough lies in the central south of Hampshire and includes the town of Eastleigh and a number of smaller settlements.

The borough covers an area of over 8,000 hectares, containing a mixture of highly urbanised settlements with more sparsely populated agricultural land in-between, supporting a population of approximately 116,000 living in around 50,000 dwellings.

The Rivers Itchen and Hamble run through Eastleigh Borough. They are chalk rivers of international importance as evident in the number of environmental designations along their length. They provide a habitat for a number of rare plant and animal species as well as being important sources of fresh water for southern Hampshire.

To the south of Eastleigh Borough is The Solent, an internationally important stretch of coastline with an extremely busy shipping area. The twin tides along this section of coastline give rise to important habitats at the mouth of the Itchen and Hamble including large areas of marshland which are recognised for their environmental importance.

A number of contextual maps are provided in Appendix B to illustrate the environmental and historical areas of importance within the borough as well as other related information.

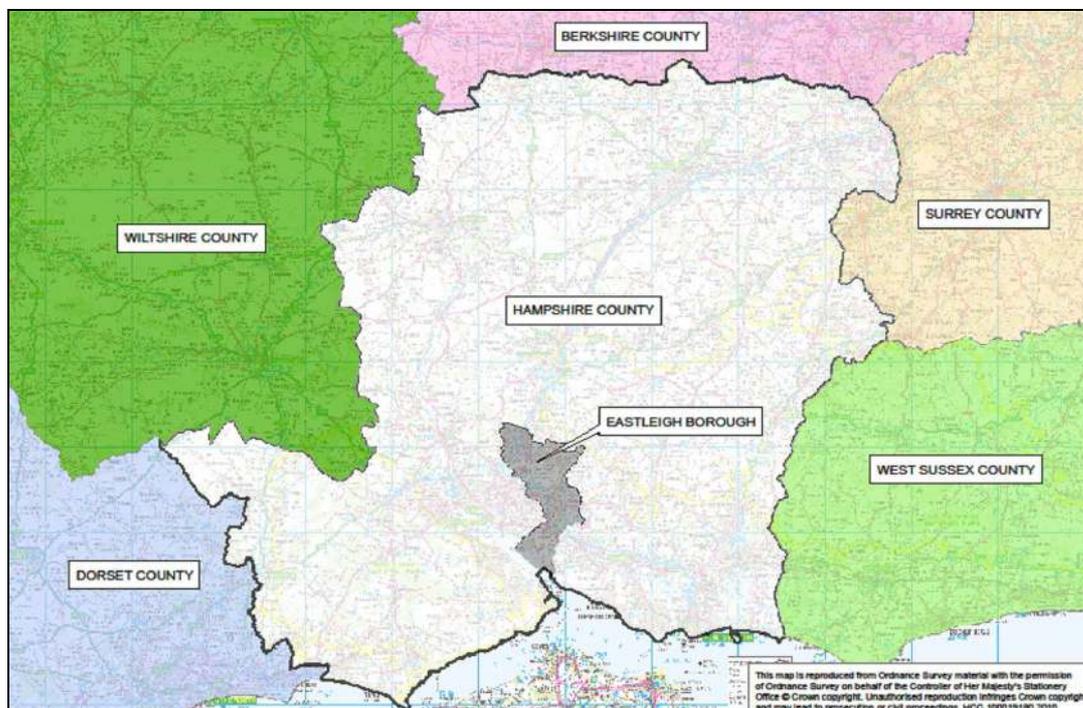


Figure 1: Eastleigh Location Plan

4.2. Geology and Soils

The geology of an area has a significant impact on its ability to contain and drain surface water and other water flows. The borough of Eastleigh lies within the eastern part of the Hampshire Basin geological region, a broad basin filled with bedrock Tertiary clays and sands which overlay Cretaceous Chalk at depth. The centre of the borough is divided by a north-westerly continuation of the Portsdown Anticline, featuring the anticline and a complimentary syncline. For this reason the bedrock Thames Group London Clay Formation outcrops both in the north and the centre of the area, whilst the bedrock Bracklesham Group Formations are found in the centre and south of the borough.

The superficial deposits have been influenced by Southampton Water to the south-west and several significant watercourses flowing towards the sea, particularly the Monks Brook, Barton River/Lower Itchen and the River Hamble. Accordingly the flanks of Southampton Water feature a succession of River Terrace Deposits (from the second to ninth terraces) whilst the river valleys feature both Alluvium and River Terrace Deposits. Immediately adjacent to Southampton Water lie superficial Tidal Flat Deposits. The Lower Itchen and River Hamble rise on Chalk outcrops outside the borough with the Chalk providing continual flow to both throughout the year. The lower reaches of the River Hamble are tidal.

The sandier members of the London Clay Formation and Bracklesham Group are secondary or minor aquifers capable of supporting water supplies at a local rather than strategic level and in some cases forming an important base flow to rivers, whilst the clays are unproductive or non aquifers. The sandy and gravelly elements of the superficial River Terrace Deposits also function as secondary or minor aquifers. Such aquifers can display a wide range of water permeability and storage. As such, infiltration drainage is only likely to be possible where sands or gravels are present and as variable clay content produces variable permeability and high groundwater levels, then ground investigation is a necessity for effective design and to reduce flood risk.

Mapping illustrating the geology of Eastleigh Borough is included within Appendix B.

4.3. Hydrology

The borough of Eastleigh is dominated by two main river catchments; the River Itchen catchment covers the majority of the borough with the River Hamble catchment to the East.

Within the River Itchen catchment there are seven sub catchments affecting Eastleigh which link into the different rivers. These areas are illustrated on the maps in Appendix B and highlight the area in which run off could be controlled to influence the level of flooding at different points.

The River Hamble catchment includes four sub catchments within the Eastleigh boundary. The majority of these affect the southern part of the borough and are illustrated within Appendix B.

The Itchen catchment is largely dominated by groundwater flow due the bedrock geology that underlies the area. The River Itchen is considered one of the best chalk streams in the world with excellent diversity and quality waters, meaning it is covered by several designations including the Special Area of Conservation (SAC) and Sites of Special Scientific Interest (SSSI) designations.

In contrast to the upper section of the river, the lower section flows through heavily urbanised areas making the catchment very prone to flash flooding from surface water run off and drainage systems being overwhelmed. Flood

risk is likely to increase in the future due to the prediction of more frequent intense storms.

A major tributary that flows into the River Itchen, and forms a considerable part of this catchment, is Monks Brook which runs through Chandlers Ford. Much of this watercourse has been culverted and, due to the proximity of properties and infrastructure, has the potential to cause significant consequences if flooding occurs.

The River Hamble catchment is predominantly rural in the upper section and highly urbanised in the lower section leading to very different characteristics in each.

This catchment drains into a number of designated sites of national and international importance for nature conservation, such as the Solent and Southampton Special Protection Area and Ramsar site or the Solent Maritime Special Area of Conservation. The upper section runs over permeable chalks where there are few properties and a lower risk of surface water flooding, whereas the lower section is dominated by clay with the potential to cause flash flooding in the urbanised areas along the coast. Future development could put added strain on existing drainage systems and will need to be carefully managed, particularly with the projected effects of climate change as identified in the SWMP Strategic Assessment & Background Information document.

A plan indicating the river catchments and river network is included in Appendix B.

5. Establishing Partnerships

The Flood and Water Management Act 2010 requires that unitary and county authorities take the lead on local flood risk management activities and defines them as a Lead Local Flood Authority (LLFA). The County Council, in its role as LLFA, has a responsibility to lead and convene production of the SWMP ensuring it is maintained and updated as required.

In view of this, Hampshire County Council has taken the lead on this SWMP bringing together those stakeholders that are critical for its production as well as providing information relating to its role as a Planning Authority, Highway Authority, Emergency Planning Authority and LLFA.

As with all SWMPs, there are a number of key partners in addition to Hampshire County Council each with important roles to play in managing flood risk. In this case they are:

- Eastleigh Borough Council
- Environment Agency and
- Southern Water

Eastleigh Borough Council has a number of permissive powers under the Land Drainage Act 1991 for the prevention and mitigation of flood damage

from ordinary watercourses and also responsibility for managing flood risk encompassed in planning legislation.

Eastleigh falls within the Environment Agency's South East region. The Environment Agency has a supervisory role over all aspects relating to flood defence with a more specific role to the maintenance of main rivers.

The borough is served by Southern Water supplying foul and surface water sewerage systems. Southern Water is also responsible for the maintenance of these networks.

A Data Sharing Protocol has been agreed and signed up to by these partners in order to agree the terms by which data is shared throughout the process of undertaking the Eastleigh SWMP and to ensure data is used correctly.

