

# Local Flood Risk Management Strategy: 2015-2020

London Borough of Croydon



Final Version

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## FOREWORD

In response to the flood events during 2007, the Government commissioned Sir Michael Pitt to undertake a review. The outcome of this, *Learning Lessons from the 2007 Floods* outlined the need for changes in the way England is adapting to the increased risk of flooding and the role different organisations have to deliver this function.

The Flood and Water Management Act 2010, enacted by Government in response to the recommendations of The Pitt Review, designated unitary and county councils as Lead Local Flood Authorities with new responsibilities for leading and co-ordinating the management of local flood risk; namely the flood risk arising from surface water runoff, groundwater and smaller watercourses and ditches, known as ordinary watercourses. This includes a statutory duty to develop, maintain, apply and monitor a strategy for the management of local flood risk.

Croydon Council is the Lead Local Flood Authority for the London Borough of Croydon. This Local Flood Risk Management Strategy (the "Strategy") offers the first opportunity for us to formalise our longer term vision and flood risk management priorities to shape a Strategy that delivers the greatest benefit to the people, property and environment of Croydon.

Croydon has a history of severe flooding. Most recently Purley and Kenley experienced significant flooding from the Caterham Bourne due to extremely high groundwater during January to March 2014, when properties and businesses were impacted and an emergency situation was declared. Severe surface water flooding during July 2007 flooded into properties and brought Purley town centre to a standstill. Croydon is at risk of flooding predominantly from surface water and groundwater sources and it is predicted that this will increase in the future; influenced by climate change and increasing pressures on development and housing need.

Since April 2011 we have been working closely with communities, businesses, and other risk management authorities, including our neighbouring boroughs, the Environment Agency and Thames Water, to improve our understanding of flood risk in Croydon and deliver measures that improve community resilience alongside nationally funded strategic schemes that deliver flood and environmental benefits to communities, businesses and infrastructure.

In developing this Strategy, we have consulted with communities, businesses, neighbouring boroughs and risk management authorities to develop a coordinated Strategy for local flood risk management across Croydon. The Strategy outlines the priorities for local flood risk management and provides a delivery plan to manage the risk over the next six years. We have given consideration to the roles and responsibilities of other risk management authorities in Croydon, including the Environment Agency, which has responsibility for managing the risk arising from Main Rivers, including the River Wandle, Norbury Brook and Chaffinch Brook, and Thames Water, which has responsibility for managing sewer flooding. Both these sources of flooding interact and influence ordinary watercourse, surface water and groundwater flood risk within Croydon.

Our Strategy complements and supports the *National Strategy* published by the Environment Agency which outlines a National framework for flood and coastal risk management. The Environment Agency has a strategic overview role of all flood and coastal erosion risk management. We have taken the guiding principles from this strategy into account when setting the following objectives for the management of local flood risk:

- Continue to build our evidence base on flood mechanisms, incidents and assets and improve how it is communicated internally and externally,
- Maximise use of resources in targeted flood management,
- Ensure evidence of historic floods and ongoing studies effectively feed into planning policy and decision-making,
- Support sustainable growth and development by understanding the needs of all parties,
- Work effectively with Risk Management Authorities in and around Croydon to jointly manage the risks,
- Improve awareness of the causes of flooding with the general public and encourage proactive management,
- Take a more holistic view of asset management in Croydon, improving priorities and addressing source control more effectively, and,
- Maximise opportunities to learn, improve and review flood management procedures based on lessons learnt.

The Strategy is accompanied by an Action Plan setting out how we will deliver the objectives of the Strategy over the next five years and a Strategic Environmental Assessment (SEA) assessing the impacts of the Strategy on the environment.

Over the next six years we will continue to work with communities and businesses to help them understand the risks they face and what can be done to manage them. A range of individual, community and council-led actions and improved awareness will help manage both the likelihood and impact of flooding and consequently lead to social, economic and environmental benefits to Croydon's communities.

Longer term strategic development across Croydon will integrate consideration of flood risk and sustainable drainage into planning and development control systems. Inappropriate development which could increase flood risk will be avoided, as will inappropriate development in areas of significant flood risk.

The Local Flood Risk Management Strategy will be updated periodically to ensure that its content and emphasis remains relevant.



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## 1. INTRODUCTION

### 1.1 Flood Risk in South West London

In England, 5.2 million properties are at risk of flooding. Of these, 1.4 million are at risk from rivers or the sea, 2.8 million are at risk from surface water and 1 million are at risk from both<sup>1</sup>. This risk was realised in many parts of the country during the summer floods of 2007, which resulted in 55,000 properties flooding, 7,000 rescues by emergency services, 13 deaths and an estimated £3billion of damages. The severity of this event generated changes in the way flooding should be managed by local and national organisations.

Across South West London there are risks of flooding from a range of sources, including surface water runoff and ponding, groundwater, sewer surcharging and flooding from main rivers and ordinary watercourses, and reservoirs. In some cases more than one of these sources of flooding can combine to cause a flood event.

Risks from tidal and river flooding associated with the River Thames, Hogsmill, Beverley Brook, River Wandle and River Graveney are relatively well understood and have been managed at a national scale for many years by the Environment Agency. However, flood risk from more local sources, including surface water runoff and ponding, groundwater and small ditches and land drains are less well understood; these are typically very localised events which are often difficult to predict, and with sparse historical records available to provide supporting evidence.

Parts of South West London have a particular susceptibility to surface water and sewer flooding due to the urbanised nature of the area and the aging Victorian sewer system. Over recent years, severe groundwater and surface water flooding has been experienced across the area causing damage to property and disruption to businesses and services. Flooding in Croydon in early 2014 was declared an emergency and required an extensive multi-agency response and clean-up operation. It highlighted the real threats that flooding from multiple sources can pose and reinforces the need to regularly review local flood risk management. Details of historic flood records are provided in Section 2.

In December 2013 the Environment Agency published its latest surface water flood mapping, the updated Flood Map for Surface Water (uFMfSW). The uFMfSW represents a refinement of the modelling undertaken as part of the London Borough of Croydon [Surface Water Management Plan \(SWMP\)](#)<sup>2</sup>, and initial high-level, borough-wide property counts undertaken to support this Strategy indicate a reduction in the flood risk by comparison although the risk of surface water flooding in Croydon remains considerable. As part of Croydon's ongoing local flood risk management work, further assessment of the uFMfSW will be carried out in order to increase understanding of local surface water flood risk and identify and prioritise those areas at greatest risk.

#### 1.1.1 The high level assessment identified the number of properties at the following risk bands:

- At High Risk: 3,714 residential properties, 578 commercial and industrial properties, 35 schools/education facilities, 12 surgeries/health care properties, three emergency service facilities, two hospitals and one residential home,
- At Medium Risk: 10,440 residential properties, 1,272 commercial and industrial properties, 72 schools/education facilities, 32 surgeries/health care properties, six emergency service facilities, three hospitals and one residential home, and,

<sup>1</sup> Environment Agency (2009) Flooding in England: A National Assessment of Flood Risk <http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/geho0609bgds-e-e.pdf>

<sup>2</sup> Capita URS for London Borough of Croydon (2011) London Borough of Croydon Surface Water Management Plan [http://www.croydon.gov.uk/contents/departments/planningandregeneration/pdf/swplan.pdf?bcsi\\_scan\\_AB11CAA0E2721250=hJz+QHAPXXp+oD93rrgS7KnTal9HAQAAudqVPA==&bcsi\\_scan\\_filename=swplan.pdf](http://www.croydon.gov.uk/contents/departments/planningandregeneration/pdf/swplan.pdf?bcsi_scan_AB11CAA0E2721250=hJz+QHAPXXp+oD93rrgS7KnTal9HAQAAudqVPA==&bcsi_scan_filename=swplan.pdf)



- At Low Risk: 33,614 residential properties, 2,455 commercial and industrial properties, 134 schools/education facilities, 67 surgeries/health care properties, 11 emergency service facilities, three hospitals and five residential homes.

Typically, reactive mitigation measures have been implemented in response to past flood events, usually with the construction of new drainage infrastructure. However, climate change and continued urbanisation are likely to increase flood risks in the future unless action is taken to mitigate or adapt to that risk.

## 1.2 Flood Risk Management in South West London

In response to the severe flooding across large parts of England and Wales in summer 2007, the Government commissioned Sir Michael Pitt to undertake a review of flood risk management. [The Pitt Review – Learning Lessons from the 2007 Floods](#)<sup>3</sup> and subsequent progress reviews outlined the need for changes in the way the UK is adapting to the increased risk of flooding and the role different organisations have to deliver this function.

[The Flood and Water Management Act 2010 \(The Act\)](#)<sup>4</sup> and the [Flood Risk Regulations 2009](#)<sup>5</sup>, make provision for unitary authorities and county councils, including all London Boroughs, as Lead Local Flood Authorities (LLFAs). As LLFA, each London Borough, including Croydon Council, has a number of duties and responsibilities in relation to managing local flood risk, as required by the [The Act](#) and the [Flood Risk Regulations 2009](#). Local flood risk is defined as the risk of flooding from surface water runoff, groundwater and small ditches and watercourses (collectively known as Ordinary Watercourses).

The Act also formalises the flood risk management roles and responsibilities for other organisations including the Environment Agency, water companies and highways authorities. The responsibility to lead and co-ordinate the management of flood risk from main rivers, the sea and other tidal sources (such as estuaries) (tidal) remains that of the Environment Agency. Further details regarding responsibilities and functions in relation to their flood risk management in South West London is provided in Section 3.

As LLFAs, each of the unitary authorities across South West London has a statutory duty to develop, maintain, apply and monitor a strategy for local flood risk management ('the Strategy').

The six LLFAs covering South West London, (namely, London Borough of Croydon, The Royal Borough of Kingston upon Thames, London Borough of Merton, London Borough of Sutton, London Borough of Richmond upon Thames and London Borough of Wandsworth), have chosen to partner together to commission the preparation of their Strategies in a coordinated manner. This partnership approach will encourage collaboration and enable flood risk across South West London to be managed more effectively and holistically. Further details of the South West London Flood Group are included in Section 5.

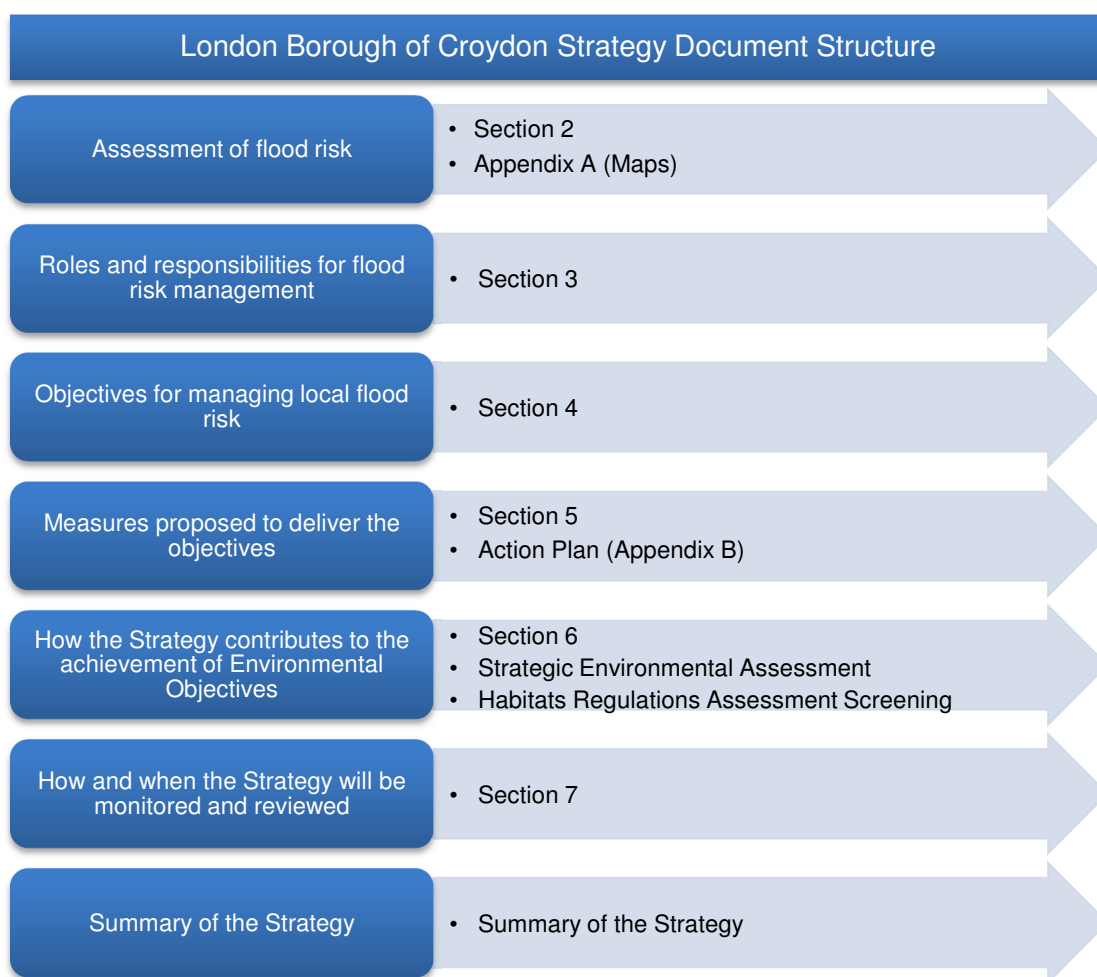
## 1.3 The London Borough of Croydon Strategy

The purpose of the London Borough of Croydon Strategy is to set out the approach to managing flood risk from local sources (i.e. surface water, groundwater and ordinary watercourses) in both the short and longer term, with proposals for actions that will help to manage the risk in a way that delivers the greatest benefit to its residents, businesses and the environment.

<sup>3</sup> Cabinet Office (2008) Sir Michael Pitt Report 'Learning lessons learned from the 2007 floods' <http://www.environment-agency.gov.uk/research/library/publications/33889.aspx>

<sup>4</sup> HMSO (2010) The Flood and Water Management Act 2010 <http://www.legislation.gov.uk/ukpga/2010/29/contents>

<sup>5</sup> HMSO (2009) The Flood Risk Regulations 2009 <http://www.legislation.gov.uk/uksi/2009/3042/made>



**Figure 1-1 Structure of the Strategy**

The Strategy complements and supports the [National Strategy](#)<sup>6</sup>, published by the Environment Agency in 2011, which outlines a National framework for flood and coastal risk management, balancing the needs of communities, the economy and the environment.

This Strategy has been developed by Croydon Council in partnership with Risk Management Authorities (RMAs), including the Environment Agency and Thames Water, as well as local communities and neighbouring boroughs. Further details of RMAs and other organisations with responsibilities for local flood risk management are provided in Section 3.

In delivering flood risk management, Croydon Council have the opportunity to deliver wider environmental objectives and requirements, as set out in European legislation including the [Water Framework Directive](#)<sup>7</sup> (WFD). The WFD was transposed into UK national law through [The Water Environment Regulations 2003](#)<sup>8</sup>, and states that Croydon Council should have regard to the River Basin Management Plans (RBMPs) when exercising its functions as a public body. The approach for addressing this, including the preparation of a Strategic

<sup>6</sup> Defra, Environment Agency (2011) The National Flood and Coastal Erosion Risk Management Strategy for England <https://www.gov.uk/government/publications/national-flood-and-coastal-erosion-risk-management-strategy-for-england>

<sup>7</sup> European Union (2000) Water Framework Directive <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0060:EN:NOT>

<sup>8</sup> HMSO (2003) The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 <http://www.legislation.gov.uk/ukxi/2003/3242/contents/made>

Environmental Assessment (SEA) and Habitats Regulations Assessment Screening exercise, is outlined in Section 6.

#### **1.4 Community Engagement and Consultation**

A community engagement exercise was undertaken between January and March 2014 offering residents and businesses the opportunity to shape the development of the Strategy and future flood risk management priorities. Details of the outcomes from the community engagement activities are included in Appendix C.

This report forms the draft Strategy which will undergo a period of public consultation, offering the opportunity for residents, businesses and risk management stakeholders to provide feedback. Following the public consultation, the Strategy will be updated in line with comments received and finalised before being adopted and published by Croydon Council.

#### **1.5 Supporting Plans and Documents**

Over recent years, a number of documents have been prepared detailing the assessment and management of flood risk within the London Borough of Croydon. As indicated in Figure 1-2, it is intended that the Strategy forms a key document in this suite of flood risk management plans, drawing together existing flood risk studies and plans into a single document that outlines how Croydon Council will manage local flood risk going forwards.

As part of the assessment of flood risk, the Strategy draws on technical information and historic records of flooding presented in the [Surface Water Management Plan \(SWMP\)](#)<sup>9</sup>, [Strategic Flood Risk Assessment \(SFRA\)](#)<sup>10</sup> and [Preliminary Flood Risk Assessment \(PFRA\)](#)<sup>11</sup>. These same documents and the partnerships forged between RMAs during their preparation are also built upon and formalised as part of the Strategy.

The Strategy also draws from wider environmental plans covering Thames catchment including the [Thames River Basin District Management Plan](#)<sup>12</sup> and the [Thames Catchment Flood Management Plan](#)<sup>13</sup> to ensure a coordinated approach to flood risk management across South West London.

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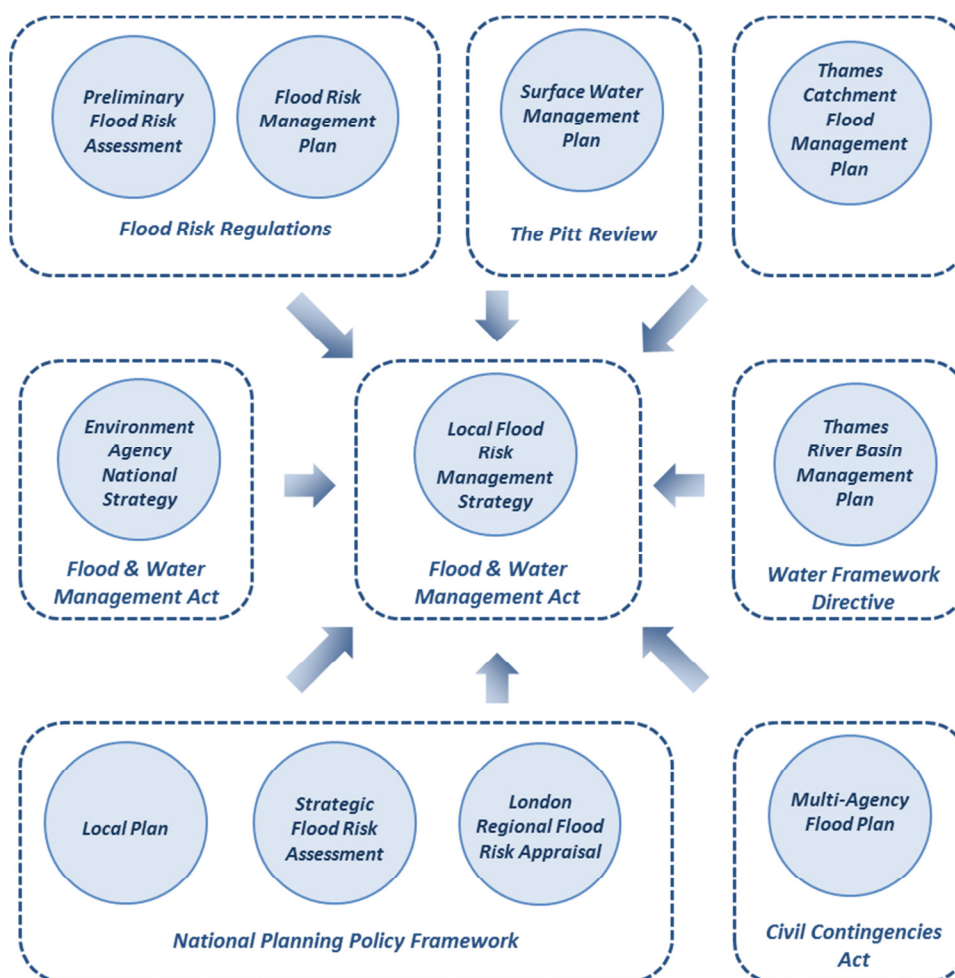
<sup>9</sup> Capita URS for London Borough of Croydon (2011) Croydon Surface Water Management Plan  
[http://www.croydon.gov.uk/contents/departments/planningandregeneration/pdf/swplan.pdf?bcsi\\_scan\\_AB11CAA0E2721250=hJz+QHAPXXp+oD93rrgS7KnTal9HAQAAudqVPA==&bcsi\\_scan\\_filename=swplan.pdf](http://www.croydon.gov.uk/contents/departments/planningandregeneration/pdf/swplan.pdf?bcsi_scan_AB11CAA0E2721250=hJz+QHAPXXp+oD93rrgS7KnTal9HAQAAudqVPA==&bcsi_scan_filename=swplan.pdf)

<sup>10</sup> Scott Wilson (2008) London Boroughs of Wandsworth, Merton, Sutton and Croydon Strategic Flood Risk Assessment  
<http://www.croydon.gov.uk/contents/departments/planningandregeneration/pdf/evidence/climate/sfralevel1final>

<sup>11</sup> Capita Symonds Scott Wilson (2011) London Borough of Croydon Preliminary Flood Risk Assessment  
<http://www.croydon.gov.uk/contents/departments/planningandregeneration/pdf/preliminaryflood-assessment.pdf>

<sup>12</sup> Environment Agency (2009) Thames River Basin District Management Plan  
<https://www.gov.uk/government/publications/thames-river-basin-management-plan>

<sup>13</sup> Environment Agency (2009) Thames Catchment Flood Management Plan  
<https://www.gov.uk/government/publications/thames-catchment-flood-management-plan>



**Figure 1-2 Legislative Drivers and Supporting Documents for the Strategy**

### Flood Risk Management Plan

As well as the duties under the Act to prepare the Strategy, Croydon Council have legal obligations under the [EU Floods Directive](#)<sup>14</sup>, which was transposed into UK Law through the [Flood Risk Regulations 2009](#)<sup>15</sup> ('the Regulations').

As part of the Greater London Flood Risk Area, the London Borough of Croydon is required to contribute to the preparation of a Flood Risk Management Plan (FRMP) for the Thames River Basin District outlining significant flood risk, receptors and consequences across their administrative area. The consultation on the Draft Thames FRMP closed on 31<sup>st</sup> January 2015 and it is due for publication by December 2015

This Strategy has been prepared to meet the requirements of the Regulations as well as the Act, and thereby avoid duplication of work.

<sup>14</sup> European Union (2007) EU Floods Directive <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007L0060:EN:NOT>

<sup>15</sup> HSMO (2009) The Flood Risk Regulations <http://www.legislation.gov.uk/ukSI/2009/3042/contents/made>

## 2. ASSESSMENT OF LOCAL FLOOD RISK

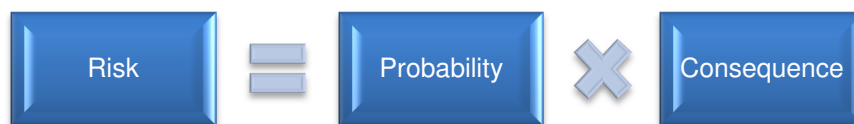
### 2.1 What is Flood Risk?

Flood risk is not just the likelihood of flooding occurring, but also the potential damage a flood could cause. Assessing risk in quantifiable, financial terms can help prioritise where available funding should be directed, as well as support applications for additional external funding.

However, it should also be borne in mind that the consequences of flooding can be far reaching and not always easy to value, particularly the social impacts of displacement, loss and fear of repeat events. All available information and past experiences have been considered in developing our objectives for managing future flood risk.

#### What is Flood Risk?

Flood Risk is the likelihood of a particular flood happening (probability) e.g. 'there is a 1 in 100 chance of flood in any given year in this location', multiplied by the impact or consequence that will result if the flood occurs.



The evaluation of risk takes into account the severity of impacts from a flood event, which can be highly variable in terms of social, economic and environmental consequences. Consequences are often measured by number of properties flooded and level of economic damage. It will also be influenced by vulnerability (i.e. a basement flat or a key emergency service station is more vulnerable than a commercial warehouse)

There will only be a risk if there is a means (pathway) of connecting the source of the flood with the people, property and land that may be affected (receptors). Source, pathway and receptor must all be present for there to be a risk.



#### 2.1.1 Influencing the risk

Flooding is a natural phenomenon linked to the volume, intensity and duration of rainfall received in a geographical area. Urban development has complicated the consequences of flooding by altering the route of watercourses or culverting them and creating hard surfaces where water ponds or flows quickly instead of infiltrating naturally to ground. Although we cannot stop the rain, there are multiple ways in which we can all influence the risk both positively and negatively. This is discussed further in Section 5.

### 2.2 Local Sources of Flood Risk

This Section of the Strategy sets out the assessment of flood risk from *local* sources, i.e. groundwater, surface water and ordinary watercourses.

For each of these sources a description of the source and mechanism of flooding has been provided and an assessment of the risk has been made drawing on historical records, outcomes from the community engagement (refer to Appendix C), as well as assessments

detailed in existing technical studies addressing both current and future risk. Appendix A provides a series of maps showing the historic records of flooding and modelled potential future impacts of flooding from local sources, where information is available.

#### Groundwater

**Table 2-1 Flooding from Local Sources – Groundwater**

<b>Description of Source</b>	Groundwater flooding occurs as a result of water rising up from the underlying aquifer or from water flowing from springs. This tends to occur after much longer periods of sustained high rainfall and can be sporadic in both location and time often lasting longer than a fluvial or surface water flood. High groundwater level conditions may not always lead to widespread groundwater flooding; however, they have the potential to exacerbate the risk of surface water and flooding from rivers by reducing rainfall infiltration capacity, and to increase the risk of sewer flooding through sewer / groundwater interactions.
<b>Supporting Documents</b>	<a href="#">London Borough of Croydon Surface Water Management Plan</a> <a href="#">London Borough of Croydon Preliminary Flood Risk Assessment</a> <a href="#">Caterham Bourne Flood Investigation: January – March 2014</a>



**Table 2-1 Flooding from Local Sources – Groundwater**

<p><b>Historic Flooding</b></p>	<p>Basements and other below ground level installations are particularly vulnerable to groundwater flooding, although property and land above ground level can be at risk.</p> <p>Instances of groundwater flooding have been reported in a number of areas in Croydon with some regular hotspots in the north of the Borough including areas around Upper Norwood, Thornton Heath and Ashburton. These can be highly localised usually affecting basements or gardens. The chalk geology in the South of the Borough increases vulnerability to groundwater emergence on a larger scale particularly in the valley routes through Kenley, Purley and Coulsdon.</p> <p>The most significant recent flooding event occurred in February and March 2014 when an unprecedented period of rainfall caused groundwater levels to rise leading to flood incidents around the Borough. The rising groundwater led to a significant flow in the Caterham Bourne, a watercourse which is largely dry for most of the time and follows a route from Tandridge in Surrey along the A22 / Godstone Road through Kenley and Purley. The 2014 floods caused significant disruption, threatening homes, essential infrastructure and transport networks. An emergency situation was declared as multiple agencies worked to keep water out of homes along the A22 and surrounding roads in Kenley and Purley.</p> <p>The Caterham Bourne has a history of rising approximately every 7 years although the last significant event prior to 2014 is recorded in 2000-01 following another exceptionally wet winter.</p> <p>Appendix A Figure 1 shows records of historic flooding from local sources including groundwater.</p> <p>Around a third of respondents to the online survey cited groundwater as a main source of flooding in Croydon. This is likely to have been influenced by the Caterham Bourne being in flood as the survey ran in early 2014.</p> <div data-bbox="512 1187 943 1509" data-label="Image"> </div> <div data-bbox="962 1187 1388 1509" data-label="Image"> </div> <p><i>Flooding in Dale Road, Purley during Caterham Bourne flood February 2014</i></p>
<p><b>Future Flood Risk</b></p>	<p>Groundwater flooding can be particularly difficult to predict due to the 'hidden' nature of the source of flooding and relatively longer period of build-up and emergence, often several days or weeks after heavy rainfall has fallen and river levels have receded.</p> <p>Existing efforts to predict groundwater flooding events are based on monitoring water levels in boreholes in areas known to be at risk. These systems can give notice (typically days or weeks ahead) of impending events. Groundwater models can be used to provide early warning systems that can alert authorities to possible groundwater flooding in advance allowing authorities to plan their response and possibly even to implement mitigating measures. However, the monitoring of boreholes and development of groundwater flood models can be costly, and are only normally undertaken in those areas of greatest risk.</p> <p>For the London Borough of Croydon SWMP, an 'Increased Potential for Elevated Groundwater' dataset was derived from British Geological Survey, Environment Agency and Defra groundwater flooding datasets (Figure 3, Appendix A). The dataset identifies areas where there is increased potential for groundwater levels to raise</p>

**Table 2-1 Flooding from Local Sources – Groundwater**

	<p>within 2 m of ground surface following periods of higher than average recharge and is intended as a high-level risk assessment, rather than detailed modelling of groundwater flood risk across the borough.</p> <p>The Southern half of the borough is dominated by chalk and has distinctly different geology to the London Clay in the North. A number of groundwater flooding mechanisms were identified in the SWMP, the most significant being associated with River Terrace Deposits associated with the River Wandle and elevated groundwater levels in the chalk aquifer.</p>
<b>Figures - Appendix A</b>	<p>Figure 1: Historic Flooding</p> <p>Figure 3: Flood Risk from Groundwater</p>

### Surface Water Runoff

**Table 2-2 Flooding from Local Sources –Surface Water Runoff**

<b>Description of Source</b>	<p>Surface water flooding usually occurs when high intensity rainfall generates runoff which flows over the surface of the ground and ponds in low lying areas, before the runoff enters a watercourse or sewer. It can be exacerbated when the soil is saturated and natural drainage channels or artificial drainage systems have insufficient capacity to cope with the additional flow.</p>
<b>Supporting Documents</b>	<p><a href="#">London Borough of Croydon Surface Water Management Plan</a><sup>16</sup></p> <p><a href="#">London Borough of Croydon Preliminary Flood Risk Assessment</a><sup>17</sup></p>
<b>Historic Flooding</b>	<p>The <a href="#">Preliminary Flood Risk Assessment</a> (PFRA) and <a href="#">Surface Water Management Plan</a> (SWMP) identify parts of Croydon to be particularly susceptible to surface water flooding, including Brighton Road through Purley up to Central Croydon and the A22 Godstone Road. The publication of the updated flood map for surface water by the Environment Agency<sup>18</sup> has refined these risk areas further. Specific episodes of surface water flooding are recorded in the following locations and numerous others across the borough, as shown in Figure 1, Appendix A:</p> <ul style="list-style-type: none"> <li>• Purley Cross roundabout &amp; Brighton Road</li> <li>• Kenley Lane and Kenley Station</li> <li>• Brighton Road, Coulsdon</li> <li>• Hamsey Green</li> <li>• Purley Oaks Road and station</li> <li>• Norbury &amp; Thornton Heath</li> </ul> <p>The London Borough of Croydon has experienced a number of surface water flood events, the most notable of which was the 20th July 2007, where intense periods of rainfall caused flash floods and the capacity of the existing drainage system to be exceeded in numerous locations across the borough. Purley town centre experienced some of the worst flooding with significant flooding to property and the transport network.</p> <p>Responses to the Croydon Strategy community engagement highlight areas where people feel the drains are regularly surcharging due to blockage or insufficient capacity</p>

<sup>16</sup> Capita Symonds URS (2011) London Borough of Croydon Surface Water Management Plan

<http://www.croydon.gov.uk/contents/departments/planningandregeneration/pdf/swplan.pdf>

<sup>17</sup> Capita Symonds URS (2011) London Borough of Croydon Preliminary Flood Risk Assessment

<http://www.croydon.gov.uk/contents/departments/planningandregeneration/pdf/preliminaryflood-assessment.pdf>

<sup>18</sup> Environment Agency, Flood Risk from Surface Water maps <http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?&topic=ufmfsfw#x=357683&y=355134&scale=2>

**Table 2-2 Flooding from Local Sources –Surface Water Runoff**

and in certain locations this has been happening for many years such as Kenley Lane, King Henry's Drive & and Purley Oaks Road. With steep topography in the South of the Borough, many roads follow the natural line of water flow, creating pressure on the drainage at the lowest points. Concerns are raised over continued paving of gardens exacerbating the problem. There is also considerable concern relating to water flowing off open land towards properties. Further information on the engagement outcomes are provided in Appendix C.



Kenley Lane after heavy rain in December 2012

**Future  
Flood Risk**

The Environment Agency has undertaken national modelling of the risk of flooding from surface water and published the mapping outcomes on their website in December 2013. The Flood Risk from Surface Water map<sup>19</sup>, identifies the risk of surface water flooding at a strategic scale and bands flood risk as follows:

- High Risk – at risk of flooding for a for a rainfall event with a 1 in 30 probability of occurrence in any given year
- Medium Risk – at risk of flooding for a for a rainfall event with a 1 in 100 probability of occurrence in any given year
- Low Risk – at risk of flooding for a for a rainfall event with a 1 in 1000 probability of occurrence in any given year, and,
- Very Low Risk – at risk of flooding for a for a rainfall event with less than a 1 in 1000 probability of occurrence in any given year.

Appendix A Figure 2 shows the Flood Risk from Surface Water mapping for the London Borough of Croydon.

The Flood Risk from Surface Water map improves on modelling and mapping undertaken as part of the Croydon SWMP in 2011. The mapping shows relatively good correlation with the surface water modelling presented in the SWMP, but shows surface water to be more constrained within roads and watercourse, which in part reflects the improved resolution of the modelling. Based on available historic information, the dataset is considered to be more reflective of flood risk across the London Borough of Croydon and will be used as the surface water flood risk map for the borough until such time as further updates or improved modelling of risk is undertaken.

An assessment of the risk to properties, critical infrastructure, transport, heritage and the environment has been undertaken for the Strategy using the Environment Agency's National Receptor Database to provide an indication of the level of risk facing Croydon. This is presented in the table below and Figures 7 and 8 in Appendix A.

<sup>19</sup> Flood Risk from Surface Water maps, also known as the updated Flood Map for Surface Water (uFMfSW) dataset.

**Table 2-2 Flooding from Local Sources –Surface Water Runoff**

No. Properties at Risk of Flooding in Croydon (based on Environment Agency ‘Flood Risk for Surface Water’ mapping)			Risk		
			Low	Medium	High
Residential			33,614	10,440	3,714
Non Residential	Commercial & Industrial		2,455	1,272	578
	Critical Infrastructure	Emergency Services (Fire, Police & Ambulance Station)	11	6	3
		Hospitals	3	3	2
		Schools and Education Facilities	134	72	35
		Surgery or Health Care	67	32	12
		Residential Home	5	1	1
		Sewage Treatment	3	2	1
		Electricity Sub Station or Building	68	27	14
		Other	147	63	34
	Non Residential Total		2,893	1,478	680
Total			36,507	11,918	4,394

The areas at greatest risk within Croydon have been identified as Critical Drainage Areas (CDAs). Sixteen specific CDAs have been identified in Croydon (see Figure 6).

The areas considered to be at greatest risk of surface water flooding within the London Borough of Croydon are:

- South and Central Croydon (CDA 042),
- Brighton Road (CDA 041),
- Purley Cross (CDA 040),
- Old Lodge Lane (CDA 036),
- A22 Godstone Road (CDA 038), and
- Chipstead Valley Road (CDA 039).

The risk of future flooding from surface water can be influenced through changes in planning and urban design as well as better education about the functions of ditches and drains. The approaches to managing these within Croydon are discussed further in Section 5.

**Figures -  
Appendix A**

Figure 1: Historic Flooding  
Figure 2: Flood Risk from Surface Water  
Figure 6: Surface Water Critical Drainage Areas  
Figure 7: Flood Risk from Surface Water: Critical Services & Transport  
Figure 8: Flood Risk from Surface Water: Environment & Heritage

Ordinary Watercourses (including small ditches and land drains)

**Table 2-3 Flooding from Local Sources – Ordinary Watercourses (incl. small ditches and land drains)**

<b>Description of Source</b>	<p>Ordinary watercourses include every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows, above ground or culverted, which is not designated as a Main River (see Section 2.3 Other Sources of Flood Risk).</p> <p>The responsibility for managing and maintaining ordinary watercourses falls to riparian owners who typically own land on either bank and therefore are deemed to own the land to the centre of the watercourse. Under the Act, Croydon Council, as the LLFA, has responsibility to manage the risk of flooding arising from the watercourses through engagement with riparian owners and enforcing maintenance responsibilities in accordance with the <a href="#">Land Drainage Act 1991</a><sup>20</sup> (see Section 3.2 for further information); prior to the Act the responsibility was shared between the Environment Agency and the Council.</p> <p>According to Environment Agency records, the mapped ordinary watercourses in Croydon include the upstream section of the Norbury Brook, near Selhurst in the north of the borough, and the tip of the Beck, which flows into the London Borough of Bromley. A number of other watercourses have been identified, including ephemeral bournes, which only flow when the groundwater is high. There is a requirement for some of these watercourses to be mapped and riparian responsibilities clarified for future management.</p> <p>Figure 5 in Appendix A shows the location of watercourses within Croydon.</p>
<b>Supporting Documents</b>	<p><a href="#">London Borough of Croydon Surface Water Management Plan</a></p> <p><a href="#">London Borough of Croydon Preliminary Flood Risk Assessment</a></p>
<b>Historic Flooding</b>	<p>Appendix A Figure 1 shows records of historic flooding from local sources including ordinary watercourses.</p> <p>The <a href="#">Surface Water Management Plan</a> outlines details of past floods from Park Hill Park where overflow from a drainage ditch on the park's boundary has been reported to contribute to flooding to the railway line below. A further investigation into drainage at the park in 2013 identified the ditch had capacity for a 1 in 5 year rainfall event but there are multiple influences on flooding<sup>21</sup>.</p> <p>A number of respondents to the public engagement refer to problems with flooding from ordinary watercourses, with particular reference to the Merstham Bourne which flowed in early 2014 and the drainage ditch running behind Wharfedale Gardens in Norbury. A number of problems have been noted with flooding at Heavers Meadow allotments, which sit alongside the Norbury Brook in an open section where it is an Ordinary Watercourse.</p>

<sup>20</sup> HMSO (1991) The Land Drainage Act 1991 <http://www.legislation.gov.uk/ukpga/1991/59/contents>. As amended by the Flood and Water Management Act 2010

<sup>21</sup> URS (2013) Park Hill Recreation Ground: Flood Remediation Assessment. August 2013



**Table 2-3 Flooding from Local Sources – Ordinary Watercourses (incl. small ditches and land drains)**

<b>Future Flood Risk</b>	<p>No modelling of the flood risk from ordinary watercourses has been undertaken across Croydon. To date, where funding has been available, this has been directed towards flood risk modelling of main rivers and surface water, in partnership with other boroughs and the Environment Agency. There are a large number of ordinary watercourses in Croydon, and little information is available in terms of their channel dimensions, water levels and flow to inform detailed modelling of these watercourses.</p> <p>Estimation of future flood risk is the potential risk that could arise based on knowledge of known flooding hotspots and mechanisms for flooding. Often ordinary watercourses in combination with other sources of flooding, such as surface water or Main River flooding can combine to exacerbate flood risk. Therefore it is important to consider risk from ordinary watercourses in combination with these, as shown in Figures 2 and 4 in Appendix A.</p> <p>Within Croydon, significant lengths of ordinary watercourse are culverted, with trash screens often located on the upstream end of culverts. Trash screens and culverts have the potential to become blocked by items such as plant debris and rubbish. Blockages can restrict the natural flow of water, increasing the chance of water flowing out of bank and causing local flooding due to the reduced conveyance potential of the associated watercourse. Therefore the risk of flooding from ordinary watercourses can be very localised and is dependent on adopting appropriate inspection and maintenance regimes to ensure this risk is minimised where possible.</p> <p>Croydon Council is aware of some known flooding problems associated with ordinary watercourses. The Merstham Bourne, an ephemeral watercourse has an open section near Coulsdon South Station, which recently caused flooding to residents' gardens during the wet weather of winter 2014. Numerous other open ditches and streams around the borough can cause problems where trash screens or downstream culverts get blocked. Problems associated with a drainage ditch in Park Hill Park in recent years have led to flooding threatening the main London to Brighton railway line. These issues have been exacerbated by a blockage in the downstream culvert and a burst water main in addition to local geography and capacity of the ditch itself.</p>
<b>Figures - Appendix A</b>	<p>Figure 1: Historic Flooding</p> <p>Figure 2: Flood Risk from Surface Water</p> <p>Figure 5: Main Rivers &amp; Ordinary Watercourses</p>

## 2.3 Other Sources of Flood Risk

Parts of Croydon are also at risk of flooding from *other* sources including Main Rivers, sewer surcharging and artificial sources. It should be noted that the focus of the Strategy is purely the management of *local* sources of flooding, however it is recognised that mechanisms of flooding may arise from interlinked sources of flooding and therefore other sources of flooding present in LBC have been identified to aid understanding and management of local flood risk in the area.