Any decisions made by these partners could also have implications on how bodies and organisations carry out their roles with respect to drainage and flood risk management. In particular those listed below:

- Network Rail;
- Highways Agency;

Flood risk is not contained within administrative boundaries. Therefore it is vital, in considering the management of surface water, to involve neighbouring authorities. In this case this includes the following authorities:

- New Forest District Council;
- Test Valley Borough Council;
- Winchester City Council;
- Southampton City Council;

All of the bodies and organisations highlighted above have been invited to comment on this SWMP.

6. Locally Agreed Surface Water Flooding Information

Given the high volume of available data it is essential to establish the most appropriate datasets, both in terms of quality and coverage, to enable a suitable assessment of local flood risk.

As part of the preparation phase of this SWMP, all available flood related data was collected from each partner and assessed in terms of quality and coverage across the borough. This data contained a range of information on historic flooding incidents as well as theoretical information relating to the potential for flood risk.

Each piece of data was assessed in accordance with the data quality and confidence criteria agreed between the partners. These criteria are:

- 1 Best Possible - No better available; not possible to improve in the near future
- 2 Data with known deficiencies - Best replaced as soon as new data are available
- 3 Gross assumptions - Based on experience and judgement
- 4 Heroic assumptions - An educated guess

Each dataset obtained for the use of this SWMP is listed within Appendix A together with its data quality score.

Information must only be used in ways appropriate to the quality of data, scale of mapping etc and each partner has specific conditions of use for data outside each individual organisation. These conditions must be complied with and no third party information will be distributed or reproduced without either the express consent of that data owner or confirmation that the conditions for use of the data is adhered to. When considering Freedom of Information (Fol) or Environmental Information Regulations (EIR) requests, Hampshire County Council is unable to release information which is owned by a third party. Data licensing requirements are identified within Appendix A alongside the data quality scoring.

6.1. Existing and Historic Flooding Incidents

Data relating to historic flooding incidents was available from all key stakeholders and was generally assessed as being of good quality in terms of flood location although the extent and consequences of these incidents were not as well recorded.

Information on known flooding has been incorporated into a flood database including as much information as is known about each flood site. This database has been ratified by the SWMP partners and it has been agreed that the localised flooding incidents database constitutes the best available information on existing and historic flooding incidents. However this data must not be used to identify individual properties at risk of flooding or with base mapping of more than 1:25,000.

This database includes sites which have experienced flooding as a result of extreme weather conditions or rainfall which has exceeded the design capacity of the existing drainage system as well as sites where blockages or failures in the system has led to flooding.

Historic flooding data can be subjective as often few formal records exist and much of the information comes from local knowledge gathered over a period of time. The Borough Council, Environment Agency and water companies were asked to comment on all historic flood data, corroborating the details as well as providing additional local flood risk sites, to ensure that the data is as accurate and up to date as possible allowing a high level of confidence to be given to these records. It is a living dataset and will be expanded and updated as new data is obtained.

6.2. Future / Potential Surface Water Flood Risk

There are two key datasets available from the Environment Agency which assess the potential for surface water flooding, namely the Areas Susceptible to Surface Water Flooding and the Flood Map for Surface Water.

The Areas Susceptible to Surface Water Flooding map was produced in July 2009. It was produced using a simplistic modelling technique based on a single rainfall event, namely a storm with a 1 in 200 chance of occurring in any year, highlighting areas that could be affected by surface water flooding within three different bandings; less, intermediate and more. It does not take into account buildings, drainage or ground permeability. This map should not be used with base mapping of more than 1:50,000 and is not designed to be a detailed representation of areas that could flood.

The Agency produced a more detailed Flood Map for Surface Water, issued in November 2010. This uses a more sophisticated modelling technique based on a number of different assumptions for ground permeability, drainage capacity and flow routing around structures. It was created using both a 1:30 and 1:200 annual probability and separates the level of flood risk into areas that could experience flooding in excess of 100mm and 300mm. It should not be used with base mapping of more than 1:25,000 and is not designed to identify individual properties at risk.

Environment Agency guidance suggests that the Areas Susceptible to Surface Water Flooding (2009) map would be more representative of flooding in areas where there is minimal drainage capacity and flat areas with a longer storm duration with the Flood Map for Surface Water (2010) being more suitable for other areas. However, the Environment Agency has stated that local information on flooding should be used to identify the most suitable mapping for specific locations.

Upon analysis of the available flood risk data, the SWMP partners have agreed that the dataset providing the best representation of potential flood risk in Eastleigh is the 2010 Flood Map for Surface Water.

The 1 in 30 year annual probability surface water flood mapping has been chosen to assess flood risk as the majority of drainage infrastructure and property resilience measures are currently designed to accommodate this scale of rainfall event. Sites at risk of flooding from 1 in 30 year rainfall event or less will therefore be prioritised for investigatory work so that those areas at the highest risk can be considered for future works.

Surface water flooding arising from 1 in 200 year rainfall event is considered very extreme rainfall which exceeds that which is generally designed to be contained within drainage systems. However, it should be modelled in terms of exceedance so that overland flows do not cause property flooding and are routed away from properties where feasible. This dataset is therefore of most use for land-use planning purposes.

In addition to these datasets, there is also information available relating to coastal and fluvial (river) flood risk. This data takes the form of the 'Flood Zones' mapping and identifies areas at high, medium and low risk of these types of flooding. This mapping is essential in order to identify where there could be issues with the interaction of surface water and other types of flooding.

Eastleigh Borough is included within the Strategic Flood Risk Assessment carried out by PUSH, the Partnership for Urban South Hampshire. This aims to assess the risk of flooding across south Hampshire using information on known and potential flood risk and assesses vulnerability, land use as well as topographical information. Where appropriate, this information will be used as part of the assessment of potential flooding risk for Eastleigh as well as being used to substantiate the findings of this SWMP.

7. Risk Assessment

7.1. Intermediate Level Assessment

Identification of 'Hotspots'

Following the strategic assessment undertaken as part of the PFRA, sites known to have flooded previously have been identified and assessed. From the information provided in flood incident reports it is clear that the extent, frequency and depth of flooding ranges widely, from very minimal surface water ponding to flooding at a depth that poses a high risk to people and property. There was a need to rank the individual sites and reduce the number to focus on those that posed the highest risk. Once these sites, known as 'hotspots', were identified, a more thorough risk assessment could be undertaken and the sites reviewed in order of their assessed risk.

In order to rank the sites in terms of flood risk, a matrix scoring system was developed. This assesses probability and consequence of flooding at each identified site within the flood risk database. The matrix scoring apportions a score to the flood risk criteria described in the Strategic Assessment and Background Information report. The sites assessed within Eastleigh Borough are listed in Appendix C.

For the highest ranked sites or those where the cause or potential mitigation is complex, a more detailed assessment may be carried out with site investigations to determine existing drainage, works carried out, potential risk and a more thorough assessment of the available data. This will allow potential mitigation options to be reviewed and a cost benefit analysis to be carried out to determine the likelihood of securing funding for any potential schemes. This assessment is more detailed than this intermediate SWMP and will be carried out separately.

However, for those sites where the existing flooding problems could be remedied through maintenance works or relatively straight forward schemes, mitigation options will be identified and these are discussed below.

7.2. Parish Risk Assessment

The following information provides an overview of flood risk in each parish, identifying areas where floods have occurred and recommendations to alleviate flood risk where appropriate. It also highlights where further investigation may be required over forthcoming years and how this information will be used in terms of each relevant authority's maintenance and capital works programmes. These recommendations will be listed within the Action Plan in Appendix E.

Flooding in the borough is fairly sporadic and there are relatively few substantial surface water flooding incidents.

The most significant flooding incidents within the borough can be attributed to fluvial issues. The River Itchen and the Monks Brook have extensive flood plains which cover a number of existing developed areas including parts of Chandlers Ford, Eastleigh town centre and Bishopstoke and it is in these areas where the potential for significant consequences from flooding is highest in the Borough.

Much of the flooding known to occur is as a result of high river flows and, during heavy rainfall, the interaction of fluvial and surface water processes. This illustrates a need to provide either additional capacity in the surface water systems and attenuation to reduce and control the amount of water entering the river or providing areas where the river flows can be allowed to be outside of the river channel (floodplain).

Fluvial, coastal and sewerage flooding incidents per se fall outside of the scope of this study as they are the responsibility of the Environment Agency and Southern Water respectively. However, where there is an interaction between different sources of flooding, in particular where any of these sources of flooding affect surface water, groundwater or ordinary watercourse flooding, they are covered below.