## Main Rivers

**Table 2-4 Flooding from Other Sources – Main Rivers**

<b>Description of Source</b>	<p>River flooding occurs when water levels rise as a result of high or intense rainfall which flows into them, resulting in watercourses overflowing or bursting their banks. A Main River is defined by the Environment Agency on its Main River Map and is usually a larger river or stream. In Croydon, much of the natural routes have been culverted underground to make way for development. The following Main Rivers are present within London Borough of Croydon;</p> <ul style="list-style-type: none"> <li>• <b>The River Wandle</b> – rises from natural springs at Waddon Ponds. It has recently been de-culverted to flow in an open section through Wandle Park. It then becomes culverted and flows west into the London Borough of Sutton and on downstream through the London Boroughs of Merton and Wandsworth before joining the River Thames.</li> <li>• <b>The Norbury Brook</b> – a tributary of the River Wandle, the Norbury Brook begins as an ordinary watercourse in Selhurst with a short open stretch in Heavers Meadow then culverted underground before emerging as an open channel in Norbury flowing northwest to become the River Graveney in London Borough of Lambeth.</li> <li>• <b>The Caterham Bourne</b> – an ephemeral watercourse which is believed to flow approximately every 7 years. The Bourne rises in Caterham in Surrey, and roughly follows the course of the A22 to Purley Cross in Croydon, where it becomes a sewer flowing north under Brighton Road to eventually join the River Wandle.</li> <li>• <b>The Chaffinch Brook</b> – flows in the north-east of the borough with some open sections close to the boundary with London Borough of Bromley, eventually joining the Pool River and River Ravensbourne</li> </ul>
<b>Supporting Documents</b>	<p><a href="#">London Borough of Croydon Strategic Flood Risk Assessment<sup>22</sup></a>  <a href="#">Thames Catchment Flood Management Plan<sup>23</sup></a>  <a href="#">Environment Agency Flood Map for Planning (Rivers and Sea)<sup>24</sup></a></p>
<b>Historic Flooding</b>	<p>Significant flood events have occurred in recent memory associated with the Caterham Bourne in January – March 2014 and also in the winter of 2000-01, when disruption lasted over several months due to the links with high groundwater, causing the waters to recede very slowly. Records exist of a number of similarly damaging floods during the 20<sup>th</sup> century, when the Bourne is in flow.</p> <p>Historic flood records dating back to the 1960s also indicate numerous incidents associated with the Norbury Brook through overtopping in open sections but also through surcharging of manholes and culverts in its culverted sections.</p> <p>A number of flood incidents have been recorded in the vicinity of the Chaffinch Brook and although not specifically attributed to the brook overtopping, these events are likely linked to the hydrology of the watercourse. The Chaffinch Brook has a significant number of tributaries which are classed as ordinary watercourses in the Ashburton area which also have some localised flood incidents associated with them.</p>

<sup>22</sup> Scott Wilson (2009) London Boroughs of Wandsworth, Merton, Sutton and Croydon Strategic Flood Risk Assessment <http://www.croydon.gov.uk/contents/departments/planningandregeneration/pdf/evidence/climate/sfralevel1final>

<sup>23</sup> Environment Agency (2009) Thames Catchment Flood Management Plan <https://www.gov.uk/government/publications/thames-catchment-flood-management-plan>

<sup>24</sup> Environment Agency, Flood Map for Planning (Rivers and Sea) <http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=e&topic=floodmap>

**Table 2-4 Flooding from Other Sources – Main Rivers**

<p><b>Future Flood Risk</b></p>	<p>In December 2013, the Environment Agency published a new set of mapping called the <a href="#">Risk of Flooding from Rivers and the Sea</a>, which shows the risk of flooding from rivers and the sea banded into High, Medium and Low Risk, in a consistent format with the Risk of Flooding from Surface Water and Reservoir Maps (see Table 2-1 and Table 2-6). Whilst this dataset is readily available to the public to understand their own flood risk, the Strategy uses the <a href="#">Flood Map for Planning (Rivers and Sea)</a>, also published by the Environment Agency, as the basis to determine future flood risk from rivers. The Flood Map for Planning (Rivers and Sea) defines Flood Zones and is used by Croydon Council, as the Local Planning Authority, to make planning decisions in line with national legislation</p> <p>The <a href="#">National Planning Policy Framework (NPPF)</a><sup>25</sup> defines Flood Zones associated with tidal and river flooding based upon the probability of flooding. The extent of land adjacent to main rivers within Flood Zone 2 (between a 1 in 100 and 1 in 1000 chance of flooding in any given year (1% AEP - 0.1% AEP) and Flood Zone 3 (greater than 1 in 100 chance of flooding in any given year (&gt;1% AEP)) varies throughout the borough, as shown in Figure 4 in Appendix A. Areas within Flood Zones 2 and 3 are as follows:</p> <ul style="list-style-type: none"> <li>• Properties along Godstone Road in Kenley and Purley associated with the Caterham Bourne.</li> <li>• All of Brighton Road from just south of Purley Cross roundabout running north through Waddon is located in Flood zone 3. The Caterham Bourne becomes culverted at Purley Cross and flows north until joining the Wandle, which first emerges at Wandle Park so the watercourse is entirely culverted through this area.</li> <li>• Properties in adjacent streets to the Norbury Brook in Thornton Heath and Norbury also fall within Flood zone 2 and 3.</li> <li>• Areas of South Norwood Country Park and nearby streets in Shirley are also at risk associated with the Chaffinch Brook.</li> </ul> <p>According to the Environment Agency<sup>26</sup>, there are approximately 5,100 properties in areas at risk of fluvial (river) flooding in Croydon; around 3% of all properties in the borough. The Environment Agency's National Flood Risk Assessment (Nafra) shows that around 93% of the properties are in areas where likelihood of flooding is low due to protection from defences.</p> <p>The Environment Agency offers a free <a href="#">flood warning service</a><sup>27</sup>, which gives advance warning of flooding via telephone, mobile SMS text, e-mail or fax. As of March 2013, 1,258 properties in Croydon were registered to receive flood warnings<sup>28</sup>. This does not include all properties at risk, though other media, such as local radio, the Environment Agency and Croydon Council website also broadcast the warnings.</p>
<p><b>Figures - Appendix A</b></p>	<p>Figure 1: Historic Flooding</p> <p>Figure 4: Flood Risk from Rivers</p> <p>Figure 5: Main Rivers &amp; Ordinary Watercourses</p>

<sup>25</sup> CLG (2012) National Planning Policy Framework.

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/6077/2116950.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf)

<sup>26</sup> Environment Agency (August 2013), Croydon London Borough Environmental Fact Sheet - compiled as an extension to the London State of the Environment Report

<sup>27</sup> <https://www.gov.uk/sign-up-for-flood-warnings>

<sup>28</sup> Environment Agency (August 2013), Croydon London Borough Environmental Fact Sheet - compiled as an extension to the London State of the Environment Report

Sewers

**Table 2-5 Flooding from Other Sources – Sewers**

<b>Description of Source</b>	<p>During heavy rainfall flooding from the sewer system may occur if (a) the rainfall event exceeds the capacity of the sewer system / drainage system, (b) the system becomes blocked by debris or sediment and/or (c) the system surcharges due to high water levels in receiving watercourses. Sewer flooding generally results in localised short term flooding.</p> <p>Management of sewer flooding is the responsibility of Thames Water as the sewerage undertaker, although it is often difficult to disassociate from surface water runoff.</p> <p>On the whole, the sewers are designed to cope with the vast majority of storms but occasionally rainfall can be so heavy that it overwhelms the system. When this happens, sewage can overflow from manholes and gullies and flood land, rivers and gardens. In the worst cases, sewage can even flood homes.</p>
<b>Supporting Documents</b>	<p><a href="#">London Borough of Croydon Surface Water Management Plan</a></p>
<b>Historic Flooding</b>	<p>As part of the Croydon SWMP, Thames Water provided information (through their DG5 register) on the total number of properties at risk of sewer flooding (both internally and externally) by postcode district based on historic flooding over the previous 10 years. Thames Water focus their efforts on removing properties from the DG5 register and therefore this dataset may not accurately represent those properties currently at risk. The information provided at the time highlighted the wards of Bensham Manor, Addiscombe, Ashburton and Waddon as being at greatest risk of sewer flooding.</p> <p>Numerous incidents in the historic flood register are attributed to surcharging sewers around the borough although evidence is anecdotal and it is not always clarified whether highway drainage or culverted watercourses have influenced the incident. A significant number of incidents are recorded in Thornton Heath and Broad Green in close proximity to the Norbury Brook as well as known surface water hotspots in Coulsdon.</p>
<b>Future Flood Risk</b>	<p>Climate change is anticipated to increase the potential risk from sewer flooding as summer storms become more intense and winter storms more prolonged. This combination is likely to increase the pressure on the existing efficiency of sewer systems, thereby reducing their design standard and leading to more frequent localised flooding incidents. Any sewer flooding that may occur could be exacerbated as a result of surface water runoff during extreme rainfall events. However the risk from sewer flooding in the London Borough of Croydon is low as the majority of Croydon is served by separate foul and surface water sewers.</p> <p>Thames Water will monitor the risk of sewer flooding and put plans in place to manage this, as required, based on their business plan and priorities. The London Borough of Croydon will work with Thames Water to identify flooding hotspots and locations of known sewer capacity issues where risk could be exacerbated.</p> <p>Thames Water will prioritise investment for potential flood alleviation schemes depending on the severity and frequency of flooding, but this can only be identified where affected property owners report the incident to the water company.</p>
<b>Figures - Appendix A</b>	<p>Figure 1: Historic Flooding</p>

## Artificial Sources

**Table 2-6 Flooding from Other Sources – Artificial Sources**

<b>Description of Source</b>	<p>Artificial sources include any water bodies not covered under other categories and typically include canals, lakes and reservoirs.</p> <p>Croydon Council own and manage one open reservoir; South Norwood Lake in the north-east of the borough close to the border with London Borough of Bromley. Russell Hill Reservoir is a covered reservoir in the West of the Borough managed by Thames Water Ltd.</p>
<b>Supporting Documents</b>	<p><a href="#">Environment Agency Risk of Flooding from Reservoirs</a></p>
<b>Historic Flooding</b>	<p>There have been no recorded incidents of reservoir flooding within London Borough of Croydon.</p>
<b>Future Flood Risk</b>	<p>Reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers on a yearly basis. As the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency are responsible for ensuring that reservoirs are inspected regularly and essential safety work is carried out.</p> <p>In the unlikely event that a reservoir dam failed, a large volume of water would escape at once and flooding could happen with little or no warning. The Environment Agency's Risk of Flooding from Reservoirs map shows the area and depths of flooding and flow velocities that could occur if a large reservoir were to fail and release the water it holds. A large reservoir is one that holds over 25,000 cubic metres of water, equivalent to approximately 10 Olympic sized swimming pools. Since this is a worst case scenario, it's unlikely that any actual flood would be this large.</p> <p>Within Croydon, if the Russell Hill Reservoir were to fail it would impact areas of West Croydon and Waddon although impact would be greater in London Borough of Sutton to the West including Wallington and Hackbridge around the route of the River Wandle. If South Norwood Lake were to fail then the impact would be almost entirely within London Borough of Bromley, affecting areas of Penge, Beckenham and Lower Sydenham.</p> <p>As the undertaker for South Norwood Lake, Croydon Council is required to ensure that inspections are carried out by a qualified (panel) engineer and that necessary safety work is completed as required to reduce the likelihood of any failure.</p>

## 2.4 Impact of Climate Change

Current predictions of future rainfall indicate that we should expect increasing numbers of severe and extreme weather events in the future. Intense storms are the main cause of surface water flooding, which would also increase in frequency. It is predicted that the frequency of heavy rainfall events could double by the 2080s according the UK Climate Projections 2009<sup>29</sup>. By the 2080s, it is predicted that there could be around three times as many days in winter with heavy rainfall (defined as more than 25mm in a day) and that the amount of rain in extreme storms (with a 1 in 5 annual chance or rarer) could increase locally by 40%. Consequently, the number of properties, business and critical infrastructure at risk will also increase.

<sup>29</sup> United Kingdom Climate Projections 2009 <http://ukclimateprojections.defra.gov.uk/>

### Implications for Flood Risk

Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability. Wetter winters and more of this rain falling in wet spells may increase river flooding in both rural and heavily urbanised catchments. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers, so we need to be prepared for the unexpected.

Rising sea or river levels may increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses. There is a risk of flooding from groundwater-bearing chalk and limestone aquifers. Recharge of the aquifers may increase in wetter winters, or decrease in drier summers.

Where appropriate, local studies are needed to understand climate impacts in detail, including effects from other factors like land use. Sustainable development and drainage will help to adapt to climate change and manage the risk of damaging floods in future.

### Adapting to Change

Past emission means some climate change is inevitable. It is essential we respond by planning ahead. We can prepare by understanding our current and future vulnerability to flooding, developing plans for increased resilience and building the capacity to adapt. Regular review and adherence to these plans is key to achieving long-term, sustainable benefits.

Although the broad climate change picture is clear, we have to make local decisions against deeper uncertainty. We will therefore consider a range of measures and retain flexibility to adapt. This approach, embodied within flood risk appraisal guidance, will help to ensure that we do not increase our vulnerability to flooding.

### Including allowances for Climate Change in Flood Risk Management

Existing flood risk studies, covering London Borough of Croydon and the wider catchment, have assessed the impacts of climate change and flood risk and provide the evidence base for understanding how this may impact current and future communities and businesses. Further information on how the Strategy takes into account the impacts of climate change is outlined in Section 5.4.

## 2.5

### Summary

This Section has afforded a summary of past and future flood risk associated with local sources in the London Borough of Croydon which are the primary focus of the Strategy. A summary of the past and future risk associated with other sources of flooding has also been provided to ensure a comprehensive appreciation of flood risk across the borough. The sources of flood risk that are of most significance to the London Borough of Croydon are considered to be surface water and groundwater.

### 3. RESPONSIBILITIES FOR LOCAL FLOOD RISK MANAGEMENT

#### 3.1 Overview

Flood events are often a complex interaction of flood source(s), pathway(s) and receptor(s), the responsibility for managing which can often lie with a number of different organisations or individuals. As a result, a clear definition of responsibilities and effective communication across these organisations and individuals is vital if the risk to people, property and the environment is to be managed effectively.

The Flood and Water Management Act 2010 designates the following organisations as Risk Management Authorities (RMAs) and sets out the legal responsibilities these organisations have for managing local flood risk:

- Lead Local Flood Authority i.e. London Borough of Croydon
- Environment Agency
- Water Company i.e. Thames Water Utilities
- Highways Authority i.e. London Borough of Croydon and Transport for London

All Risk Management Authorities have a duty to cooperate with the LLFA, and other RMAs when exercising their flood risk management functions.

In addition, other legislation (such as the [Highways Act 1980](#)<sup>30</sup>, [Land Drainage Act 1991](#)<sup>31</sup>, [Water Resources Act 1991](#)<sup>32</sup>, [Civil Contingencies Act 2004](#))<sup>33</sup> place duties and powers upon specific organisations and individuals of relevance to local flood risk management.

This Section provides an overview of the legal responsibilities and functions held by different organisations and individuals under all the legislation.

#### 3.2 Responsibilities of Risk Management Authorities

##### London Borough of Croydon

##### ...as the Lead Local Flood Authority

Croydon Council are a RMA under the Act as both the LLFA and the Highways Authority. Figure 3-1 presents the duties and powers they have as the LLFA. Where multiple sources of flooding occur, Croydon Council as the LLFA will coordinate response and ensure all RMAs are aware of their responsibilities.

##### ...as a Highways Authority

The highway drainage system is integral in the management and behaviour of surface water during heavy rainfall events. As a Highways Authority, the [Highways Act 1980](#) requires that Croydon Council ensure that highways are drained of surface water and where necessary maintain all drainage systems.

##### ...as a Category 1 Responder

Croydon Council is a Category 1 Responder under the [Civil Contingencies Act 2004](#) and therefore has a responsibility, along with other organisations for developing emergency plans, contingency plans and business continuity plans to help reduce, control or ease the effects of

<sup>30</sup> HSMO (1980) Highways Act <http://www.legislation.gov.uk/ukpga/1980/66/contents>

<sup>31</sup> HSMO (1991) Land Drainage Act <http://www.legislation.gov.uk/ukpga/1991/59/contents>

<sup>32</sup> HMSO (1991) Water Resources Act <http://www.legislation.gov.uk/ukpga/1991/57/contents>

<sup>33</sup> HSMO (2004) Civil Contingencies Act <http://www.legislation.gov.uk/ukpga/2004/36/contents>



an emergency. The complex and diverse nature of flooding and the consequences that arise, require a comprehensive and often sustained response from a wide range of organisations, and as such Croydon Council has prepared a Multi-Agency Flood Plan<sup>34</sup> to allow all responding parties to work together on an agreed coordinated response to severe flooding.

#### ...as a Local Planning Authority

As a Local Planning Authority Croydon Council has a responsibility to consider flood risk in their strategic land use planning and the development of their Local Plan. Croydon Council is the 'decision maker' on flood risk for planning applications for development, taking into consideration technical advice from other risk management authorities as consultees (statutory).

The [National Planning Policy Framework](#)<sup>35</sup> (NPPF) and [supporting guidance](#)<sup>36</sup> require Local Planning Authorities to undertake a Strategic Flood Risk Assessment (SFRA) and to use their findings, and those of other studies, to inform strategic land use planning. This includes a requirement to steer development towards areas of lowest flood risk (the Sequential Test) before considering development in areas more prone to flooding. The London Boroughs of [Merton, Croydon, Sutton, and Wandsworth SFRA Level 1](#)<sup>37</sup> was produced in December 2008 to support the [Local Plan](#)<sup>38</sup>. When considering applications for development, site-specific flood risk assessments are a requirement of the NPPF. Local requirements for these are outlined in the [Croydon Level 2 SFRA](#)<sup>39</sup>.

#### ...as Regulator of Ordinary Watercourses

Croydon Council has been given the powers of ordinary watercourse consent under the [Land Drainage Act 1991](#)<sup>40</sup>, which were transferred from the Environment Agency to LLFAs as of the 6<sup>th</sup> of April 2012. Any works (either temporary or permanent), that may alter or impact the flow or storage of water within an ordinary watercourse will require consent from the Council prior to any work being carried out. Croydon Council therefore have:

- The power to serve notice on riparian landowners along ordinary watercourses who need to carry out maintenance to reduce flooding.
- The power to serve notice on a person to abate a nuisance in relation to an ordinary watercourse where that nuisance is an obstruction erected, raised or altered or any culvert erected or altered without prior consent as required under Section 23 of the Land Drainage Act 1991.

<sup>34</sup> London Borough of Croydon (2013) Croydon Multi-Agency Flood Plan 2013

<sup>35</sup> Communities and Local Government (2012) National Planning Policy Framework

<http://www.communities.gov.uk/documents/planningandbuilding/pdf/2116950>

<sup>36</sup> Communities and Local Government (2014) Planning Practice Guidance: Flood Risk and Coastal Change:

<http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

<sup>37</sup> Scott Wilson (2008) Merton, Croydon, Sutton, Wandsworth Level 1 Strategic Flood Risk Assessment, December 2008

<http://www.croydon.gov.uk/contents/documents/meetings/806358/609905/2008/2008-01-04/706672/flood1.pdf>

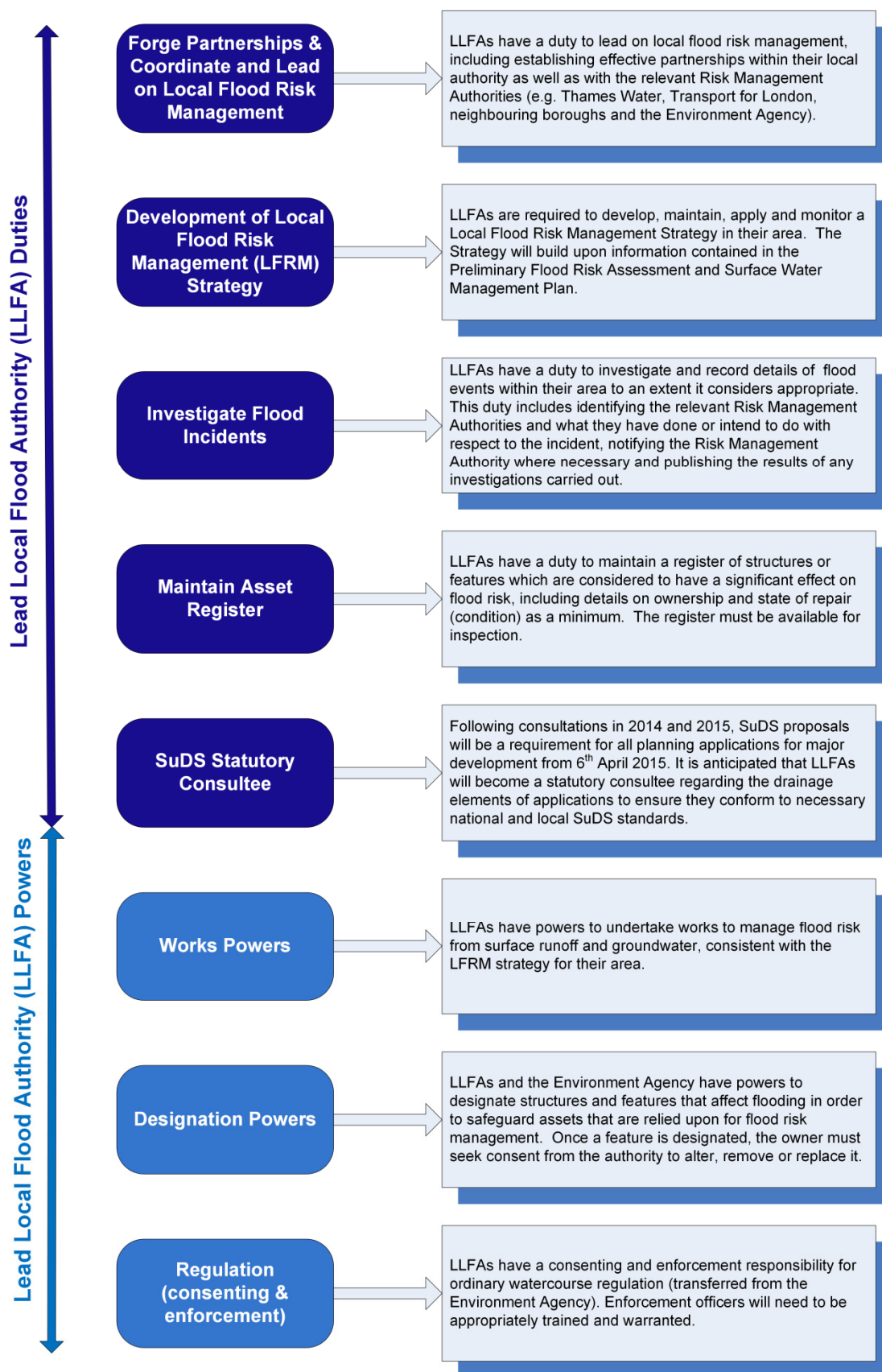
<sup>38</sup> See Croydon Council website for latest version of Local Plan

<http://www.croydon.gov.uk/planningandregeneration/framework/localplan/>

<sup>39</sup> Scott Wilson (2009) Croydon Level 2 Strategic Flood Risk Assessment, April 2009

<https://www.croydon.gov.uk/sites/default/files/articles/downloads/sfralevel2final.pdf>

<sup>40</sup> HMSO (1991) Land Drainage Act <http://www.legislation.gov.uk/ukpga/1991/59/contents> as amended by the Flood and Water Management Act



**Figure 3-1 Duties and Powers for London Borough of Croydon under the Act**

### Environment Agency

The Environment Agency is designated a RMA under the Act. The Environment Agency is responsible for managing flooding from main rivers and the sea and has a responsibility to provide a strategic overview for all flooding sources and coastal erosion.

### Thames Water Utilities Ltd

As the Sewerage undertaker serving London Borough of Croydon, Thames Water is designated a RMA under the Act.

Thames Water is responsible for surface water drainage from development via adopted sewers and for maintaining public sewers into which much of the highway drainage (both London Borough of Croydon and TfL routes) connects.

In October 2011 water and sewerage companies in England and Wales became responsible for private sewers which were previously the responsibility of property owners. However, not all private sewers were included; there are some cases where the property owners remain responsible for the sections of pipe between the property and the transferred private sewer. Further information is available via [Thames Water's website](http://www.thameswater.co.uk/)<sup>41</sup>.

### Transport for London

As a Highways Authority, Transport for London (TfL) is designated a RMA under the Act.

Under the Highways Act 1980, TfL have responsibilities for the effectual drainage of surface water from adopted roads along red routes insofar as ensuring that drains, including kerbs, road gullies and ditches and the pipe network which connect to the sewers, are maintained.

## 3.3

### Roles and Responsibilities of Other Organisations / Individuals

Individuals, communities and businesses have an important role to play in managing local flood risk, alongside defined Risk Management Authorities.

- **Property owners** are responsible for maintaining a proper flow of water in any watercourse running through their land and protecting their property (through property level resilience and resistance measures).
- **Businesses** can reduce flood risk by ensuring their activities do not lead to blockages of drains or watercourses and ensuring waste is stored and disposed of correctly.
- **Individuals** can reduce flood risk by taking action such as disposing of leaf litter rather than letting it block drains, ensuring ditches and drains are kept free from litter or waste and getting involved in local flood risk management activities.

Additionally there are significant roles for larger organisations or businesses who are not classified as Risk Management Authorities;

- **Major infrastructure providers** must consider how works to their assets or within their land boundaries may impact on wider flood risk, and work with Croydon Council to identify multiple benefits and maximise the value of financial investment.
- **Property developers** must ensure that new development does not increase flood risk to the surrounding area, prioritising sustainable drainage techniques and water sensitive urban design.

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<sup>41</sup> Thames Water Utilities website <http://www.thameswater.co.uk/>

Croydon Council recognise the vital role individuals, communities and businesses have in managing flood risk and the requirement for more information to be available to support these initiatives. The Strategy, therefore, aims to promote and encourage personal responsibility by raising awareness of flood risk and how this can be reduced and by supporting community-based actions.

### Property Owners and Residents

It is the responsibility of householders and businesses to look after their property, including protecting it from flooding. It is important that householders, whose homes are at risk of flooding, take steps to ensure that their home is protected. Practical guidance can be found in the publication 'Prepare your property for flooding' available on the [Environment Agency website](#)<sup>42</sup>.

### Property Level Protection

Property Level Protection (PLP) can include a range of measures that can be taken to protect a property or make it more resilient to flood damage. [The National Flood Forum website](#)<sup>43</sup> provides guidance about PLP and details of suppliers of resilience measures such as air brick covers, flood boards or water resilient doors. Further links can be found in Table 5-2.

### Riparian Owners

If you own land which is adjacent to a watercourse or land which has a watercourse running through it, you are a riparian owner and you have certain legal responsibilities to maintain the watercourse. Where a watercourse marks the boundary between adjoining properties, it is normally presumed the riparian owner owns the land up to the centre line of the watercourse.

RMAs have powers and responsibilities to manage flood risk and work with others to improve river environments. This may often affect riparian owners, who must also adhere to certain responsibilities including;

- To maintain the watercourse and to clear any obstructions (natural or otherwise) so the normal flow of water is not impeded,
- To maintain the banks and bed of the watercourse and any flood defences that exist on it,
- To accept the natural flow from your upstream neighbour and transfer it downstream without obstruction, pollution or diversion,
- To maintain any structures on your stretch of watercourse including culverts, weirs and mill gates, and
- To apply to Croydon Council for formal consent for any works in or adjacent to an ordinary watercourse, or to the Environment Agency for works within 8m of a Main River.

Croydon Council has permissive powers to carry out flood defence works for ordinary watercourses at their discretion, in a similar manner to those powers used by the Environment

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<sup>42</sup> Environment Agency website - 'Prepare your property for flooding'  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/451622/LIT\\_4284.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/451622/LIT_4284.pdf)

<sup>43</sup> National Flood Forum website [www.nationalfloodforum.org.uk](http://www.nationalfloodforum.org.uk)

Agency for Main Rivers. Further information for riparian owners is available in the Environment Agency publication '[Living on the Edge](#)'.<sup>44</sup>

#### *Sutton and East Surrey Water*

Sutton and East Surrey Water (SESW) provide drinking water only and do not have any sewerage responsibilities within the London Borough of Croydon. Their responsibilities therefore are as a riparian owner and property owner for their assets including the Kenley Water Treatment Works. During periods of flooding from the Caterham Bourne and high groundwater, water abstractions and site activity at the Kenley works can directly influence local flood risks and these activities should be managed in liaison with the Environment Agency and Croydon Council as the LLFA.

#### *Property Developers*

It is essential that much-needed new homes in Croydon are forward-looking in their drainage design; not simply replacing what is there but reducing the risk, and designing buildings with a full understanding of local flood sources so that existing risks can be mitigated and future risks minimised. All new development should be prioritising sustainable drainage techniques in line with the NPPF, the London Plan<sup>45</sup> and its accompanying Sustainable Design and Construction SPD<sup>46</sup>. Drainage design and maintenance should follow best practice industry guidance available via [www.susdrain.org](http://www.susdrain.org) including;

- [The SuDS Manual \(C697\)](#)<sup>47</sup>, and any subsequent updates
- [Planning for SuDS – making it Happen \(C687\)](#)<sup>48</sup>
- [Retrofitting to manage surface water \(C713\)](#)<sup>49</sup>

Additionally developers should take note of any local guidance produced by London Borough of Croydon and the most up to date flood risk information by consulting [www.croydon.gov.uk/flooding](http://www.croydon.gov.uk/flooding). Section 5 of this strategy looks at some of the actions the council are taking to address flood risk in property development.

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<sup>44</sup> Environment Agency (2012) 'Living on the Edge'

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/454562/LIT\\_7114.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/454562/LIT_7114.pdf)

<sup>45</sup> Greater London Authority (2011) The London Plan. July 2011 <https://www.london.gov.uk/priorities/planning/publications/the-london-plan>

<sup>46</sup> Greater London Authority (2014) Sustainable Design and construction supplementary Planning Guidance <https://www.london.gov.uk/sites/default/files/Sustainable%20Design%20%26%20Construction%20SPG.pdf>

<sup>47</sup> CIRIA (2007) The SuDS Manual (C697) [http://www.ciria.org/Resources/Free\\_publications/the\\_suds\\_manual.aspx](http://www.ciria.org/Resources/Free_publications/the_suds_manual.aspx)

<sup>48</sup> CIRIA (2010) Planning for SuDS – Making it Happen (C687) [http://www.ciria.org/Resources/Free\\_publications/Planning\\_for\\_SuDS\\_ma.aspx](http://www.ciria.org/Resources/Free_publications/Planning_for_SuDS_ma.aspx)

<sup>49</sup> CIRIA (2012) Retrofitting to manage surface water (C713) [http://www.ciria.org/Resources/Free\\_publications/Retrofitting\\_manage\\_surface\\_water.aspx](http://www.ciria.org/Resources/Free_publications/Retrofitting_manage_surface_water.aspx)

## 4. OBJECTIVES FOR MANAGING LOCAL FLOOD RISK

### 4.1 London Borough of Croydon Local Objectives

The objectives for the London Borough of Croydon Strategy have been developed in line with the Environment Agency's [National Flood and Coastal Erosion Risk Management Strategy for England](#)<sup>50</sup>, the outcomes from the public engagement exercise undertaken to inform to the Strategy and discussions with Croydon Council and RMA officers.

#### London Borough of Croydon Local Strategy Objectives

1. Continue to build our evidence base on flood mechanisms, incidents and assets and improve how it is communicated internally and externally.
2. Maximise use of resources in targeted flood management.
3. Ensure evidence of historic floods and ongoing studies effectively feed into planning policy and decision-making
4. Support sustainable growth and development by understanding the needs of all parties
5. Work effectively with Risk Management Authorities in and around Croydon to jointly manage the risks.
6. Improve awareness of the causes of flooding with the general public and encourage proactive management
7. Take a more holistic view of asset management in Croydon, improving priorities and addressing source control more effectively.
8. Maximise opportunities to learn, improve and review flood management procedures based on lessons learnt

**Figure 4-1 Local Flood Risk Management Objectives**

### 4.2 Guiding Principles for Setting Objectives

#### National Flood Risk Management Objectives

The Environment Agency's [National Flood and Coastal Erosion Risk Management Strategy for England](#)<sup>51</sup> sets out the following national objectives for flood risk management;

- **Understand the risks** – understanding the risks of flooding and coastal erosion, working together to put in place long-term plans to manage these risks and making sure that other plans take account of them,

<sup>50</sup> Environment Agency (2011) National flood and coastal erosion risk management strategic for England <http://www.environment-agency.gov.uk/research/policy/130073.aspx>

<sup>51</sup> Environment Agency (2011) National flood and coastal erosion risk management strategic for England <http://www.environment-agency.gov.uk/research/policy/130073.aspx>



- **Prevent inappropriate development** – avoiding inappropriate development in areas of flood and coastal erosion risk and being careful to manage land elsewhere to avoid increasing risks,
- **Manage the likelihood of flooding** – building, maintaining and improving flood and coastal erosion management infrastructure and systems to reduce the likelihood of harm to people and damage to the economy, environment and society,
- **Help people to manage their own risk** – increasing public awareness of the risk that remains and engaging with people at risk to encourage them to take action to manage the risks that they face and to make their property more resilient, and
- **Improve flood prediction, warning and post-flood recovery** – improving the detection, forecasting and issue of warnings of flooding, planning for and co-ordinating a rapid response to flood emergencies and promoting faster recovery from flooding.

#### Guiding Principles for Local Flood Risk Management

The National Strategy strategic aims and objectives are supported by six high-level principles, to guide decisions on risk management activities, and the process by which they are taken, at both a national and local level. Croydon Council has used these to guide the development of objectives and identification of measures to deliver local flood risk management within Croydon.

**Table 4-1 Guiding Principles for Local Flood Risk Management in Croydon**

<b>Proportionate and risk based approach</b>	Flood risk management activities should be proportionate to the risk that is faced. It is not possible to prevent flooding altogether. To try and do so would be technically unfeasible, environmentally damaging and uneconomical. A risk based approach to managing flooding targets investment to areas where the risk is greatest by examining both the likelihood and consequences of a flood occurring.
<b>A catchment based approach</b>	To manage flood risk effectively, it is important to understand the interactions with the wider area over the entire catchment. This means ensuring that activities are coordinated and working closely with neighbouring authorities to ensure that activities do not adversely affect other areas.
<b>Community focus and partnership working</b>	Working closely with communities provides a clearer understanding of the issues and appreciation of the community perspective of flooding. Giving communities a greater say in what activities take place and helping them to manage their own risk will result in better decisions being made and allows greater flexibility in the activities that take place. It is also vital to work in partnership with other authorities to ensure that risk is managed in a coordinated way beyond the boundaries and responsibilities of individual authorities and organisations.
<b>Beneficiaries encouraged to invest</b>	If funding for flood risk management activities relies on central and local government alone, then those activities will be significantly limited by the funds available. They will also be constrained by national controls and reduce the scope for local influence. Those that benefit should therefore be encouraged to invest in order to maximise flood risk management activity and allow innovative solutions to take place.
<b>Sustainability</b>	More sustainable approaches to flood risk management should be sought to consider wider sustainability issues such as the environment, whole-life costs, and the impact of climate change. Wherever possible, solutions to flooding problems should work with natural processes and aim to enhance the environment.
<b>Multiple benefits</b>	Flood risk management solutions can often provide additional social, economic and environmental benefits. For example the use of sustainable drainage systems (SuDS) can reduce the pollution of watercourses by minimising urban storm water runoff. The potential to achieve multiple benefits should be considered in all flood risk management activities.

### Public Priorities for Local Flood Risk Management

A community engagement exercise was undertaken to capture community objectives and priorities for flood risk management in the London Borough of Croydon (Appendix C). These were used to inform the development of the local objectives for local flood risk management. Respondents were particularly concerned about maintenance of existing drainage, particularly in areas known to flood regularly during heavy rainfall. The council are looking to build on increased gully cleaning by improving awareness of flood hotspots and feeding it into the maintenance programme for targeted use of resources.