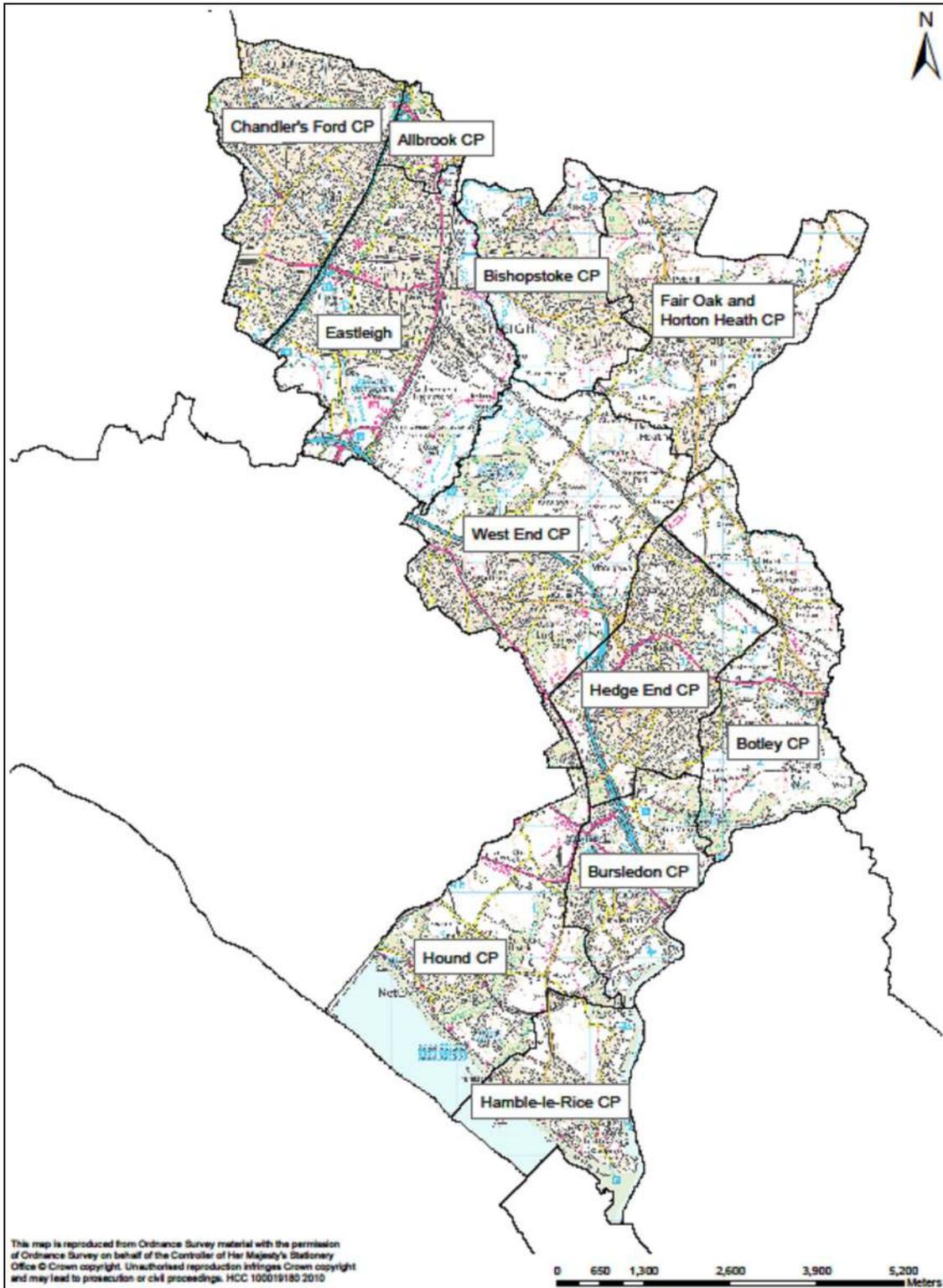


Figure 2: Location of Parishes within Eastleigh Borough

Maps illustrating historic flooding incidents and information on potential flood risk are included for each parish within Appendix D.

7.2.1. Allbrook

Allbrook is the smallest of the parishes within Eastleigh Borough located in the north of the Borough, adjacent to the River Itchen. Although there are large areas of rural land within this parish there are also some densely populated areas which, under heavy rainfall, could lead to flooding due to urban run-off.

Within Allbrook, there has been flooding along Allbrook Hill which has affected some residential and commercial properties. This flooding is thought to be due to the river overtopping and flowing down the hill. This can also impact Pitmore Road although there is no record of property flooding. Flooding has been minimal in recent years largely due to the provision of a grill on the main river culvert and its continual maintenance. It is not thought that any additional work is required in this area at present but it is recommended that this site is monitored and if flooding re-occurs, there may be the need for further investigation.

The Flood Map for Surface Water has been used to carry out the initial assessment of potential flood risk. It shows a small area thought to have a potential risk of surface water flooding located adjacent to the Lower Itchen main river that flows alongside the north east boundary of the parish. The watercourse runs close to the rear of a number of properties on Pitmore Road although, given the distance and elevation of these properties, flooding is unlikely to occur.

This area is also adjacent to the Flood Warning Area known as 'Shawford to Bishopstoke on the River Itchen' which is defined as a flood zone 3 area and at high risk of flooding.

Other areas within the parish shown to be at a potential risk of surface water flooding are sporadic and appear to be concentrated around the M3 junction 12 interchange. Flooding is not known to be an issue in this area at present. However, this highlights the importance of maintaining the existing surface water and river systems to provide the maximum amount of drainage and ensuring suitable maintenance.

Any future development in this area should take the potential for flooding into account and where feasible, should aim to meet or better greenfield run-off rates.

The recommendations for Allbrook are:

- Hampshire County Council to continue to monitor the flood risk situation in the vicinity of Allbrook Hill
- The Planning Authority should ensure that future developments take into account potential flood risk and do not increase runoff rates within these areas

7.2.2. Bishopstoke

Bishopstoke is located towards the northern boundary of Eastleigh. Land use is dominated by residential development through the centre of the parish with the rural area of Stoke Park to the north and agricultural areas to the south.

The only known flooding incident in Bishopstoke is along Fair Oak Road. In this area, the existing ditches and piped system were known to surcharge causing inundation to the foul sewer. Works have been carried out to the existing drainage, removing blockages and improving the capacity of the ditches. This is believed to have resolved this issue and no further works are required at present although it is recommended that the relevant parties are contacted to ensure a suitable level of maintenance is carried out.

In addition to this, there is an area to the south of Templecombe Road where the existing land drainage and ordinary watercourse is thought to be at capacity or there are restrictions further downstream. It is recommended that the riparian landowners in this area are contacted and reminded of their responsibilities in relation to ditch and ordinary watercourse maintenance.

The parish of Bishopstoke includes an area identified by the EA as the 'Shawford to Bishopstoke on the River Itchen' flood warning area which covers a large area to the west of the parish. This area is the Itchen flood plain and is largely undeveloped although does have the potential to impact on the properties along the edge of the flood plain with one major highway and a sewage works potentially at risk. This area is also highlighted as Flood Zone 3. Although no works are proposed, it is recommended that residents within this area sign up to the Environment Agency's flood warning service which will give an indication of the likelihood of flooding. It is also recommended that any development within this area aims to provide additional capacity and attenuation in excess of the greenfield run-off rates. As a minimum, greenfield rates should be provided.

The Flood Map for Surface Water highlights a few areas that have the potential for surface water flooding in future. The largest of these areas follows the Bow Lake main river line in the north of the parish and is within an undeveloped area.

The Fair Oak Road area is shown to have a potential surface water flood risk although there have not been any reported incidents in this area. The data suggests that the interaction of drainage and rivers is a critical aspect of flood risk in Bishopstoke and will need to be carefully considered in any future works to ensure the flood risk is kept to a minimum. It is also essential to ensure that suitable maintenance is carried out on these watercourses and the drainage systems in the higher risk areas to ensure their capacity is maintained.

The recommendations for Bishopstoke are:

- Hampshire County Council to ensure the riparian landowners are aware of their maintenance responsibilities for ordinary watercourses.
- The Environment Agency should promote their Flood Warning Service to those properties not already signed up to the Shawford to Bishopstoke flood zone
- The Planning Authority should ensure that future developments take into account potential flood risk and do not increase runoff rates within these areas

7.2.3. Botley

Botley Parish is located centrally extending to the western boundary of the borough of Eastleigh. It is predominantly rural with a high proportion of agricultural land and includes the villages of Botley, Boorley Green, Broadoak and parts of Hedge End.

The A334 bisects the parish centrally, running east to west and connects Hedge End with Botley and Wickham further to the east. The London to Portsmouth railway line also crosses the parish to the north of Botley village centre forming part of the critical transport network.