Respondents also expressed particular concern about the potential impacts of new development on local flood risk as well as localised issues such as paving over of driveways and inappropriate drainage at property level. Through the internal flood group, planning and development have improved communications with other teams in the council and plan to actively promote information sharing about local flood risk and up-skilling between teams to ensure accurate local flood risk information is informing decision-making and the development of planning policy.

## **5. DELIVERY OF LOCAL FLOOD RISK MANAGEMENT**

### **5.1 Overview**

This section sets out how the local flood risk management objectives will be delivered over the next six years. A number of measures and actions have been identified to achieve this, and these are set out in the Action Plan that accompanies the Local Strategy as provided in Appendix B. These will help to improve the understanding of flood risk across the Borough and inform the way flood risk is reduced and planned for, to increase resilience against the impacts of climate change.

In delivering flood risk management, Croydon Council has the opportunity to deliver wider environmental objectives and requirements, as set out in European Legislation including the Water Framework Directive. A Strategic Environmental Assessment and a Habitats Regulations Assessment Screening exercise has been undertaken to inform the Strategy development; further details are provided in Section 6.

Specifically this section outlines:

- The delivery of local flood risk management in the London Borough of Croydon to date (Section 5.2),
- How Croydon Council will deliver their legislative duties under the Flood and Water Management Act 2010 (Section 5.3),
- How the London Borough of Croydon local flood risk management objectives will be delivered (Section 5.4),
- How local flood risk management measures will be prioritised (Section 5.5),
- How local flood risk management measures will be funded (Section 5.6),
- Steps communities, residents and businesses can take to prepare for flooding (Section 5.7), and

Further information on the Local Flood Risk Management Action Plan can be found in [Section 5.7](#).

The Croydon Council website<sup>52</sup> provides the latest information on flood risk management in Croydon.

### **5.2 Delivery of Local Flood Risk Management to Date**

In identifying the measures for the management of local flood risk in Croydon it is important to recognise where Croydon Council are starting from in order to understand the key steps that will need to be taken.

As Lead Local Flood Authority (LLFA) for the London Borough of Croydon, Croydon Council has already undertaken a number of activities to deliver duties under the Act and take a proactive approach to delivering local flood risk management in Croydon. Some of the key activities undertaken to date include:

- Undertaking cleansing of gullies in identified 'high risk' areas on an annual basis – the high risk areas were based on those roads that were reported as flooding during the July 2007 surface water flooding event.

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<sup>52</sup> Croydon Council flood pages: [www.croydon.gov.uk/flooding](http://www.croydon.gov.uk/flooding)

- Production of the London Borough of Croydon Surface Water Management Plan,
- Production of the London Borough of Croydon Preliminary Flood Risk Assessment,
- Setting up and attending quarterly meetings of South West London Flood Group (see Section 5.3 for further information),
- Setting up of the Croydon Internal Flood Group to enable close working between council departments on flood risk management (see Section 5.3 for further information),
- Applying for funding through the Drain London project, administered by the Greater London Authority, and the Environment Agency (FCRM GiA and Local Levy – see Section 5.6) to undertake investigations into flooding risk, mechanisms and potential mitigation schemes in Critical Drainage Areas,
- Improving understanding of local flood risk through collating historic and emerging information on local flood risk and mechanisms, working with neighbouring authorities and RMAs, and attending capacity building workshops run by Defra and the Environment Agency,
- Setting up procedures and delivering legislative duties as required under the Act (see Section 5.3), and,
- Undertaking a joint commission, with the South West London Flood Group, to deliver the South West London Flood and Water Management Act 2010 Roadmap, identifying the required legislative duties, proposed delivery route for these and opportunities for joint working across South West London boroughs.
- Forming a five-borough groundwater flood group to help develop a multi-agency solution to reduce the impacts of groundwater flooding.

### 5.3 Delivery of Legislative Duties

Under the Act, Croydon Council have a number of duties and powers relating to the management of local flood risk. The existing procedures in place and the proposed measures to deliver these are outlined below.

#### Forge Partnerships and Lead on Local Flood Risk Management

##### *Internal Flood Group*

Local flood risk management for London Borough of Croydon is being led by the Highways team within the Development and Environment directorate. The internal flood group was set up in early 2013 to encourage a more joined up approach across the council and is chaired by Highways. The group is attended by representatives from multiple functions of the council including emergency planning, development management, parks & green spaces, public health enforcement, ICT services, building control and spatial planning.

##### *Local Stakeholders*

There are a number of local residents groups with particular interest in flooding, particularly in those areas being regularly affected. The Purley Flood Group was established in 2011 as part of a pilot scheme to get communities more involved in their own flood management. The group

has its own [community flood plan](#)<sup>53</sup> and are in regular communication with the Council about how flood risks can be alleviated in the area.

Residents associations in Kenley, Norbury and Addiscombe have also expressed concerns relating to local flooding hotspots through the recent online survey, meetings, Facebook groups and other communication mediums in recent years. As part of this strategy, Croydon Council will be looking to improve communications on flood management with these local communities.

Working in partnership is key to achieving maximum benefit with limited resources. Most infrastructure and utilities companies operating within London Borough of Croydon have assets under threat from increasing flood risk. Croydon Council needs to work closely with organisations such as Network Rail, Transport for London, Thames Water, Sutton and East Surrey Water and EDF energy to maximise any joint funding opportunities for schemes with multiple benefits.

#### *South West London Flood Group*

The South West London Flood Group was formed in 2011 and reports to the Thames Regional Flood and Coastal Committee. The South West London Flood Group comprises the six LLFAs covering South West London, namely, London Borough of Croydon, The Royal Borough of Kingston upon Thames, London Borough of Merton, London Borough of Sutton, London Borough of Richmond upon Thames and London Borough of Wandsworth, and the Environment Agency and Thames Water Utilities Ltd.

The Group meet quarterly to share best practice and understanding of flood risk across South West London, and, where possible, provide coordinated and collaborative management of flooding.

#### *Groundwater Solution Cell*

This group was set up in 2014 during a period of unprecedented rainfall where rapidly rising groundwater was realised as a significant threat, and which needs to be approached at a regional scale. At the time of writing, the group is chaired by a member of London Fire Brigade, Bexley and comprises the Environment Agency and five LLFAs in South London, namely London Borough of Bexley, London Borough of Bromley, London Borough of Croydon, Royal Borough of Greenwich and London Borough of Sutton (although there is intention to involve further authorities as plans progress). The group has been formed to try to establish sustainable operational solutions for groundwater flooding at a regional scale through a multi-agency partnership and therefore reduce risk to people and property across the region.

#### *Regional Flood and Coastal Committee*

The [Thames Regional Flood and Coastal Committee](#)<sup>54</sup> (RFCC) was established in accordance with the Act and is composed of elected members appointed by each LLFA and independent members appointed by the Environment Agency with relevant experience in the Thames Region. The Committee has three primary functions:

- To ensure there are coherent plans for identifying, communicating and managing flood and coastal erosion risks across catchments,

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<sup>53</sup> Purley Community Flood Plan <http://www.croydon.gov.uk/contents/departments/planningandregeneration/pdf/purleyflood-plan.pdf>

<sup>54</sup> Environment Agency Website: Thames Regional Flood and Coastal Committee <https://www.gov.uk/government/groups/thames-regional-flood-and-coastal-committee>

- To promote efficient, targeted and risk-based investment in flood and coastal erosion risk management that optimises value for money and benefits for local communities, and
- To provide a link between the Environment Agency, Lead Local Flood Authorities, other RMAs, and other relevant bodies to engender mutual understanding of flood and coastal erosion risks in its area.

The South West London Flood Group is represented on the Thames RFCC by a Councillor from one of the six boroughs.

### Investigate Flood Incidents

Under Section 19 of the Flood and Water Management Act, Croydon Council must, *“to the extent that it considers it necessary or appropriate, investigate*

- a) Which risk management authorities have relevant flood risk management functions, and*
- b) Whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.”*

In order to assist decision-making under this duty, Croydon Council has developed a protocol and guidance to determine thresholds over which an investigation should be carried out under the terms of the Act. The protocol is in living draft form pending review following the 2014 floods. Some key thresholds from the draft protocol include;

- **Human safety:** There has been a fatality or serious injury as a direct result of flooding
- **Residential property:** Depth greater than 0.10m over ground floor threshold or more than 3 properties
- **Critical Infrastructure:** flooding has prevented the operation of the critical infrastructure for more than 2 hours
- **Commercial Property:** more than 3 properties been affected by flooding *or* the flooding is deemed to have caused significant economic disruption.
- **Flood Management responsibility:** It is unclear which Risk Management Authority is responsible or whether the appropriate duties have been carried out.
- **Public Duty:** The weight of public interest justifies the need for investigation (to be decided internally after review)

### Maintain an Asset Register

Records of significant assets and associated information have been gathered via the Internal Flood Group and collated in spreadsheet format. These assets are being uploaded onto a London wide database system called FloodStation to map the data to help aid future maintenance and management decisions and sharing of information with neighbouring LLFAs and Risk Management Authorities.

### Undertake a Statutory Consultee Role for SuDS for New Developments

Schedule 3 of the Act includes a commitment to bring in further legislation to introduce sustainable drainage systems (SuDS) into new or redevelopments. In September 2014, an



alternative approach was proposed on the delivery of SuDS through the existing planning system which then underwent consultation<sup>55</sup>. The Department for Communities and Local Government issued a Written Statement in December 2014<sup>56</sup> outlining the Government's response and intentions going forward to implement new SuDS policy.

From 6 April 2015 Local Planning Authorities (LPAs), including Croydon Council, will be expected to ensure that local planning policies and decisions on planning applications relating to major development<sup>57</sup> include SuDS for the management of run-off, unless demonstrated to be inappropriate. Minor developments with drainage implications would continue to be subject to existing planning policy (Section 103 of the NPPF) and smaller developments in flood risk areas should still give priority to the use of SuDS.

The Statement sets out that the LPA should consult with the LLFA with regards to surface water management to ensure the SuDS will be operated to appropriate standards and arrangements are in place for their maintenance over the full lifetime of the development.

Further consultation has been carried out on the proposal to make LFFAs statutory consultees for planning applications with regards to surface water management. The result of this consultation is anticipated prior to 6<sup>th</sup> April 2015.

#### Powers to do Works and Designate Structures

The Flood and Water Management Act 2010 gives Croydon Council powers as an LLFA to designate a structure or feature where it is felt to be significant in influencing flood risk management. The owner may then not alter, remove or replace it without prior consent of the Council. Private owners will be consulted prior to any designation and have the right to appeal against initial designation.

#### Regulation of Ordinary Watercourses

Croydon Council has been given certain powers to enforce local flood risk management practices in its administrative area. This includes the powers of ordinary watercourse consent under the Land Drainage Act 1991<sup>58</sup>, which were transferred from the Environment Agency to LFFAs as of the 6<sup>th</sup> of April 2012. This means that any works (either temporary or permanent), that may alter or impact the flow or storage of water within an ordinary watercourse will require consent from the council prior to any work being carried out.

Croydon Council has set up a consenting process for works affecting an ordinary watercourse within the borough. Application forms and guidance can be downloaded from the [Council website](#)<sup>59</sup>

## 5.4 Delivery of Local Flood Risk Management Objectives

### Overview

Keeping people safe and protecting life is always the priority for flood management. Beyond this there are a number of measures that can be taken to manage the risk and impacts of flooding on local communities, businesses, infrastructure, heritage and the environment.

<sup>55</sup> Defra (September 2014) Delivering Sustainable Drainage Systems Consultation Document

<sup>56</sup> Department for Communities and Local Government (Dec 2014) House of Commons Written Statement (HCWS161) Sustainable Drainage Systems.

<sup>57</sup> The definition for Major and Minor developments are set out in the Town and Country Planning Order 2010

<http://www.legislation.gov.uk/uksi/2010/2184/contents/made>

<sup>58</sup> Land Drainage Act 1991: <http://www.legislation.gov.uk/ukpga/1991/59/contents>

<sup>59</sup> Ordinary watercourse consenting in Croydon <http://www.croydon.gov.uk/environment/flood-water/watercourse>

For each of the local flood risk management objectives, potential measures were identified for further consideration. These were informed by council staff and RMAs attending workshops throughout the strategy development and the outcomes from the online survey undertaken as part of the community engagement exercise described in Appendix C.

### Public Priorities for Future Flood Risk Management in Croydon

As part of the public engagement undertaken in developing this Strategy (Appendix C), residents, communities and businesses were asked to identify how they thought the local flood management priorities they identified could be achieved within Croydon. The following were preferred by respondents:

- Maintaining drainage / flood defence assets to reduce surface water flooding.
- Focussing on areas that have experienced flooding
- Working to ensure that new developments do not have an impact on flooding

### Identification of Local Flood Risk Measures

Table 5-1 outlines the measures identified to deliver the local flood risk management objectives for the London Borough of Croydon and the Flood risk management guiding principles that they achieve.

Table 5-1 London Borough of Croydon Local Flood Risk Management Objectives and Measures		
Objective	Measures to achieve the objective	Guiding Principles
<i>Continue to build our evidence base on flood mechanisms, incidents and assets and improve how it is communicated internally and externally.</i>	<ul style="list-style-type: none"> <li>• Improving in-house information management</li> <li>• Establish ways to keep the evidence base up to date and feeding into policy</li> <li>• Raise profile and understanding of groundwater as a flood risk</li> </ul>	<ul style="list-style-type: none"> <li>• Proportionate and risk based approach</li> </ul>
<i>Maximise use of resources in targeted flood management.</i>	<ul style="list-style-type: none"> <li>• Up skilling and training for existing staff on new areas of responsibility</li> <li>• Communication about targets and objectives between teams</li> <li>• Monitoring funding streams available for flood remediation measures</li> <li>• Use best current understanding and available funding to prioritise flood alleviation work</li> <li>• Review effectiveness of emergency procedures and ensure our capabilities are known throughout the council and our commissioned services</li> </ul>	<ul style="list-style-type: none"> <li>• Proportionate and risk based approach</li> <li>• Beneficiaries encouraged to invest</li> </ul>
<i>Ensure evidence of historic floods and ongoing studies effectively feed into planning policy and decision-making</i>	<ul style="list-style-type: none"> <li>• Maintain regular communication between highways and planning</li> <li>• Establish a borough-wide understanding of the future flood risk, including the likelihood of future flood events.</li> <li>• Establish the impact of planned growth on flooding hotspots/CDAs in collaboration with development plans</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainability</li> <li>• Multiple benefits</li> <li>• Catchment-based approach</li> </ul>
<i>Support sustainable growth and development by understanding the needs of all parties</i>	<ul style="list-style-type: none"> <li>• Prepare for carrying out SuDS approvals in-house</li> <li>• Create tools / guidance for developers to help them to easily consider the most appropriate types of drainage</li> <li>• Review how we consider flood risk to and from minor developments and ways to encourage more sustainable design.</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainability</li> <li>• Multiple benefits</li> </ul>

**Table 5-1 London Borough of Croydon Local Flood Risk Management Objectives and Measures**

<i>Work effectively with Risk Management Authorities in and around Croydon to jointly manage the risks</i>	<ul style="list-style-type: none"> <li>• Meet with Network Rail / Thames Water / TfL to discuss areas where their infrastructure falls in Croydon's flood hotspots</li> <li>• Work with multi-agency partners to enhance local arrangements for flood planning and response.</li> <li>• Continue to meet regularly and work with the other five South West London Boroughs</li> </ul>	<ul style="list-style-type: none"> <li>• Community focus and partnership working</li> <li>• Catchment based approach</li> </ul>
<i>Improve awareness of the causes of flooding with the general public and encourage proactive management</i>	<ul style="list-style-type: none"> <li>• Engaging with the public through various means of communication</li> <li>• Encourage residents to help themselves with small-scale initiatives</li> <li>• Targeting riparian owners and educating on responsibilities</li> <li>• Develop our capability to warn and to provide information and advice to the public with partner organisations</li> </ul>	<ul style="list-style-type: none"> <li>• Community focus and partnership working</li> <li>• Beneficiaries encouraged to invest</li> </ul>
<i>Take a more holistic view of asset management in Croydon, improving priorities and addressing source control more effectively.</i>	<ul style="list-style-type: none"> <li>• Seek to achieve multiple benefits in water management schemes</li> <li>• Seek out opportunities for de-culverting</li> </ul>	<ul style="list-style-type: none"> <li>• Proportionate and risk based approach</li> <li>• Multiple Benefits</li> </ul>
<i>Maximise opportunities to learn, improve and review flood management procedures based on lessons learnt</i>	<ul style="list-style-type: none"> <li>• Clarify flood recovery process</li> <li>• Establish Lessons Learnt review procedure</li> </ul>	<ul style="list-style-type: none"> <li>• Multiple benefits</li> <li>• Community</li> </ul>

In the short term, local flood risk management will focus on communication and education and building flooding evidence and understanding. As the flooding evidence and understanding increases, projects and schemes will be identified, developed and progressed, where funding allows, to address local flood risk in those areas at greatest risk.

Croydon Council has already successfully secured first stage funding to address some of the borough's flooding hotspots including;

- Flood and Coastal Erosion Risk Management Grant in Aid (FCERM GiA) funding<sup>60</sup> for approximately £1m over 5 years to model, design and implement flood alleviation measures for the Caterham Bourne. The total figure is subject to change pending outcomes of the first stage (modelling and options appraisal) of the project and funding availability.
- FCERM GiA funding for up to £327,000 over 4 years to model and implement surface water alleviation for localised flooding in Kenley. The total figure is subject to change pending outcomes of the first stage (modelling and options appraisal) of the project and funding availability.
- Drain London funding<sup>61</sup> of approximately £23,000 towards modelling and options assessment to alleviate surface water flooding along the A23 / Brighton Road area.

<sup>60</sup> Allocation of government funding for which LLFAs can apply annually from the Environment Agency towards the cost of building new flood and coastal re-erosion defences

<sup>61</sup> The Drain London Project was commenced in 2010 by the Greater London Authority to bring together all London boroughs and risk management authorities to help manage and reduce surface water flood risk, through development of

The council has also committed some internal funding to ensure the progression of these projects. Further information on the funding sources, and details relating to the specific projects mentioned above, are included in Section 5.6.

Future schemes and mitigation for the different sources of flooding are likely to include those outlined in Table 5-2, though this list is not comprehensive.

Table 5-2 Example Measures for Managing Local Flood Risk	
Source of Flooding	Example Measures
Surface Water	<ul style="list-style-type: none"> <li>• Communication and Education</li> <li>• Property Level Protection &amp; Resilience Measures – Guidance on <a href="#">Property Level Flood Resilience for Property Owners</a><sup>62</sup> is available, and further information is provided through independent organisations including the <a href="#">National Flood Forum</a> and the <a href="#">Environment Agency</a>.</li> <li>• Planning control and policies, e.g. controlling paving of front gardens</li> <li>• Individual actions, e.g. depaving of front gardens</li> <li>• Defined schemes or projects for specific areas of highest flood risk, which could include Sustainable Drainage Systems (particularly with new developments). SuDS aim to manage the risk of flooding at source and can range from small to large scale measures and can deliver a number of additional benefits such as improving water quality. Examples include, green roofs, soakaways, swales, permeable paving, rainwater harvesting and detention basins.</li> </ul>
Groundwater	<p>Groundwater is particularly difficult to mitigate and manage. Engineering solutions to mitigate groundwater flooding are limited because of the large volumes of water and spatial areas involved, and because it is not contained or channelled.</p> <p>Potential measures could include:</p> <ul style="list-style-type: none"> <li>• Controlling groundwater levels in the subsurface through pumping.</li> <li>• Controlling groundwater levels at the surface by channelling and diverting the flow of water at the surface away from sensitive downstream receptors and dealing with pinch point where water is forced through a narrow corridor, such as an existing culvert, to avoid water backing up.</li> <li>• Dealing with the consequences of groundwater flooding through: <ul style="list-style-type: none"> <li>• Strategic level actions, such as establishing a Community Flood Action Group of household level protection, or,</li> <li>• Site specific (property owner) actions, such as sealing floors, lower parts of walls and opening and installing sump and pump systems.</li> </ul> </li> </ul> <p>Guidance on how <a href="#">property owners can help themselves to reduce the impact of flooding from groundwater</a><sup>63</sup> is available via the Environment Agency website.</p>
Ordinary Watercourses	<p>Poor maintenance of ordinary watercourses has the potential to increase the risk of flooding in the future. Due to an expected lack of funding for maintenance of ordinary watercourses in the future, prioritisation of ordinary watercourses within</p>

*Surface Water Management Plans and Preliminary Flood Risk Assessments for each borough and delivery of further investigations for areas at greatest risk across London. Further information is available through the GLA website: <http://www.london.gov.uk/priorities/environment/looking-after-londons-water/drain-london>*

<sup>62</sup> White, I., O'Hare, P., Lawson, N., Garvin, S., and Connelly, A (2013) Six Steps to Property Level Flood Resilience – Guidance for Property Owners. Manchester, UK. [http://www.bre.co.uk/filelibrary/pdf/projects/flooding/Property\\_owners\\_booklet\\_v2\\_web\\_\(2\).pdf](http://www.bre.co.uk/filelibrary/pdf/projects/flooding/Property_owners_booklet_v2_web_(2).pdf)

<sup>63</sup> Environment Agency (2011) Flooding from groundwater: Practical advice to help you reduce the impact of flooding from groundwater [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/297421/flho0911bugi-e-e.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297421/flho0911bugi-e-e.pdf)

**Table 5-2 Example Measures for Managing Local Flood Risk**

	<p>the borough, along with gullies and other flood risk assets will be central to maximising the positive impact of flood risk management activities carried out by Croydon Council. As such, appropriate measures might be:</p> <ul style="list-style-type: none"> <li>• Work with landowners and riparian owners to ensure they are aware of their rights and responsibilities and fulfil those.</li> <li>• Management and maintenance of watercourses, e.g. keeping watercourses clear of debris and vegetation to ensure that the flow of water is not impeded.</li> <li>• Ensuring culverts and trash screens are not blocked through regular inspection, particularly when heavy rainfall is expected.</li> <li>• Undertaking works to: <ul style="list-style-type: none"> <li>• increase the size of culverts,</li> <li>• develop additional storage for flood water, and</li> <li>• deculvert watercourses, where feasible to do so.</li> </ul> </li> </ul>
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### Planning for Climate Change

Croydon Council will seek to use the best available information and evidence on climate change to inform ongoing local flood risk management.

In taking forward local flood risk management measures Croydon Council will:

- Seek to understand how climate change might impact flood risk to communities and businesses,
- Assess how climate change impacts on flood risk may affect the London Borough of Croydon objectives for managing flooding over the longer term,
- Explore what options could be used to manage those impacts of climate change on flood risk, and
- Educate communities and businesses on the causes and potential impacts of climate change and how they can reduce these by taking action now.

## 5.5 Prioritising Local Flood Risk Management Measures

It is not possible to prevent all flooding, and with limited resources and funding flood risk management work will need to be prioritised. Each measure in this strategy has been split into a number of actions (as outlined in the Action Plan in Appendix B) and these have been prioritised as High, Medium or Low based on current understanding of local flood risk and resources and funding available to address this across the borough. The majority of actions are based on:

- improving communication and education of residents and property owners to enable them to help themselves, and
- putting procedures in place within the council to improve understanding and future management of local flood risk across the borough.

As understanding of flood risk improves specific mitigation schemes and activities will be developed to address flood risk in those areas at greatest risk. This will require a clear protocol in terms of identifying which actions or schemes should be taken forward given the

limited local and national funding streams. In these cases the following will be important considerations:

- **Risk** – the risk of doing nothing in terms of economic, social and environmental terms,
- **Consequence** – how many people or properties the measure or scheme could impact, e.g. an individual property, ward or the borough as a whole, and
- **Deliverability** – including costs and technical deliverability, e.g. providing information on flood resilience measures via the council website would be cheaper and technically easier to implement than designing and implementing a large flood alleviation scheme.

Moving forward, to ensure funding and resources are targeted to those areas and actions of highest importance we will prioritise our activities based on the following, where:

- There is a historic and ongoing flood risk from local flooding sources (surface water, groundwater and smaller watercourses and ditches),
- Funding is available,
- There is an identified benefit to properties, communities, businesses and / or infrastructure,
- Funding is made available by partners, where perhaps traditional funding sources are not available or cannot fully fund the cost of the measure,
- The measure delivers benefit and mitigation to areas identified as being at risk through London Borough of Croydon's Local Flood Risk Management Strategy, Surface Water Management Plan, Strategic Flood Risk Assessment or Preliminary Flood Risk Assessment, and
- Schemes deliver multiple benefits, including wider environmental benefits.

The prioritisation of schemes and actions will be reviewed annually based on available funding, resources and local priorities, and published on the Croydon Council website.

#### Quick Wins

Following the outcomes of the public engagement exercise, the following actions have been prioritised for delivery in the first 2 years of the Strategy:

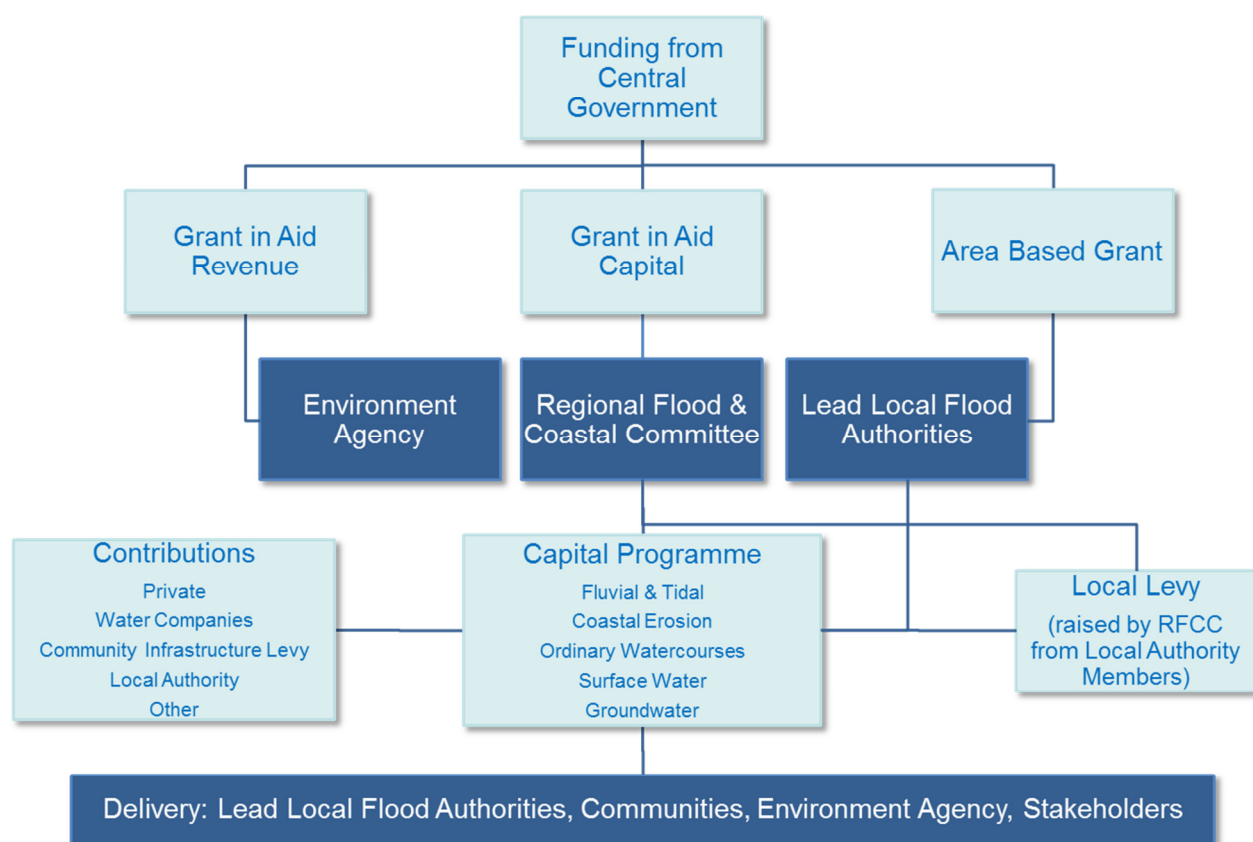
- **Improve in-house information management.** By improving how information is collected by telephone in the call centre, as well as from email and the council website, and disseminated to council officers,
- **Raise profile and understanding of groundwater as a flood risk** through improving groundwater information on the council website,
- **Focus on flooding hotspots and Critical Drainage Areas in collaboration with development plans by establishing the impact of planned growth** through creating a 'living list' of high priority CDAs and smaller hotspots,
- **Meet with Network Rail, Thames Water & TfL to discuss areas where their infrastructure falls in Croydon's flood hotspots** and collate evidence of problem areas relating to other RMA's infrastructure, and



- **Encourage residents to help themselves and improve resilience to their properties** by providing information on available funding sources for measures and providing links to independent organisations who can provide guidance and advice

## 5.6 Funding for Local Flood Risk Management

Local flood risk management measures will require funding from a variety of sources, both internal and external to the Council. The primary funding sources to date have been through central government funding, however, there are significant pressures on these funding sources in the current economic climate, and in the future there will be greater emphasis on LLFAs to fund activities and schemes from their own or alternative local sources of funding. There are a number of routes through which central government funding may contribute towards flood risk management activities, as detailed in Figure 5-1 and summarised below.



**Figure 5-1 Summary of Lead Local Flood Authority Potential Funding Streams**

### Funding for Lead Local Flood Authorities Responsibilities

The Government has committed funding annually to support LLFAs in their 'new' flood management roles up to March 2016. The funding is provided through 'Area Based Grants', which have been allocated by the Department for Environment and Rural Affairs (Defra) based on the individual flood risk each local authority faces. Beyond this period funding commitments are unclear and there are likely to be pressures on further funding given the significant challenges local government faces within the current spending review. Details of the allocations since implementation of the Act are included in Table 5-3. The funding is not ring-fenced and 2015/16 will see a reduction of this funding source.

**Table 5-3 Defra funding allocation for LLFA duties to Croydon Council**

Financial Year	Approximate Grant Allocation
2011/12	£142,000
2012/13	£250,000
2013/14	£250,000
2014/15	£250,000
2015/16	£215,000

#### *Funding for Lead Local Flood Authorities SuDS Approving Body Preparation*

Defra made additional funding available, for 2014-2015. This was initially provided to assist LLFAs in setting up and preparing for their role as a SuDS Approving Body (SAB) under Schedule 3 of the Flood & Water Management Act 2010. The funding was intended to assist LLFAs to put the required systems, procedures and resources in place to fulfil their duties as a SAB, when they were enacted. It is now being utilised to prepare for new SuDS implementation through the planning system. The funding is a one-off payment. It is not presently confirmed whether additional funding will be available from central government for the additional duty for planning authorities or statutory consultee function of Croydon Council as an LLFA.

#### *Funding for Flood Risk Management Studies and Schemes (Projects)*

In the main, flood risk management projects are funded by a combination of the following funding streams:

- National funding – Flood and Coastal Erosion Risk Management Grant in Aid (FCRM GiA),
- Regional funding – Local Levy, and
- Local / other funding contributions.

It should be noted that the mechanism for attracting the national (FCRM GiA) and regional (Local Levy) funding gives priority to the protection of residential properties.

#### *Flood and Coastal Erosion Risk Management Grant in Aid (FCRM GiA)*

Flood and Coastal Risk Management Grant in Aid (FCRM GiA) is the capital budget set aside by central government for flood defence projects across England. Following consultation during 2011, Defra introduced a new approach to the funding of flood risk management capital projects. This approach was termed the 'Flood and Coastal Resilience Partnership Funding' approach. The key benefits of the new approach are:

- Communities, through their Regional Flood and Coastal Committees (RFCCs), can take decisions on which projects should progress, based on local willingness to contribute towards the benefits that would be delivered,
- The programme of capital works will be prioritised based on the damage being prevented by the project, and
- A higher proportion of capital projects can be eligible for some government funding, subject to resources being available.

### **Caterham Bourne Flood Alleviation Scheme**

In April 2014, the Thames RFCC approved the first stage of a funding application (through FCRM GiA) for a catchment wide investigation and flood alleviation scheme for the Caterham Bourne. The application was led by Croydon Council in partnership with Surrey County Council and Tandridge District Council for a total sum of approximately £1m over 5 years. This figure will be subject to change pending the outcomes of the first stage of work and funding availability.



*Flooding from the Caterham Bourne in Warlingham, Surrey, February 2014*

During 2014, a consultant was procured to carry out the first stage catchment modelling and feasibility which will investigate surface water and groundwater mechanisms in the catchment.

The catchment study will inform the most appropriate forms of flood management in both Tandridge and Croydon for maximum benefit to local residents.

### **Kenley Flood Alleviation Scheme**

In April 2013, approval was granted for an FCRM GiA application for the first stage of funding of up to £327,000 to address long-standing localised surface water flooding problems in the Welcomes Road / Kenley Lane area of Kenley. The first stage funding allocation commenced in the 2014-15 financial year and total funding will be subject to change pending the outcome of initial modelling and options appraisal. A consultant has been procured to carry out the first stage of refined modelling of the area alongside stakeholder engagement with local residents to develop an evidence base for detailed design of flood alleviation options in the area. This stage of the project is programmed for completion by December 2015.

### *Local Levy*

This funding is raised by way of a levy on local authorities within the boundary of each RFCC. The Local Levy is used to support, with the approval of the committee, flood risk management projects that are not considered to be national priorities and hence do not attract full national funding through the FCRM GiA. As both the Caterham Bourne and Kenley FCRM GiA projects have surpassed the 100% partnership funding score due to the high number of properties at risk in Croydon, no Local Levy funding has been allocated to these projects to date.

The Local Levy allows locally important projects to go ahead to reduce the risk of flooding within each committee's area. In addition to prioritising where Local Levy is to be spent, each RFCC annually sets the level of local levy funding that each local authority will contribute in the following year.

### *Other Sources of Funding*

In order to maximise the benefits of the new approach to funding of flood risk management capital projects, LLFAs should work closely with partnering organisations and other bodies to attract alternative sources of funding. It is important to note that the likelihood of securing FCRM GiA of Local Levy can significantly increase when other sources of funding are secured.

In taking forward flood risk management activities Croydon Council will need to consider securing funding from alternative sources, including Central Government, other RMAs and stakeholders and private beneficiaries. Working to maximise multi-beneficial outcomes of new schemes or activities could open up more avenues of internal revenue than purely flood risk management, particularly where measures address existing core activities for the Council. There are also opportunities for European grants or environmental grants for schemes delivering multiple benefits.

Table 5-3 highlights possible sources of funding that could contribute to the delivery of flood risk management projects or schemes.

<b>Table 5-3 Possible sources of alternative funding for local flood risk management</b>	
<b>Funding Source</b>	<b>Description</b>
Private Contributions	Voluntary contributions from private organisations / individuals who benefit from flood risk management projects. This could include local businesses & landlords.
Water Company Investment	Water companies are able to contribute to some types flood risk management projects where it can be demonstrated that joint benefits can be obtained and/or there is increased resilience for their assets.
Community Infrastructure Levy (CIL) <sup>64</sup>	A locally set general charge which local planning authorities can choose to implement. Levied on developers, per square metre of certain types of development across an authority's area. Local communities set their own priorities on how the majority of this funding is allocated.
Developer Contributions through Section 106 Agreements	Planning obligations or 'Section 106 Agreements' are a well-established mechanism for securing funding for agreed issues arising from a development proposal.
Other	There are a multitude of alternative funding sources available depending on the type of activity or scheme being proposed. For example, this could include delivery of Water Framework Directive (WFD) objectives, and will be dependent on the activity or scheme seeking funding.

It is clear from the above that funding to deliver capital projects will need to be sought from a variety of sources as government funding will be limited each year and is likely, in many cases, to be a contribution towards project costs rather than full funding. Any projects are therefore likely to be developed through partnership working, with partners and organisation with relevant flood risk responsibilities or assets relating to the project engaged in the production of the scheme. Partnership working may also provide opportunities for reduction in costs through shared benefits.

<sup>64</sup> Inside Government Website, Community Infrastructure Levy <https://www.gov.uk/government/policies/giving-communities-more-power-in-planning-local-development/supporting-pages/community-infrastructure-levy>

Timeframes for accessing funding sources will strongly influence decisions to implement particular measures as well as the viability of certain options. Particular types of funding will also require engagement of additional partners to maximise the likelihood of accessing them.

Further information on the different funding sources is available in the Defra guidance document '[Partnership Funding and Collaborative delivery of local flood risk management](#)'<sup>65</sup>.

#### Maintenance Activities

In the current financial climate, there are significant pressures on Council budget and funding for maintenance activities. Using the Strategy Action Plan, historic flood evidence and communication with residents, Croydon Council will look to prioritise maintenance for those assets which have the greatest effect on local flood risk and in those areas most at risk to maximise effectiveness of limited funding. At the same time, Croydon Council will seek to maximise income from external sources, including asset owners and riparian owners, for flood risk management.

### **5.7 London Borough of Croydon Action Plan**

**5.7.1** An Action Plan has been developed that details the measures and actions that will be taken to deliver the Local Objectives. For each measure a number of actions have been identified and for each of these the proposed funding route, timescale for implementation, and delivery lead and partners have been identified. The Action Plan will be the key mechanism through which progress in meeting the Local Objectives will be monitored.

The London Borough of Croydon Action Plan is included in Appendix B.

The actions outlined in the Action Plan are indicative and will be reviewed annually based on available funding, resources and local priorities.

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<sup>65</sup> Halcrow Group Ltd for Defra (2012) Partnership funding and collaborative delivery of local flood risk management.  
[http://randd.defra.gov.uk/Document.aspx?Document=9958\\_FD2643\\_Partnershipfundingguide.pdf](http://randd.defra.gov.uk/Document.aspx?Document=9958_FD2643_Partnershipfundingguide.pdf)

## 6. DELIVERY OF WIDER ENVIRONMENTAL OBJECTIVES

### 6.1 Overview

The Act states that the Strategy must specify how it contributes to the achievement of wider environmental objectives. In order to address this requirement a Strategic Environmental Assessment (SEA) of the Strategy has been undertaken in accordance with the European Union adopted [Directive 2001/42/EC](#)<sup>66</sup> on the assessment of the effects of certain plans and programmes on the environment (the 'SEA Directive'). Alongside this a Habitats Regulations Assessment<sup>67</sup> (HRA) Screening has been undertaken to assess the impacts of implementing the Strategy policies and measures on European Designated Sites within 10km of London Borough of Croydon.