The topography is largely low lying with levels falling towards the river Hamble to the eastern boundary of the parish. A number of the tributaries of the Hamble have their sources within or flowing through the parish before joining the main river.

There have been a number of flooding issues in the parish of Botley however, the majority of these sites have had works carried out or have works planned to address these problems.

Those sites which are still thought to pose a flood risk include Broad Oak Road where investigation is already underway and Maddoxford Lane where investigation is still required. It is recommended that the flood issues in Maddoxford Lane are investigated to determine the cause of flooding and if mitigation works are viable.

There are a number of rivers that flow through the parish which have the potential to cause flooding and these are highlighted within Flood Zone 3. Botley is also covered in part by the Environment Agency flood warning area of 'Bishop's Waltham and Botley on the River Hamble' at the eastern edge of the parish. It is recommended that where it is available, residents sign up to the Environment Agency's flood warning service.

The Flood map for Surface Water shows very few urbanised locations are at risk under a 1:30 storm scenario. Those areas that are follow the line of the Hedge End and Moorgreen streams, both of which are classified as main rivers. The only other area shown to be at risk runs just to the north of the

railway line at Boorley Green which again is largely rural and poses very little risk to properties. The 1:200 storm scenario does highlight an increased risk across the parish but this still doesn't pose a high risk to people and properties as the vast majority of risk areas follow the lines of the watercourses.

Botley is considered to be at a relatively low risk of flooding although any future development will have to ensure it does not increase the risk as a result of high river levels causing capacity issues within existing or new drainage systems.

The recommendations for Botley are:

- Hampshire County Council as LLFA should lead the investigation into the causes of flooding in Maddoxford Lane and identify potential mitigation options
- Hampshire County Council to ensure the riparian landowners are aware of their maintenance responsibilities for ordinary watercourses.
- The Environment Agency should promote their Flood Warning Service to those properties not already signed up to the 'Bishop's Waltham and Botley on the River Hamble' flood warning service.
- The Planning Authority should ensure that future developments take into account potential flood risk and do not increase runoff rates within these areas

7.2.4. Bursledon

Bursledon parish is located towards the south east of Eastleigh borough with the River Hamble forming its eastern border leading into the Solent. It is segmented by the M27 running through the northern third of the parish leaving a relatively sparsely populated and agricultural area to the north with the settlements of Bursledon and Lowford to the south. There are also a number of boatyards and a marina along the edge of the parish adjacent to the River Hamble.

There are two known flooding issues within the Bursledon parish. Church Lane is known to suffer from flooding and this is thought to relate directly to the tidal influence of the River Hamble. The existing surface water drainage outfalls into the river but during extremely high tides the water level blocks the drainage outfall and prevents the water escaping. This can also lead to the drainage system silting up. Although there is little that can be done to prevent this, regular maintenance of the existing drainage should be undertaken to ensure maximum capacity is available. If works are carried out on the drainage system, it may be possible to provide additional capacity.

There has also been an issue at Long Lane where runoff from the adjoining land can exceed the capacity of the drainage system. Although maintenance has reduced the frequency of flooding, there is the potential to carry out works

to provide water storage within the car park, reducing the impact on the surface water system. This site will require additional investigation to determine who is responsible for the drainage in this area.

The River Hamble is the source of much of the potential flood risk in the area and is identified by the EA as the 'Hamble Estuary' Flood Warning area.

In addition to the River Hamble, the Hungerford Stream, which is also a main river, starts in the Lowford area and flows south to meet the Hamble at the southern edge of the parish at the Portsmouth / Southampton railway line. The Hungerford Stream is highlighted as Flood Zone 3 and is also shown to have a potential to surface water flooding. This is likely to be due to the interaction of the stream and any surface water drainage out falling in that area.

Overall, Bursledon is considered to be at a relatively low risk of flooding although care must be taken when looking at future developments or drainage works in the vicinity of the watercourses in order to avoid flooding as a result of rising river levels.

The recommendations for Bursledon are:

- Hampshire County Council as LLFA should lead the investigation into Long Lane drainage issues to determine responsibility.
- The Planning Authority should ensure that future developments take into account potential flood risk and do not increase runoff rates within these areas

7.2.5. Chandlers Ford

At the most north westerly point of Eastleigh borough, Chandlers Ford is a heavily urbanised parish bordered by the adjoining boroughs and the M3. The Eastleigh to Romsey railway line runs through the centre of the parish.

This parish has a number of the Monks Brook tributaries running through its northern section forming the main Monks Brook River adjacent to the railway station which then runs south through Eastleigh town and into Southampton City.

There have been a number of flooding incidents within the parish of Chandlers Ford however, works have been undertaken on a number of them including Leigh Road, Cambridge Drive and Ford Avenue. Works have also been carried out on Hocombe Road which, although having reduced the risk of flooding, is dependent on a suitable maintenance regime being in place. Flooding is still a risk in Gordon Road, Common Road and Nickson Close where the watercourse has been known to overtop the culvert and Pine Road where debris is an issue, blocking the gullies. All of these areas are within the Monks Brook catchment and should be considered for further investigation and potential drainage improvements.

The southern part of the Monks Brook in Chandlers Ford is within the EA's 'Chandlers Ford to Swaythling' flood warning area, the majority of which stops at Chandlers Ford station although there is a small section of flood warning area running alongside the railway line. The vast majority of the Monks Brook tributaries are considered to be in flood zone 3 although this does not constitute a flood warning area.

In terms of potential areas at future risk of surface water, the mapping shows that the majority of these areas are located within the Flood Zone 3 following the line of the Monks Brook tributaries and centred on the railway station where the tributaries merge. There are very few areas away from this watercourse illustrating the need to control and manage the interaction between the watercourses and surface water drainage.

In terms of the number of properties potentially at risk from flooding, this parish is considered to have a relatively high risk with approximately 730 properties at risk from a 1:200 year storm scenario. This highlights the importance of ensuring the Monks Brook functions at its full capacity with culverts and the river bed / banks kept clear. In addition, any future drainage works or development should aim to provide additional capacity and must not increase flows in either the river or existing drainage systems. Due to the urbanised nature of the area, property resilience is likely to be an important factor in the prevention of significant consequences from flooding.

It is recommended that the Monks Brook catchment undergoes further investigation to determine possible mitigation or property resilience options. It is also recommended that all those within the flood warning area sign up to the flood warning service.

The recommendations for Chandlers Ford are:

- Hampshire County Council as LLFA should lead the investigation into the causes of flooding in the Monks Brook catchment and identify potential mitigation options
- The Environment Agency should promote their Flood Warning Service to those properties not already signed up to the 'Chandlers Ford to Swaythling' flood warning service.
- The Planning Authority should ensure that future developments take into account potential flood risk and do not increase runoff rates within these areas

7.2.6. Eastleigh Town

Eastleigh is the heavily urbanised central town of the borough. It has a substantial mix of residential and commercial properties with a number of industrial estates. Within this part of the borough are the main railway stations of Eastleigh and Southampton Airport Parkway which serve the critical London to Portsmouth or Bournemouth routes. Southampton Airport Parkway

is also linked to the Southampton International Airport and is adjacent to junction 5 of the M27 and close to the link to the M3 making it a critical transport link and infrastructure interchange.

Despite the urban nature of the majority of Eastleigh, there are large recreational areas including Fleming Park and Lakeside Country Park. These two parks are on the edge of the Monks Brook River which passes through the Borough and into Southampton city. The River Itchen and Barton River also flow through the Eastleigh area although on the eastern border.

There have been relatively few serious flooding incidents in this area. Flooding has been recorded at Station Hill in the centre of Eastleigh but following works and continual maintenance to the existing drainage, the frequency of flooding here has reduced. There are some issues in the Stoneham Lane area where the existing ditches and culverts can be heavily impacted by debris and works are planned to be undertaken in this area to improve the current drainage provision. Maintenance will still be a critical factor and it is essential that all parties implement a suitable maintenance regime.

Southampton Road and Passfield Avenue are still known to flood although the impacts are minimal. These areas should be investigated further to identify opportunities for future drainage improvement works.

There are two significant flood warning areas within Eastleigh where the Monks Brook and the River Itchen flow through the town. However, these areas do not affect significant numbers of people and are concentrated in the more rural areas posing a minimal risk. There is also a relatively low level of potential surface water flooding.

It is recommended that any future development should aim to provide additional drainage or attenuation to reduce the potential for flooding in these areas.

The recommendations for Eastleigh are:

- Hampshire County Council to ensure the riparian landowners are aware of their maintenance responsibilities for ordinary watercourses.
- The Planning Authority should ensure that future developments take into account potential flood risk and do not increase runoff rates within these areas

7.2.7. Fair Oak and Horton Heath

This parish is at the north east of Eastleigh Borough. It includes the settlements of Fair Oak and Horton Heath with a substantial amount of rural land between the two.