Both the HRA and the SEA were developed alongside this Strategy and have been used to inform sustainable decision making throughout

### 6.2 Strategic Environmental Assessment (SEA)

#### Overview

SEA involves the systematic identification and evaluation of potential environmental impacts of specified plans and programmes before deciding which are adopted. Consideration should be made with regards to both the positive and negative impacts of options on wildlife and habitats, populations and health, soil, water, air, climate factors, landscape, cultural heritage and the inter-relationships between these receptors.

The first stage of the SEA was to produce a combined Scoping Report for all six South West London Local Flood Risk Management Strategies<sup>68</sup> to set out the framework for undertaking a SEA for the Strategies and the scope of the assessment. The next step was to produce the SEA Environmental Report<sup>69</sup> for the London Borough of Croydon, which identifies the likely significant effects of the implementation of the Strategy on relevant environmental receptors. It also identifies how the Strategy can contribute to the achievement of wider environmental objectives, including Water Framework Directive (WFD) objectives.

Figure 7 and Figure 8 in Appendix A show the critical infrastructure and the environment and heritage sites, respectively, in the London Borough of Croydon and their potential interaction with local sources of flooding (surface water).

#### SEA Outcomes

The key findings of the SEA process are set out in the Environmental Report for the Strategy. This broadly outlines how the objectives and the identified measures might be expected to affect a number of different aspects of the environment (referred to as 'receptors'). The SEA demonstrates that the London Borough of Croydon's Strategy is predicted to have positive impacts on the environment in the short term and in the long term (i.e. beyond the life of the Strategy), since the Strategy takes a proactive approach to reducing and managing local flood risk within the London Borough of Croydon. Each of the Strategy objectives successfully supports the range of environmental objectives identified within the SEA framework, achieving a positive outcome for each SEA objective.

<sup>66</sup> European Union (2001) Strategic Environmental Assessment Directive  
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32001L0042:en:NOT>

<sup>67</sup> Capita URS for the London Borough of Croydon (2014) South West London Local Flood Risk Management Strategy – HRA for the London Borough of Croydon

<sup>68</sup> Capita URS for the South West London Flood Group (2014) South West London Local Flood Risk Management Strategy SEA - Scoping Report

<sup>69</sup> Capita URS for the London Borough of Croydon (2014) South West London Local Flood Risk Management Strategy SEA - Environmental Report for the London Borough of Croydon



The majority of Strategy objectives are likely to have indirect beneficial effects on the environment as they relate to improving knowledge and understanding, and promote high level management of local flood risk rather than actual works or actions that could have an effect on the ground.

Overall, the combined Strategy objectives and measures are considered to be beneficial for the environment, due to the likely outcomes of improved local flood risk management and subsequently reduced local flood risk to the natural and built environment within the London Borough of Croydon.

### 6.3 Habitats Regulations Assessment (HRA)

A Habitats Regulations Assessment (HRA) screening assessment (as required by Article 6 of the [EC Habitats Directive 1992 \(92/44/EEC\)](#)<sup>70</sup>, and Regulation 48 of the [Conservation \(Natural Habitats &c\) Regulations 1994](#)<sup>71</sup>) was undertaken as part of the Strategy development. This screening exercise assessed the impacts of implementing the Strategy objectives and measures on European Designated Sites (Special Areas of Conservation, Special Protection Areas and Ramsar sites) within 10km of Croydon. Where the HRA determines that the Strategy would give rise to significant environment effects on a European site designated for its biodiversity value a full HRA will be required.

Figure 8 in Appendix A shows the potential interaction of local sources of flooding (surface water) with the environment in the London Borough of Croydon.

#### HRA Outcomes

The key findings of the HRA Screening assessment are set out in the Habitats Regulations Assessment for the Strategy. It concluded that the Strategy for the London Borough of Croydon has been screened out as having no likely effects on any European sites due to a lack of pathways linking them to local flood risk management in the borough and therefore no further HRA is required.

### 6.4 Water Framework Directive (WFD)

The Strategy will complement work that is currently underway to comply with the requirements of the European [Water Framework Directive \(WFD\) \(2000/60/EC\)](#)<sup>72</sup>. Although a formal WFD assessment (WFDa) is not a statutory requirement of the Strategy, WFD requirements have been considered as part of the SEA process, including where opportunities to improve WFD status exist.

The Environment Agency is responsible for preparing management plans for river basin districts in England and Wales. The plans outline the characteristics of the river basin district, identify the pressures that the local water environment faces, and specify the actions that will be taken to address any problems before 2015.

For the Thames River Basin District, the density of the population together with relatively low rainfall means that the water environment is stressed, with less water per person than many Mediterranean regions. This leads to over-extraction, and the high risk of pollution. Many of the rivers within the Thames river basin have been heavily modified as a consequence of development, flood risk management and for navigation. As a result only 23% of the assessed water bodies covered by the Thames River Basin Management Plan are regarded having an

<sup>70</sup> European Union (1994), The Habitats Directive, [http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index\\_en.htm](http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm)

<sup>71</sup> HMSO (1994), The Conservation (Natural Habitats &c) Regulations 1994, <http://www.legislation.gov.uk/ukxi/1994/2716/contents/made>

<sup>72</sup> European Union (2000) Water Framework Directive 2000/60/EC, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0060:EN:NOT>

ecological status of at least “good”. There are no water bodies in the Thames river basin that were considered to exhibit “high” ecological status.

Flood risk management activities are expected to have a significant impact on the ability of the UK to comply with the requirements of the WFD, as flood protection can involve substantial alteration to the natural properties of a river. The Thames River Basin Management Plan encourages the use of sustainable drainage systems as a means of reducing the physical impact of flood risk management works on the ecological status or potential of water bodies.

### Outcomes

Within Croydon, the River Wandle has been assessed to have poor ecological status under the WFD<sup>73</sup>. The waterbody is defined as being ‘Heavily Modified’ and must reach good ecological status by 2027.

The Strategy seeks to alleviate local flood risk by encouraging best practice for the maintenance of flood prevention and drainage assets, however this practice may sometimes have adverse effects on biodiversity, for example clearance of vegetation may lead to habitat loss along river corridors and deterioration in water quality. There may be opportunities for multi beneficial schemes which have positive effects on water quality and subsequently biodiversity from small-scale measures such as implementation of SuDS or changes in drainage. There may also be cumulative benefits to biodiversity and water quality through strategic management of local flood risk, as enabling natural flood patterns to continue or extend in some areas can improve wetland habitats.

Other plans and strategies provide mitigation to avoid impacts on designated sites, protected species and habitats as part of flood prevention measures. However, cumulative impacts may arise where a number of measures combine to alter hydrological systems or land use. For instance, many small changes to water levels may result in overall gains or losses in freshwater habitats or there may be cumulative effects on a particular species or type of habitat.

New requirements for major developments to demonstrate prioritisation of SuDS as part of their planning applications and the potential for Croydon Council as an LLFA to become statutory consultee on drainage elements of applications will play an important role in contributing to the delivery of the Thames River Basin Management Plan and WFD objectives. Increased communications with riparian owners and improved mapping of Croydon’s drainage ditches will also contribute to the WFD by improving management of local watercourses that drain into larger river systems.

In assessing this Strategy for WFD compliance, the measures proposed are unlikely to have environmental effects and will not cause deterioration to water bodies. However, as projects and schemes are developed these may require site specific environmental assessment to identify any potential environmental effects (positive and negative).

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<sup>73</sup> Environment Agency (2009) Thames River Basin District River Basin Management Plan

## **7. STRATEGY MONITORING & REVIEW**

### **7.1 Overview**

The Act requires the LLFA to specify how and when the Strategy will be reviewed, and, where considered appropriate, to update their identified objectives and measures for flood risk management on a regular basis.

### **7.2 Annual Monitoring**

Croydon Council propose to monitor progress against the Strategy Action Plan annually. This will involve assessing which actions have been delivered, and determining whether there has been any change to the prioritisation of actions. Findings from this monitoring process will be presented to the Croydon Flood Group and the South West London Flood Group.

Progress against the Strategy Action Plan will be reported to Elected Members through an Annual Monitoring Report submitted to the Scrutiny and Strategic Overview Committee.

### **7.3 Review**

The Strategy has been developed to deliver a short to medium (6-year) improvement plan to establish a sound evidence and knowledge base upon which to develop a longer-term investment plan for local flood risk management activities in Croydon.

It is proposed that a review of the Strategy should be scheduled for 2020, and thereafter every six years (as a minimum) to coincide with the requirement under the Flood Risk Regulations 2009 to revise the Flood Risk Management Plan.

However, the Strategy should be viewed as a dynamic strategy and may require review more regularly to recognise specific changes. Potential triggers for a review of the Strategy may include:

- Occurrence of a significant and widespread surface water flood event,
- Significant changes to datasets or information which may alter the understanding of risk within the study area,
- Significant amendments to the legal responsibilities and/or roles and functions of Risk Management Authorities and/or other organisations,
- Annual Monitoring identifies that the Strategy is not achieving its objectives, or,
- Change in funding availability which has a significant effect on the Strategy Action Plan.

## GLOSSARY & ABBREVIATIONS

Term	Definition
Annual Exceedance Probability (AEP)	Chance of occurrence in any one year, expressed as a percentage. For example, a 1% annual probability event has a 1 in 100 chance of occurring in any given year.
Aquifer	A source of groundwater comprising water bearing rock, sand or gravel capable of yielding significant quantities of water.
Attenuation	In the context of this strategy – the storing of water to reduce peak discharge of water.
Catchment Flood Management Plan	A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
Category 1 Responders	As defined under Schedule 1 of the Civil Contingencies Act, Category 1 responders are “core responders” in the event of an emergency and include emergency services, local authorities, health bodies and Government agencies including the Environment Agency.
Civil Contingencies Act 2004	Aims to deliver a single framework for civil protection in the UK and sets out the actions that need to be taken in the event of a flood. The Civil Contingencies Act is separated into two substantive parts: local arrangements for civil protection (Part 1) and emergency powers (Part 2).
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions.
Critical Drainage Area	A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding during severe weather thereby affecting people, property or local infrastructure.
Culvert / culverted	A channel or pipe that carries water below the level of the ground.
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years.
Flood Zone 1	Low Probability of Flooding. In accordance with the NPPF, land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year.
Flood Zone 2	Medium Probability of Flooding. In accordance with the NPPF, land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1-0.1%), or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5-0.1%) in any year.
Flood Zone 3a	High Probability of Flooding. In accordance with the NPPF, land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of sea flooding (>0.5%) in any year.
Flood Zone 3b	Functional Floodplain. In accordance with the NPPF, land where water has to flow or be stored in times of flood.
Environment Agency	Environment regulator for England and Wales. Risk Management Authority responsible for management of flood risk from fluvial (main rivers), tidal and coastal sources of flooding and Reservoirs.
Flood Defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Floodplain	Area adjacent to river, coast or estuary that is naturally susceptible to flooding.

Term	Definition
Flood Resilience	Resistance strategies aimed at flood protection.
Flood Risk	The level of flood risk is the product of the frequency or likelihood of the flood events and their consequences (such as loss, damage, harm, distress and disruption).
Flood Risk Assessment	Considerations of the flood risks inherent in a project, leading to the development actions to control, mitigate or accept them.
Flood Storage	A temporary area that stores excess runoff or river flow often ponds or reservoirs.
Flood Resilience	Resistance strategies aimed at flood protection.
Flood Zone	The extent of how far flood waters are expected to reach.
Fluvial	Relating to the actions, processes and behaviour of a watercourse (river or stream).
Fluvial flooding	Flooding by a river or a watercourse.
Functional Floodplain	Land where water has to flow or be stored in times of flood.
Greenfield	Previously undeveloped land.
Groundwater	Water that is in the ground, this is usually referring to water in the saturated zone below the water table.
Highways Act 1980	Sets out the main duties (management and operation of the road network) of highways authorities in England and Wales. The Act contains powers to carry out functions / tasks on or within the highways such as improvements, drainage, acquiring land etc.
Hydraulic Modelling	A computerised model of a watercourse and floodplain to simulate water flows in rivers too estimate water levels and flood extents.
Infiltration	The penetration of water through the grounds surface.
Infrastructure	Physical structures that form the foundation for development.
Land Drainage Act 1991	Sets out the statutory roles and responsibilities of key organisations such as Internal Drainage Boards, local authorities, the Environment Agency and Riparian owners with jurisdiction over watercourses and land drainage infrastructure. Parts of the Act have been amended by the Flood and Water Management Act 2010.
Local Flood Risk	Defined in the Flood and Water Management Act as flooding from surface runoff, ordinary watercourses and groundwater.
Lead Local Flood Authority (LLFA)	The statutory body defined under the Flood and Water Management Act responsible for the management of local flood risk, namely surface water runoff, groundwater and ordinary watercourses.
Local Planning Authority	Body that is responsible for controlling planning and development through the planning system.
Main River	Watercourse defined on a 'Main River Map' designated by DEFRA. The environment Agency has permissive powers to carry out flood defence works, maintenance and operational activities for Main Rivers only.
Mitigation Measure	An element of development design which may be used to manage flood risk or avoid an increase in flood risk elsewhere.

Term	Definition
Multi-Agency Flood Plan (MAFP)	Plan outlining how responding parties under the Civil Contingencies Act and key voluntary response organisations will work together on an agreed coordinated response to severe flooding in London Borough of Croydon.
National Strategy	National Flood and Coastal Erosion Risk Management (FCERM) Strategy for England, developed by the Environment Agency.
National Planning Policy Framework (NPPF)	National Planning Policy Framework (NPPF) for England, published by the Development for Communities and Local Government. This sets the government's planning policies for England and how these are expected to be applied.
Ordinary Watercourse	A watercourse that does not form part of a Main River. This includes "all rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows" according to the Land Drainage Act 1991.
Overland Flow	Flooding caused when intense rainfall exceeds the capacity of the drainage systems or when, during prolonged periods of wet weather, the soil is so saturated such that it cannot accept any more water.
Ramsar Site	Wetlands of international importance designated under the Ramsar Convention.
Residual Flood Risk	The remaining flood risk after risk reduction measures have been taken into account.
Return Period	The average time period between rainfall or flood events with the same intensity and effect.
Riparian Owner	Anyone who owns land or property alongside a river or other watercourse. Responsibilities include maintaining river beds/banks and allowing flow of water to pass without obstruction.
Risk	The probability or likelihood of an event occurring.
River Catchment	The areas drained by a river.
Sewer Flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
Standard of Protection	The flood event return period above which significant damage and possible failure of the flood defences could occur.
Sustainability	To preserve /maintain a state or process for future generations.
Sustainable Drainage System (SuDS)	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations meeting their own needs.
Swale	A grass-lined channel designed to control the flow rate and quality of water as it drains from a site.
Tidal	Relating to the actions or processes caused by tides.
Tributary	A body of water, flowing into a larger body of water, such as a smaller stream joining a larger stream.
1 in 30 year event	Event that has a 1 in 30 probability of occurring in any given year. Also expressed as an event, which has a 3.33% Annual Exceedance Probability.
1 in 100 year event	Event that has a 1 in 100 probability of occurring in any given year. Also expressed as an event, which has a 1% Annual Exceedance Probability.



## **APPENDIX A – FLOOD RISK MAPS**

**Figure 1** Historic Flooding

**Figure 2** Flood Risk from Surface Water

**Figure 3** Flood Risk from Groundwater

**Figure 4** Flood Risk from Rivers

**Figure 5** Main Rivers & Ordinary Watercourses

**Figure 6** Surface Water Critical Drainage Areas

**Figure 7** Flood Risk from Surface Water: Critical Services & Transport

**Figure 8** Flood Risk from Surface Water: Environment & Heritage

## **APPENDIX B – ACTION PLAN**

## **APPENDIX C – SUMMARY OF COMMUNITY ENGAGEMENT**

### **Purpose, Methodology and Response**

#### *Purpose*

Croydon Council wished to engage with the local community at an early stage in developing their Local Flood Risk Management Strategy to gather information on local flooding incidents, flood preparedness, perceptions of flooding and local priorities for local flood risk management. The information collated through this exercise has been used to provide an evidence base to inform the Local Flood Risk Management Strategy.

#### *Engagement Approach*

A survey was developed to gather views and evidence, which was available online between 6<sup>th</sup> January 2014 and 31<sup>st</sup> March 2014. It should be noted that this coincided with a range of flooding incidents within Croydon and across the country and a high level of public interest in flooding issues.

Questions included in the survey covered 5 broad areas:

- Current understanding of flooding in Croydon,
- Previous experiences of flooding,
- Communication of flood risk information,
- Priorities for flood risk management, and
- Funding for flood risk management.

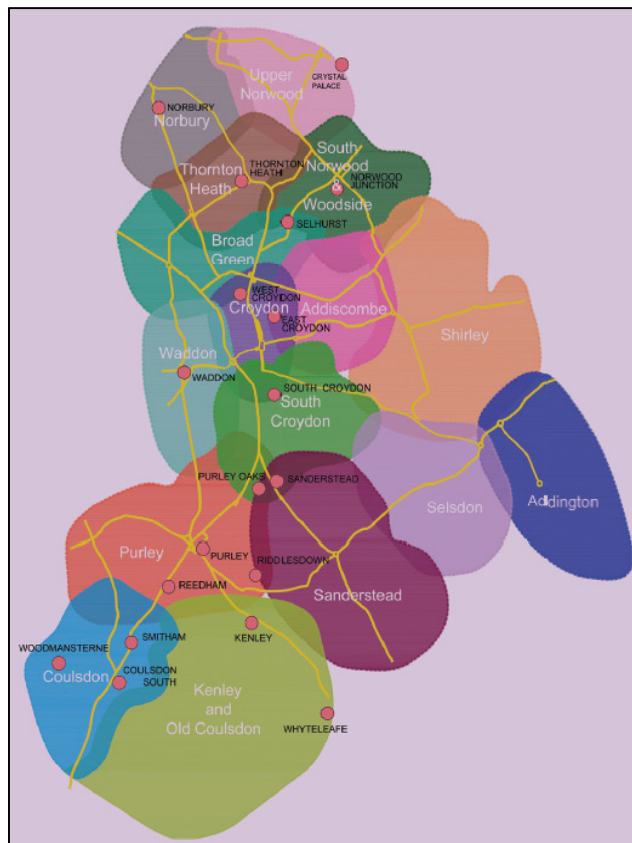
To promote the survey, Croydon Council undertook the following engagement activities:

- Link emailed to resident associations,
- Twitter announcement,
- Dedicated page created on the council website,
- Banner ads on the council website, and
- Email sent to elected members.