There have been a number of flooding incidents in this parish and works have been undertaken in the majority of these areas to improve the drainage capacity and condition. Two areas are still known to be at a higher risk of flooding, namely Allington Lane and Fir Tree Lane. These areas both suffer from frequent silting and damage to the existing ditches and regular routine maintenance is required. Other areas that have been prone to flooding, namely Summerlands Road and Botley Road, will also require appropriate maintenance on the existing drainage and culverts to ensure that the flood risk is kept to a minimum. It is recommended that the relevant authorities and riparian owners are contacted to ensure that a suitable maintenance regime is in place.

In terms of the potential surface water flood risk, there are areas thought to have the potential to cause flooding and are focussed around the watercourses which run through the parish. These include tributaries of the River Itchen towards Fair Oak and also Ford Lake to the east of the parish. The area of most concern is within the centre of Fair Oak which, although on the line of the River Itchen, shows areas at risk within a relatively populated area. Flooding is not known to be an issue here at present and it is recommended that any future development includes provision to keep runoff rates to an absolute minimum and provide a suitable level of attenuation.

The recommendations for Fair Oak and Horton Heath are:

- Hampshire County Council to ensure the riparian landowners are aware of their maintenance responsibilities for ordinary watercourses particularly in Allington Lane, Fir Tree Lane, Summerlands Road and Botley Road.
- The Planning Authority should ensure that future developments take into account potential flood risk and do not increase runoff rates within these areas

7.2.8. Hamble-le-Rice

Hamble is a relatively rural parish located on the edge of Southampton Waters and the River Hamble. There is a considerable mix of residential properties, industrial estates and commercial and waterfront premises as well as critical infrastructure such as the police control centre located on Hamble Lane.

There is only one known significant flooding issue in Hamble-le-Rice and this affects the area around Green Lane and Rope Walk, adjacent to the Solent and the tidal area of the River Hamble.

Flooding in this area is directly related to the high tides in the area and at particularly high tides, water has been known to overtop the existing flood defences. Although there are a number of properties affected in this area, there is no record of internal flooding and once the tide recedes, the water can escape. This does have an impact on surface water as the drainage systems will not be able to discharge at high tides but to date, this has not caused a

significant issue. However, given the potential risk, this area will be put forward for further investigation to assess the risk in more detail and to determine the feasibility of mitigation works.

This area is also within the Environment Agency's flood warning area of The Hamble Estuary which runs along the eastern border of the parish. This is a relatively rural area but any properties within the vicinity are advised to sign up to the Environment Agency's flood warning service.

The potential flood risk mapping does show a number of areas where there could be a potential issue with future surface water flooding, the most significant being around the Hamble railway station. Although these areas are not known to suffer from flooding at present, it is recommended that any future development takes this information into account and ensures sufficient drainage and attenuation is provided.

The recommendations for Hamble-Le-Rice are:

- Hampshire County Council as LLFA should raise awareness of coastal flooding issues and identify what measures can be taken to protect properties
- Hampshire County Council as LLFA should lead the investigation into the causes of flooding at Green Lane and Rope Walk and identify potential mitigation options
- The Planning Authority should ensure that future developments take into account potential flood risk and do not increase runoff rates within these areas

7.2.9. Hedge End

Hedge End parish lies in the centre of Eastleigh Borough. It is bordered to the north by the main Portsmouth to London railway line and to the western edge, by the M27. The vast majority of this area is urban with the settlement of Hedge End a major area of expansion and population growth.

There are several main rivers running through the parish including the Marls Road Stream and the Hedge End Stream to the south of the B3036, the Wildern Stream and Shamblehurst Stream towards the centre of the parish and the Moorgreen Stream to the north, crossing the railway line. In addition to this, the Woodhouse gully, also a main river, crosses the M27 at junction 7.

At present, there are few known problem areas within the parish of Hedge End. Flooding is known to occur in Moorgreen Road and is believed to be as a result of the lack of capacity in the existing drainage system although this should be resolved as part of the school redevelopment in this area.

There is also known to be flooding in the Upper Northam Drive area where maintenance of a watercourse is insufficient. Work has been carried out in this location to adjust the existing drainage systems allowing suitable maintenance

to be carried out, however, the riparian landowners should be informed of their maintenance responsibilities.

There are a number of tributaries of the River Hamble which run through the parish of Hedge End and these have the potential to cause flooding and as well as limiting the amount of water that can drain from surface water systems.

Although there are no known flooding issues in these areas, it is recommended that any development in these areas, limit the surface water runoff to greenfield runoff rates or lower.

The recommendations for Hedge End are:

- Hampshire County Council to ensure the riparian landowners are aware of their maintenance responsibilities for ordinary watercourses particularly in Upper Northam Drive
- The Planning Authority should ensure that future developments take into account potential flood risk and do not increase runoff rates within these areas

7.2.10. Hound

Hound is a relatively rural parish bordering Southampton Water. It contains large portions of agricultural land surrounding residential areas as well as two historically significant areas namely Netley Castle and associated Abbey and the Queen Victoria Country Park.

There have been few significant flooding incidents with the parish of Hound. Those that have occurred have affected Shop Lane, Hound Way and Grange Road, Netley and are primarily the result of frequent blockages of the existing ditch and culvert systems. Although maintenance is carried out on these routes, high levels of debris and also vehicles over-running the ditch edges have led to the capacity being compromised as well as a lack of maintenance by riparian landowners. These routes are not primary roads within the parish but are fairly heavily trafficked and it is recommended that works are carried out to repair these systems and that a review of the maintenance programme is carried out.

Flood risk from rivers and the sea is relatively minor within the parish and those areas that are potentially at risk are generally rural and there would be a minimal impact if flooding did occur. The potential risk from surface water flooding does highlight a few areas which tend to match the locations of the watercourses in the area.

It is recommended that works are carried out to alleviate the flooding issues discussed above and in addition to this, any future developments should

consider the interaction of drainage with the watercourses ensuring sufficient capacity is provided.

The recommendations for Hound are:

- Hampshire County Council to ensure the riparian landowners are aware of their maintenance responsibilities for ordinary watercourses particularly in the Grange Road area.
- The Planning Authority should ensure that future developments take into account potential flood risk and do not increase runoff rates within these areas

7.2.11. *West End*

The parish of West End is located towards the centre of Eastleigh borough bordering the City of Southampton on its westerly boundary. The village of West End is at its southern reach and is bordered by the M27 which effectively splits the urban / rural elements of the parish. Much of the parish consists of agricultural areas although a substantial proportion consists of the Itchen Valley Country Park, a site of international environmental importance.

The River Itchen runs through this country park with two major tributaries running through much of the northern part of the parish. There are also a number of smaller watercourses in the parish and these are concentrated around the main rivers to the North West with a small number to the south.

Of the flood incidents shown in the mapping in Appendix D, two of these have had works carried out to resolve the issues. The remaining flood issues are within Moorgreen Road and Quob Lane where there are issues with the existing ditch system. Regular maintenance is required in these locations and it is recommended that all parties ensure that suitable maintenance is carried out. Little Quob Lane is also known to be an issue where the existing ditch system and drainage is not functioning correctly. The exact cause of flooding is unknown and it is recommended that additional investigation is carried out in this area.

In terms of future flooding, the largest area thought to be at risk is the flood plain of the Itchen at the Itchen Valley Country Park. This area is within the Environment Agency flood warning area of 'Mansbridge and Woodmill on the River Itchen' however, there have been no recorded flooding incidents to date.

There are a number of areas which are thought to be at a potentially high risk of surface water flooding, the majority of which follow the watercourses and match the Flood Zone 3 locations. However, there are some areas which need to be noted, most significantly along the line of the M27 and parts of the railway line.

Given the rural nature of these areas, the impact of any flooding is likely to be minimal, however it highlights the need to carefully consider the locations of

any future developments and to ensure that properties in these areas are resilient to flooding.

The recommendations for West End are:

- Hampshire County Council to ensure the riparian landowners are aware of their maintenance responsibilities for ordinary watercourses particularly in Quob Lane and Moorgreen Lane
- Hampshire County Council as LLFA should lead the investigation into the causes of flooding in Little Quob Lane and identify potential mitigation options
- The Planning Authority should ensure that future developments take into account potential flood risk and do not increase runoff rates within these areas

7.3. Flooding Hotspots Requiring Further Assessment

The assessment of flood risk within each parish in section 7.2 above makes a number of recommendations for action to address that risk. These recommendations are captured and elaborated in the Action Plan attached at appendix E.

There are three key areas where the causes of flooding are complex which will require additional investigation to understand the mechanisms of flooding and potential mitigation options and these are listed below.

It must be noted that other sites may be investigated prior to or in addition to these if further information identifies an increased flood risk or additional issues are identified.

The sites identified are as follows:

Rank	GIS Reference	Location
1	Various	Monks Brook Catchment (Chandlers Ford)
2	9045	Little Quob Lane / Baltic Close / Princes Close, West End
3	9020	Green Lane / Rope Walk, Hamble Le Rice

Table 1: Flooding Hotspots Requiring Further Assessment

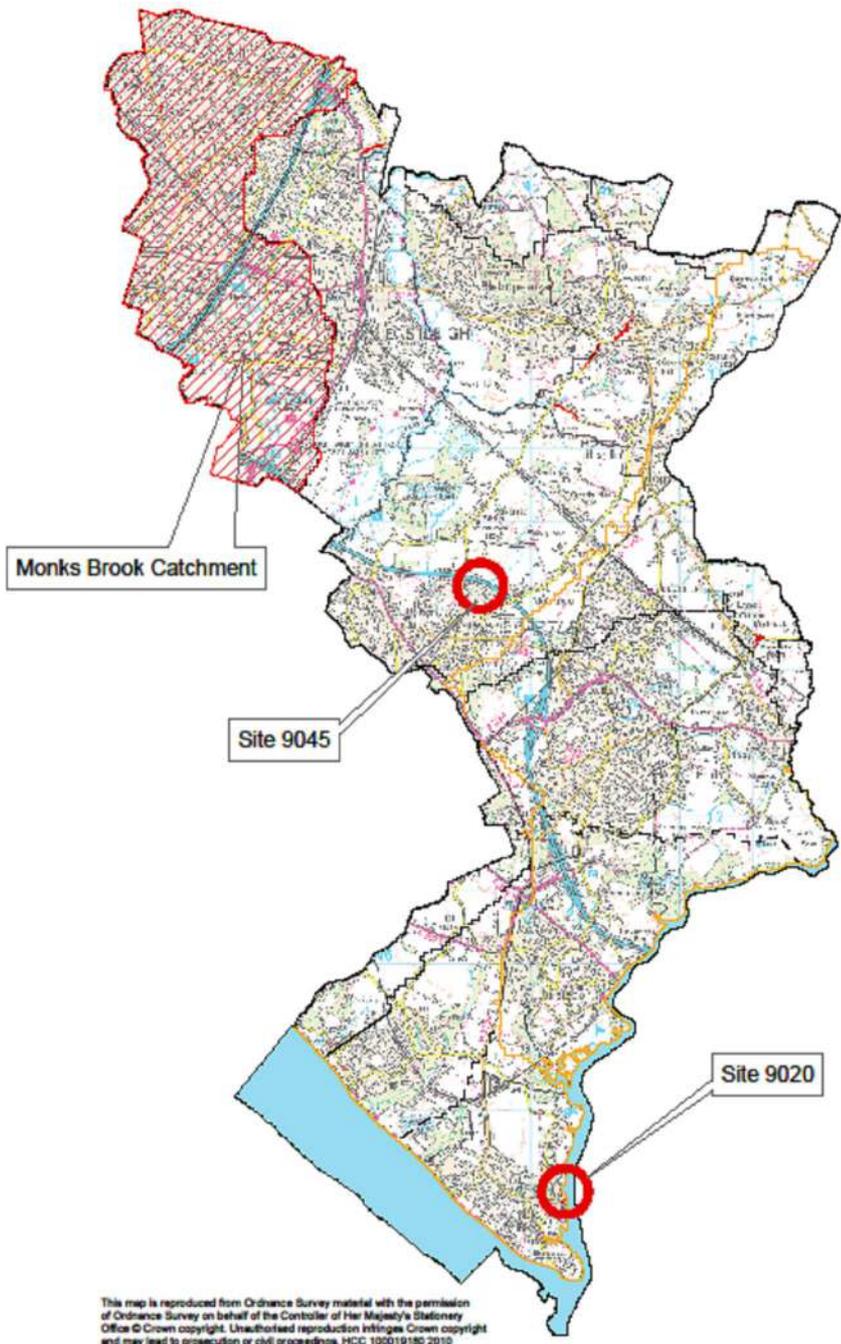


Figure 3: Location of Sites Recommended for Further Assessment

7.4. Managing the Potential for Flood Risk

The following table summarises the number of properties thought to be located within areas at risk of surface water flooding under both a 1:30 and 1:200 storm events. This information was extracted from the Environment Agency's Flood Map for Surface Water and must be used with caution as it is not designed to identify individual properties at risk. However, it can be used to provide an indication of which areas may have a higher relative risk than others.

Parish	Total number of properties per Parish.	Number of properties at risk			
		1:30 deep	1:30 shallow	1:200 deep	1:200 shallow
Allbrook	715	0	6	3	19
Bishopstoke	4216	30	83	96	322
Botley	2361	4	23	18	92
Bursledon	2765	11	18	16	75
Chandlers Ford	10674	70	208	300	729
Eastleigh	10886	0	28	61	652
Fair Oak & Horton	4202	28	100	84	248
Hamble le Rice	2485	0	35	7	160
Hedge End	8737	6	80	93	495
Hound	3411	5	17	51	110
West End	5381	15	69	46	227
Eastleigh Borough	55833	169	667	775	3129
Totals					

Table 2: Properties potentially at risk from surface water flooding
Shallow = 100mm depth Deep = 300mm depth (see section 6.2)

7.5. Managing Flood Risk

The assessment of flood risk within each area in section 7.2 above makes a number of recommendations which are common for the borough as a whole and there are also additional actions that can be taken to reduce the potential for flooding. These recommendations are summarised below and are also elaborated on in the Action Plan attached at appendix E.

Proactive measures can be undertaken to reduce the level of risk such as reviewing drainage maintenance programmes. It is recommended that when drainage maintenance works are being carried out in areas where flooding is shown to be a potential risk (from the potential flood risk maps), an assessment is carried out on the existing drainage capacity. If it is shown that there is already more capacity in the drainage than assumed in the modelling then it could be shown that the areas are at less risk. The potential effects of climate change also need to be considered and it is recommended that where feasible, additional capacity is provided in the order of 30%. This is not always feasible and a whole catchment analysis should be carried out to ensure that

flood risk is not increased downstream. The retro-fitting of SuDS and upstream attenuation can be an effective method of increasing capacity without adversely impacting the downstream catchment.

All new buildings and the development of car parking and hard standing should incorporate sustainable drainage systems with the aim of returning runoff rates and volumes back to the original greenfield discharge to prevent flooding and to ensure the quality of local water. Where this document identifies a risk of surface water flooding, detailed surface water assessments should be submitted for all applications for new buildings, car parking and hard standing areas.

Given the size of the borough, this is a significant task and is unlikely to be carried out in a short period of time. However, as those areas currently affected by flooding are assessed and the flood risk reduced, attention can be centred on those areas potentially at future risk.

The issues around riparian ownership are also essential and these roles and responsibilities need to be publicised more fully. This should be undertaken through the publication and promotion of this document and others which explain the roles and responsibilities in more detail. Targeted publicity should also be carried out in areas where the lack of maintenance is known to be an issue.

The importance of maintaining the flow of watercourses and ditches is critical as these convey much of the water within the Borough. Any obstruction to the watercourse has the potential to increase flood risk and it is essential that all those with responsibilities for the maintenance of these systems ensure a suitable maintenance regime is in place. This is becoming more of an issue with the spread of invasive and non native plant species such as Himalayan Balsam and Japanese Knotweed. Where vegetation is adversely affecting the flow of water the land owner is responsible for the control or removal of that vegetation. Additional information on this role as well as how to control these plant species can be found on the Environment Agency's website (www.environment-agency.gov.uk).

In all cases, the homeowners should be made aware of methods of protecting their home. This has the added benefit of demonstrating a lower risk to insurance companies which could have a financial benefit for those living in these areas.

The Environment Agency has a large amount of information relating to this already on its web site and through means such as parish flood plans and multi-agency flood plans, information can be provided to each community.

In addition to this, home owners can subscribe to the Environment Agency's Flood Warning Service where it is available, which can help to provide advance warning of flooding and assist in the preparation for flooding.

It is recommended that the information in this SWMP is publicised so as to raise awareness of the information available to assist the public in identifying the potential level of flood risk in their area and to assist in the provision of property level protection information.

8. Evaluation of Options & Considerations

In order to determine the suitability of mitigation options for these locations a preliminary assessment of each identified flood location will be required in order to determine the cause of flooding, factors contributing to flooding and whether any works can be undertaken in order to remove or reduce the risk of flooding.

At this phase of evaluation options should not be constrained by availability of funding or delivery mechanisms and should identify all feasible measures available for managing surface water flood risk. Consideration should also be given to other sources of flooding and their interaction with surface water flooding and opportunities for measures that deliver multiple benefits.

In some cases it may not be possible or cost-effective to undertake mitigation works at present but the consideration of other investment projects such as those of the water companies, developers or other partners may make the mitigation of surface water flood risk more viable.

In these instances, the SWMP should identify a suitable strategy to ensure the investment reduces surface water flood risk.

It is recommended that the borough council takes into account areas identified as having the potential for surface water flooding as identified within this Surface Water Management Plan and identifies the need for flood risk mitigation infrastructure when setting its Community Infrastructure Levy.

It is vital that key partners and stakeholders, including the local community, are engaged in this process. This can help determine the level of public interest and support for risk management as well as the appetite for local fund-raising to assist in the delivery of flood mitigation and alleviation measures.

It is recommended that short-listing of these measures is undertaken using a two stage process as defined in the Defra Technical Guidance. Stage 1 of this process requires further site inspections to consider the technical feasibility and relevance of each measure at each of the detailed sites. This process adopts the following scoring system:

- 3** - Feasible with significant benefit;
- 2** - Feasible with some benefit;
- 1** - Feasible but marginal benefit; and
- 0** - Not Feasible or Not Relevant.

Only measures which score 2 or more will be considered further under Stage 2. Stage 2 considers individual measures scored against various criteria, with scores summed to generate a short-list. These short-listing criteria are outlined in Table 3 below. The purpose of the scoring is to rank individual measures to identify those to take forward for more detailed appraisal. The key criterion is whether the measures will assist in meeting the objectives established at the outset of the SWMP.

Criteria	Description	Score
Technical	Is it technically possible and buildable? Will it be robust and reliable?	U (Unacceptable) – measures eliminated from further consideration. -2 Severe negative outcome -1 Moderate negative outcome 0 Neutral +1 Moderate positive outcome +2 High positive outcome
Economic	Will benefits exceed costs?	
Social	Will the community benefit or suffer from implementation of the measure?	
Environmental	Will the environment benefit or suffer from implementation of the measure?	
Objectives	Will it help to achieve the objectives of the SWMP partnership?	

Table 3: Example of Short-Listing Criteria (taken from Defra Technical Guidance)

Sites considered for mitigation against flood risk arising from surface water will be assessed against these criteria to identify suitable measures for reducing or removing the risk. Those options scoring 5 or more will be considered in more detail, either individually or in combination, in order to determine the preferred option of greatest overall benefit.

9. Implementation and Recommendations

The Action Plan is an essential part of a SWMP. It summarises the actions and recommendations made within this SWMP as well as those areas requiring more detailed investigation. In order for the Action Plan to be effective, it will require agreement from each stakeholder and a commitment that the actions will be undertaken within agreed timescales.

These recommendations can be summarised in 4 general categories:

- Communication
- Maintenance and Capital schemes (Implementation)
- Policy and Procedures
- Emergency Planning

In addition to these generic actions, there is an action plan for each Parish which provides more details on individual sites, schemes and other measures to assist in the reduction of flood risk.

The Action Plans are located within Appendix E

Although the actions are identified within the Action Plans, a brief summary of actions for each authority or responsible body is identified below:

Hampshire County Council (as LLFA and Highway Authority)

- To publicise this SWMP and the information within it so as to raise awareness of the information available to assist the public in identifying the potential level of risk in their area and to assist in the provision of property level protection information.
- To take the lead in ensuring that there is a suitable level of communication with the public and other stakeholders as well as appropriate links made with other work / strategies.
- To ensure suitable maintenance is carried out on highway drainage and ensure others are aware of their maintenance responsibility particularly riparian landowners in relation to ordinary watercourses.
- To take the lead on the additional investigations and assessments identified with section 7.2 and within the Action Plan
- To work with stakeholders to develop proposals for capital works which should be fed through the Local Flood Risk Management Strategy in order to bid for funding.

Eastleigh Borough Council

- To ensure future development takes into account those areas highlighted as being at risk both through potential surface water flooding and where drainage has been identified as being at full capacity.
- To promote the use of sustainable and suitable drainage systems within developments taking into account the information within this SWMP.
- To work with the LLFA to reduce the impact of flooding where possible in the Borough of Eastleigh.

Environment Agency

- To promote the use of the flood warning / alert service where available, for both groundwater and river flood risk.
- To ensure suitable maintenance is carried out in relation to main rivers
- To work with the LLFA to reduce the impact of flooding where possible in the Borough of Eastleigh.

Southern Water

- To provide, maintain and extend a system of public sewers in their area.
- To work with the LLFA to reduce the impact of flooding where possible in the Borough of Eastleigh.

Riparian Landowners

- To ensure the appropriate level of maintenance is carried out to watercourses and ditches on or adjacent to their properties.

10. Review & Monitoring

In order for a Surface Water Management Plan to be effective, it will require updating when new information is obtained. This could include additional sites affected by flooding or completion of schemes reducing the risk in a particular area. Changes to legislation and guidance and the availability of funding will also need to be considered at a national and/or local level.

Given the range of documentation that could be updated within different timescales, this SWMP will remain as a live document and will be updated as situations change.

The action plan will be reviewed on an annual basis to ensure that each party is progressing their relevant actions. This will also aid in the identification and preparation of schemes to be put forward onto the capital scheme programme.

Although the areas identified within this document have undergone an initial investigation and assessment, it is essential that any flood incidents that occur in the future are identified, assessed and put into future work programmes as appropriate.

This need is consistent with the requirement to investigate flooding under section 19 of the Flood and Water Management Act 2010. Section 19 states that on becoming aware of a significant flooding event the County Council, in its role as Lead Local Flood Authority must, to the extent that it considers it necessary or appropriate, investigate which risk management authorities have relevant flood risk management functions, and whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.

In order to fulfil this requirement and to ensure an investigation is of the most benefit to the community, Hampshire County Council will also investigate the cause and effects of significant flood incidents and make recommendations on reducing the risk of the flood incident reoccurring. These reports will be linked to the relevant SWMP and any agreed recommendations added to the action plan.

To facilitate the reporting of significant flood incidents, a standard template has been developed and is available for all parties to complete and forward to the LLFA. This form will be available on Hampshire County Councils flood risk management web pages (www.hants.gov.uk/flooding)

Any reviews or updates on this document will be carried out between the key stakeholders as identified in section 5. If there is a particular issue relating to other stakeholders, they will also be invited to assist with this procedure.

11. Conclusion

This intermediate level SWMP has set out to ensure that all flood risk partners work together to understand the locations, causes and effects of flooding within the borough of Eastleigh and to identify measures to mitigate against flooding in the form of an Action Plan

It has done this through regular stakeholder meetings, which will be continued, using local knowledge to identify, map and assess those areas where surface water flooding has been or has the potential to be a high risk.

It has identified a number of areas where additional work is required, both in terms of assessment of flood risk and physical mitigation works in order to reduce the level of flood risk. This work will constitute a detailed SWMP and these will be undertaken on a countywide risk prioritised basis to ensure time and resources are directed to the areas at highest risk.

Recommendations have been made which cover a wide range of areas including effective communication, policy and schemes and has sought to highlight the outcomes from this report to all parties who may be able to influence and reduce flood risk.

This report will continue to develop as flood risk is better understood and as additional flood risk areas are identified, ultimately leading to a reduction in the risk of flooding as well as an increase in the understanding of flood risk across the borough.

12. Abbreviations

CFMP	Catchment Flood Management Plan
DEFRA	Department for Environment, Food and Rural Affairs
DPD	Development Plan Document
EA	Environmental Agency
EBC	Eastleigh Borough Council
FoIA	Freedom of Information Act
FRA	Flood Risk Assessment
FRM	Flood Risk Management
FRR	Flood Risk Regulations 2009
FWMA	Flood and Water Management Act 2010
GIS	Geographical Information Systems
HCC	Hampshire County Council
LDF	Local Development Framework
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LRF	Local Resilience Forum
MAFP	Multi-Agency Flood Plans
NPPF	National Planning Policy Framework
PFRA	Preliminary Flood Risk Assessment
RBMP	River Basin Management Plan
RFCC	Regional Flood and Coastal Committee
SAC	Special Area of Conservation
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
UKCIP	UK Climate Impacts Programme
WFD	Water Framework Directive

13. Glossary

Aquifer	Layer of water-bearing permeable rock, sand or gravel which is capable of providing significant amounts of water.
Catchment Flood Management Plan (CFMP)	Strategic planning tool 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.
Combined Sewer System	Sewer system that carries both sewage and storm water.
Core Strategy	A Development Plan Document setting out the spatial vision and strategic objectives of the planning framework for an area, having regard to the Community Strategy.
Cost-Benefit Analysis	Analysis which quantifies in monetary terms the costs and benefits of a proposed scheme, including items which the market does not provide a readily available monetary value for. Sometimes referred to as Benefit-Cost Analysis.
Critical Drainage Area	Defined in the Town and Country Planning Act as an area within Flood Zone 1 which has critical drainage problems and which has been notified to the local planning authority by the Environment Agency. Also identified within the Strategic Flood Risk Assessment based on recorded and anecdotal historical flood events.
DG5 Register	A water company held register of properties which have experienced sewer flooding (either internal or external flooding) due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 10 years.
Designing for Exceedance	Designing for Exceedance is an engineering philosophy or approach which aims to plan for and manage flows which are larger than the designed capacity of infrastructure during rainfall events. An example of designing for exceedance would be the use of car parks to store water during flood events. Construction Industry Research and Information Association (CIRIA) have published a designing for exceedance best practice manual.
Environment Agency	The Environment Agency is the leading public body for protecting and improving the environment in England and Wales today and for future generations. The organisation is responsible for wide-ranging matters, including the management of flood risk from main rivers and the coast, water

	resources, water quality, waste regulation, pollution control, inland fisheries, recreation, conservation and navigation of inland waterways. It will also have a new strategic overview for all forms of flooding.
Essential Infrastructure	Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. Essential utility infrastructure which has to be located in a flood risk area for critical operational reasons, including electricity generating power stations and grid and primary substations; water treatment plants; and sewage treatment plants if adequate measures to control pollution and manage sewage during flooding events are in place.
Exceedance Flows	Excess flow that appears on the surface once the capacity of the underground drainage system is exceeded.
Floods Directive	The EU Floods Directive came into force in November 2007 and is designed to help Member States prevent and limit the impact of floods on people, property and the environment. It was transposed into English law in December 2009 by the Flood Risk Regulations.
Flood Risk Assessment (FRA)	An assessment of the likelihood and consequences of flooding in a development area so that development needs and mitigation measures can be carefully considered.
Flood Risk Regulations 2009 (FRR)	These Regulations transpose Directive 2007/60/EC (EU Floods Directive) of the European Parliament and of the Council on the assessment and management of flood risks for England and Wales.
Flood and Water Management Act 2010 (FWMA)	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
Flood Zones	These are a national dataset held by the Environment Agency and show the predicted probability of flooding for any given area. The zones were created following Defra's Making Space for Water pilot study. This was a Government programme that sought to take forward the developing strategy for flood and coastal erosion risk management in England.
Flood Zone 1	Low probability of flooding – Land considered as having less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
Flood Zone 2	Medium probability of flooding – Land considered

	as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% to 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding in any year (0.5% to 0.1%).
Flood Zone 3a	High probability of flooding – Land considered as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea in any year (>0.5%).
Flood Zone 3b	The Functional Floodplain – This zone comprises land where water has to flow or be stored in times of flood. Land within this zone is considered to flood with an annual probability of 1 in 20 (5%) or greater in any year, or has been designed to flood in an extreme (0.1%) flood.
GIS	Software package used for spatial mapping and analysis of data.
Greenfield Run-off Rate	The rate of runoff which would occur from a site that was undeveloped and undisturbed.
Groundwater flooding	Flooding caused by raised groundwater levels, typically following prolonged rain. High groundwater levels may result in increased overland flow flooding
Lead Local Flood Authority (LLFA)	Lead Local Flood Authorities are unitary authorities or County Councils, and have been established as part of the Flood and Water Management Act. LLFAs are responsible for leading the co-ordination of flood risk management in their area, but can delegate flood or coastal erosion functions to another risk management authority by agreement.
Local Development Framework (LDF)	A non-statutory term used to describe a folder of documents which includes all the local planning authority's Local Development Documents (LDDs). The local development framework will also comprise the statement of community involvement, the local development scheme and the annual monitoring report.
Local Resilience Forums (LRF)	LRFs are multi-agency forums, bringing together all organisations who have a duty to co-operate under the Civil Contingencies Act, and those involved in responding to emergencies. They prepare emergency plans in a co-ordinated manner.
Main River	Main Rivers are usually larger streams and rivers, but also include smaller watercourses of strategic drainage importance. A main river is defined as a watercourse shown as such on a main river map, and can include any structure or appliance for

	controlling or regulating flow or water in, into or out of a main river. The Environment Agency's powers to carry out flood defence works apply to main rivers only. Main rivers are designated by Defra.
Multi-Agency Flood Plans (MAFP)	Multi-Agency Flood Plans are specific emergency plans which should be developed by LRFs, to deliver a coordinated plan to respond to flood incidents.
National Planning Policy Framework	Sets out Government policy on development and flood risk to ensure that flood risk is taken into account at all stages in the planning process, to avoid inappropriate development in areas at high risk of flooding, and to direct development away from areas at highest risk.
Ordinary Watercourse	An ordinary watercourse is any other river, stream, ditch, cut, sluice, dyke or non-public sewer which is not a Main River. The Lead Local Authority has consenting and enforcement powers for these features under the Land Drainage Act.
Overland Flow/Surface Water Run-Off	Water flowing over the ground surface that has not reached a natural or artificial drainage channel.
Pitt Review	An independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.
Pluvial Flooding	'Pluvial' flooding (or surface runoff flooding) is caused by rainfall and is that flooding which occurs due to water ponding on or flowing over the surface before it reaches a drain or watercourse.
Preliminary Flood Risk Assessment (PFRA)	Requirement under the EU Floods Directive/Flood Risk Regulations. The LLFA must complete a preliminary assessment report on past and future flood risk, and identify significant flood risk areas using national datasets.
Regional Flood and Coastal Committee (RFCC)	RFCCs have replaced Regional Flood Defence Committees following the Flood and Water Management Act. They consult with the Environment Agency to help develop flood risk management solutions, as well as providing advice on community engagement, coastal erosion, incident management and emergency planning within their regions. They also have a responsibility for raising local levies and providing an accountable forum for testing new ideas and ways of working.
Resilience Measures	Resilience measures are designed to reduce the impact of water that enters property and businesses, and could include measures such as raising electrical appliances.

Resistance Measures	Resistance measures are designed to keep flood water out of properties and businesses, and could include flood guards for example.
Riparian Owners	A riparian owner is someone who owns land or property adjacent to a watercourse. A riparian owner has a duty to maintain the watercourse and allow flow to pass through freely.
Risk	In flood risk management risk is defined as the probability of a flood occurring x consequence of the flood.
River Basin Management Plan (RBMP)	A management plan for all river basins required by the Water Framework Directive. These documents will establish a strategic plan for the long-term management of the River Basin District, set out objectives for water bodies and, in broad terms, what measures are planned to meet these objectives, and act as the main reporting mechanism to the European Commission.
Sewers for Adoption	Standard for new drainage systems in England & Wales so that they can be adopted by a water company. It acts as a guide to assist developers in preparing their submission to a sewerage undertaker before they enter into an Adoption Agreement under Section 104 of the Water Industry Act 1991. Sewers for Adoption is now in its 6 th edition (2006) and is available from WRc.
Shoreline Management Plan (SMP)	A plan providing a large-scale assessment of the risk to people and to the developed, historic and natural environment associated with coastal processes. It presents a policy framework to manage these risks in a sustainable manner.
South East Plan	A broad development strategy for a region for a 15 to 20 year period prepared by the South East England Partnership Board.
Strategic Flood Risk Assessment (SFRA)	A SFRA provides information on areas at risk from all sources of flooding. The SFRA should form the basis for flood risk management decisions, and provides the basis from which to apply the Sequential Test and Exception Test (as defined in PPS25) in development allocation and development control process.
Surface Water Flooding	In the context of this report, surface water flooding describes flooding from sewers and ordinary water courses that occurs as a result of heavy rainfall.
Sustainable Drainage Systems (SuDS)	Sustainable drainage systems are a sequence of management practices and control measures designed to mimic natural drainage processes by allowing rainfall to infiltrate and by attenuating and conveying surface water runoff slowly compared to conventional drainage. SuDS can operate at

	different levels; ideally in a hierarchy of source control, local control and regional control.
UK Climate Impacts Programme (UKCIP)	UKCIP publishes climate change scenarios on behalf of the Government showing how the UK's climate might change in this century. The UKCIP02 climate change scenarios are widely used in research into the impacts of climate change.
Water Framework Directive (WFD)	EC water legislation designed to improve and integrate the way water bodies are managed throughout Europe. The WFD came into force on in December 2000. Member States must aim to reach good chemical and ecological status in inland and coastal waters by 2015.