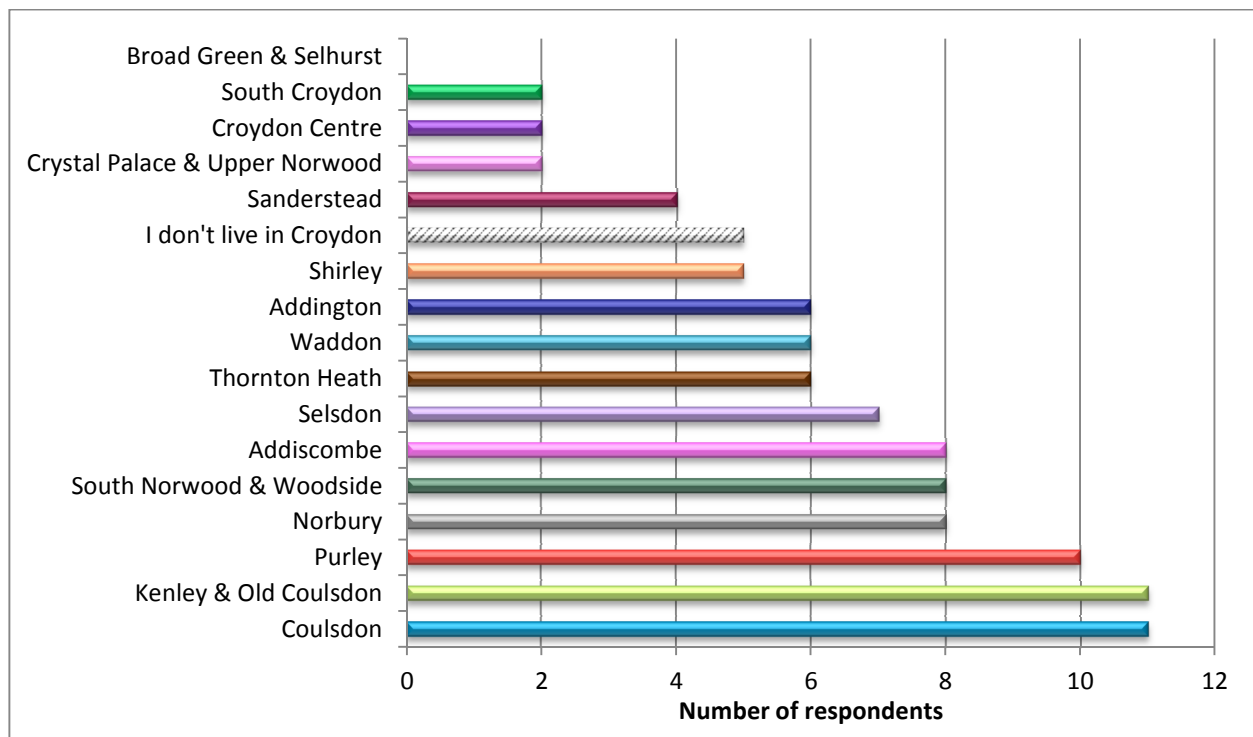
#### *Response Rate*

In total the council received 113 completed surveys in response to this engagement process.

Survey responses were received from across the borough. Respondents were asked to indicate the area of Croydon, as set out in the Local Plan, in which they lived as displayed in Figure C-1. Figure C-2 illustrates the distribution of respondents across the 16 different areas of Croydon. As may be expected with the timing of the survey, the greatest numbers of respondents were located in the south of the borough which was affected by serious flooding in early 2014 such as Kenley, Purley and Coulsdon. However, the numbers are not significantly greater than some northern parts of Croydon including South Norwood and Norbury.



**Figure C-1: Areas of Croydon as described in the Local Plan**



**Figure C-2: Croydon Local Flood Risk Management Strategy Survey Responses**

### General Caveats

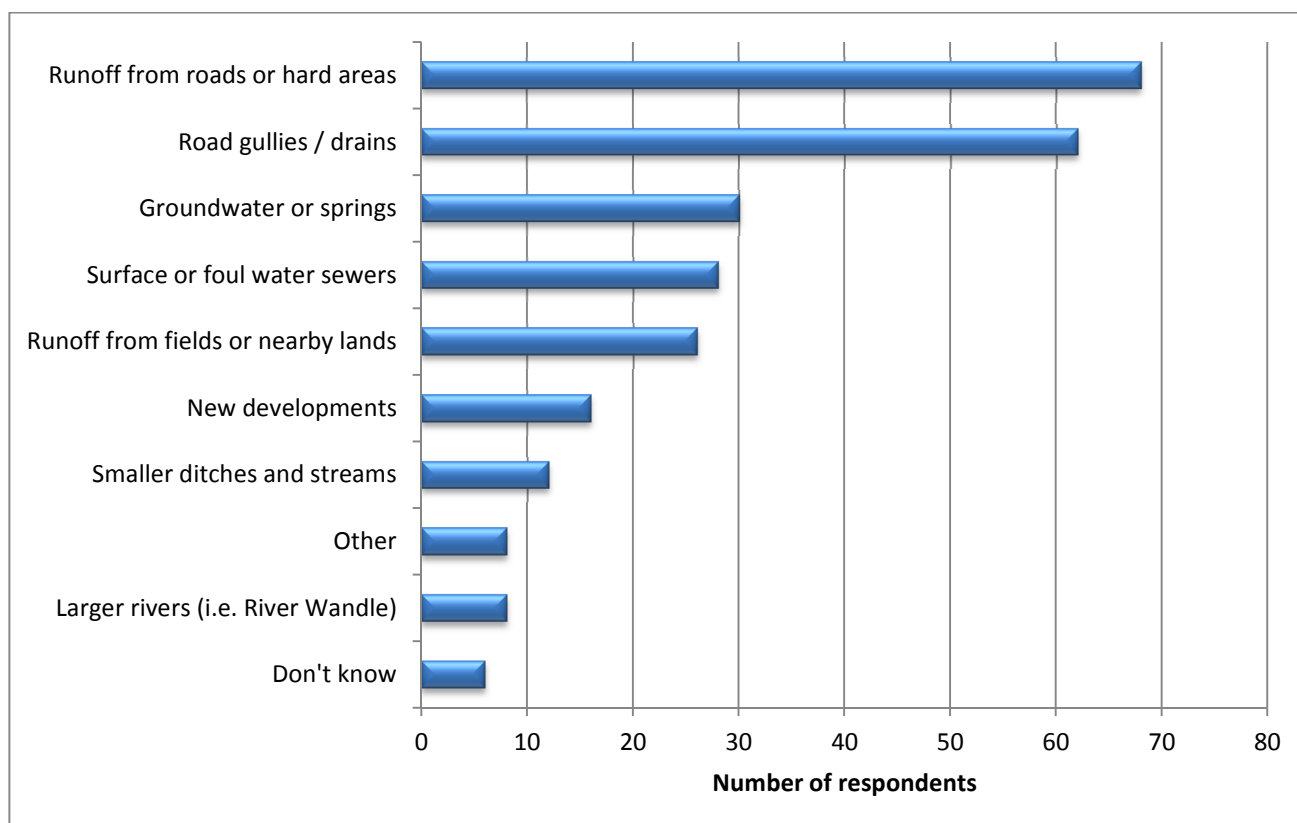
The results of this engagement are not statistically representative for the views of London Borough of Croydon residents due to the nature of the methodology used. The level of response, information gathered and views obtain provide a useful indicator of wider opinion and any important issues that will need to be considered.

Due to the software used and the different response options open to respondents, it was possible for people to submit more than one response. This has been monitored during the engagement period and analysis and it does not appear to have been abused or be a significant issue affecting the response.

Percentages used in this analysis have been rounded and may not add up to exactly 100%. For some survey questions, respondents could select more than one response which also means that percentages, if added together, can total more than 100%.

### Current Understanding of Flood Risk in London Borough of Croydon

Respondents were asked to identify what they thought were the main sources of flooding in their local areas. Figure C-3 illustrates the perceived greatest sources of flooding in Croydon.



**Figure C-3: Sources of local flooding identified by survey respondents**

A notable majority of respondents felt surface runoff from roads and blocked drains are the greatest cause of flooding. Surface water flooding is one of Croydon's most significant flood risks and the historic flood register does indicate significant flooding of roads particularly at topographical low points.

Historic records held by Croydon suggest that flooding from surface water is the most prevalent source of flooding throughout the borough. This is reflected in the survey, with runoff from roads or impermeable surfaces, new development and blocked road gullies identified by a large percentage of respondents as sources of flooding.

A significant number of respondents have noted groundwater as a main cause of flooding. This is likely to be linked to the very wet weather experienced at the time of the survey causing high groundwater in multiple locations and causing the Caterham Bourne to flow. Thirty respondents, who stated groundwater as the main flooding source, resided predominantly in the following areas:

- Norbury,
- Purley,
- Kenley & Old Coulsdon, and
- Shirley.

Historic records support these parts of the borough as more prone to these sources of flooding

It should be noted that of the eight people who responded 'other', five specifically mention the Caterham Bourne or 'underground river' as the greatest cause.

### Experiences of Flooding in Croydon

Respondents were asked to provide information about previous flooding incidents. 47 (44%) respondents advised that they had experienced flooding and most provided details of the event. The causes of the flooding were not always known and responses were varied, although the largest number stated heavy rainfall as the main cause.

Reported flooding sources		
Heavy rainfall	22	47%
Blocked road drains	6	13%
High groundwater	4	8.5%

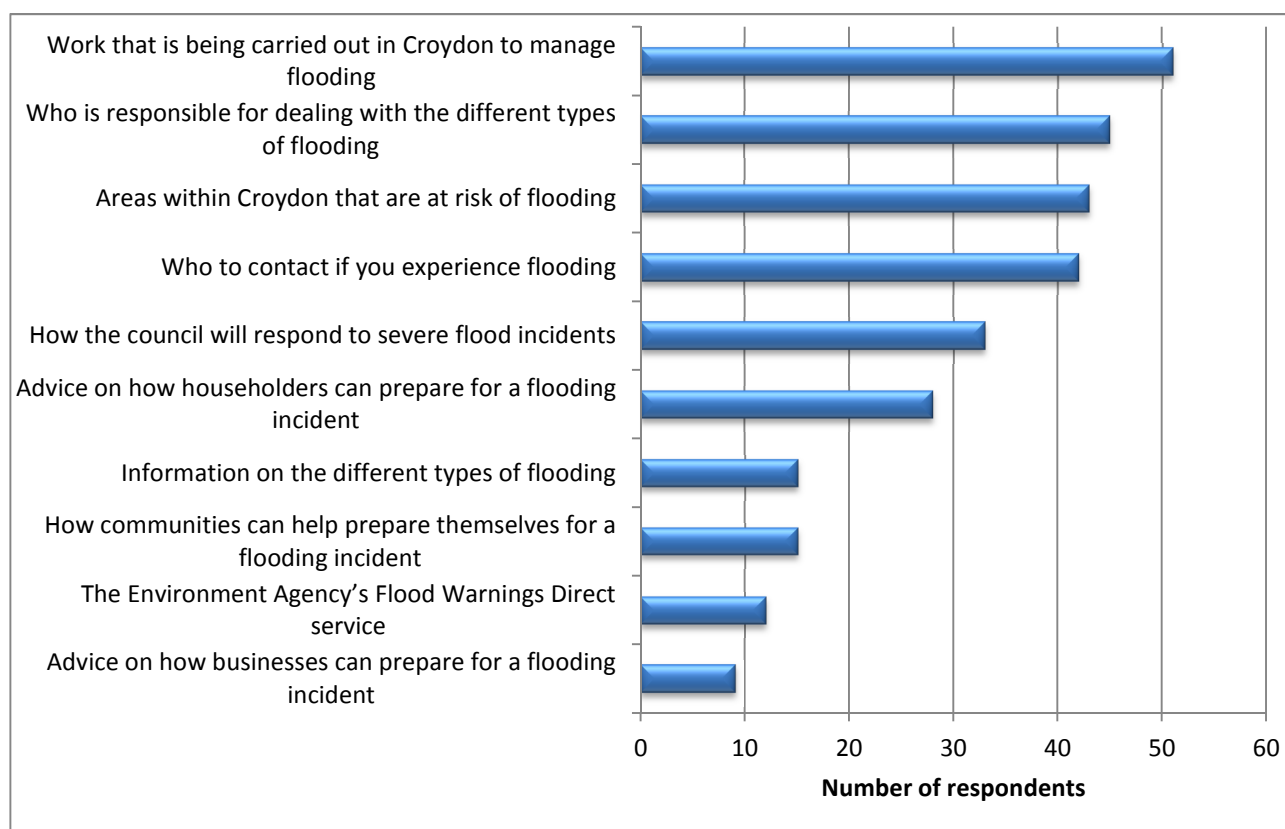
Respondents who had experienced flooding were asked to indicate how they were affected by the flooding incident. The most commonly affected receptors were:

Most commonly affected receptors	Number of respondents	% of respondents
Local Roads	15	32%
Property (Internally)	12	26%
Gardens	7	15%

### Communication of flood risk information

A key outcome from the survey was that respondents would like to receive more information on a number of topics, for example the existing local flood risk, how this is being managed and how to better protect themselves and their property from flooding. Figure C-4 illustrates the key topics which respondents would like to receive greater information on.

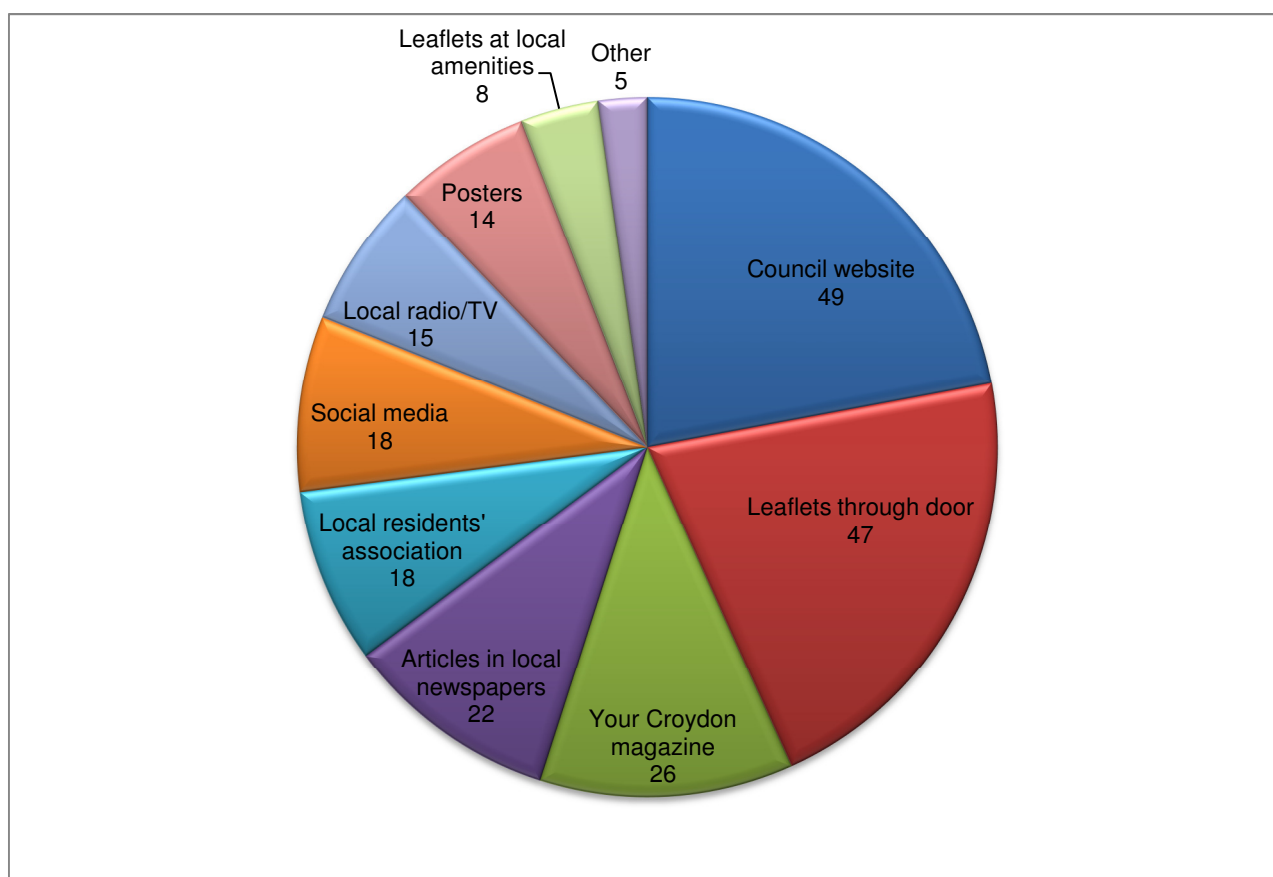




**Figure C-4: Key topics which respondents would like to receive further information on**

Respondents were asked what their preferred method of communication would be regarding flood risk information. Responses were varied and this is illustrated in Figure C-5. In summary, the preferred methods of communication were;

Method	Number of respondents	% of respondents
Council Website	49	43%
Leaflets / Newsletter	47	42%
Your Croydon magazine	26	23%



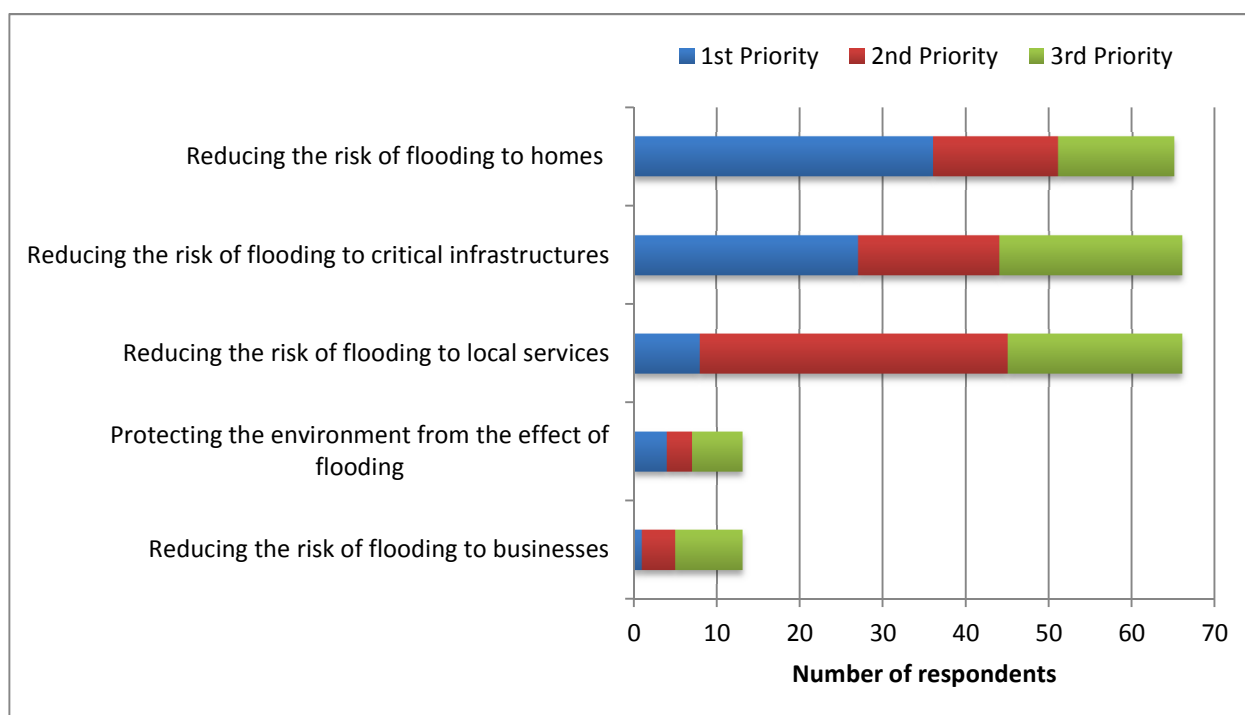
**Figure C-5: Preference of communication methods**

#### Priorities for Flood Risk Management

Respondents were asked to indicate how concerned they were about different consequences of flooding, ranging from not at all concerned to very concerned. Respondents are most concerned about maintenance of drainage and or flood prevention assets as well as the effect new development may be having on flood risk.

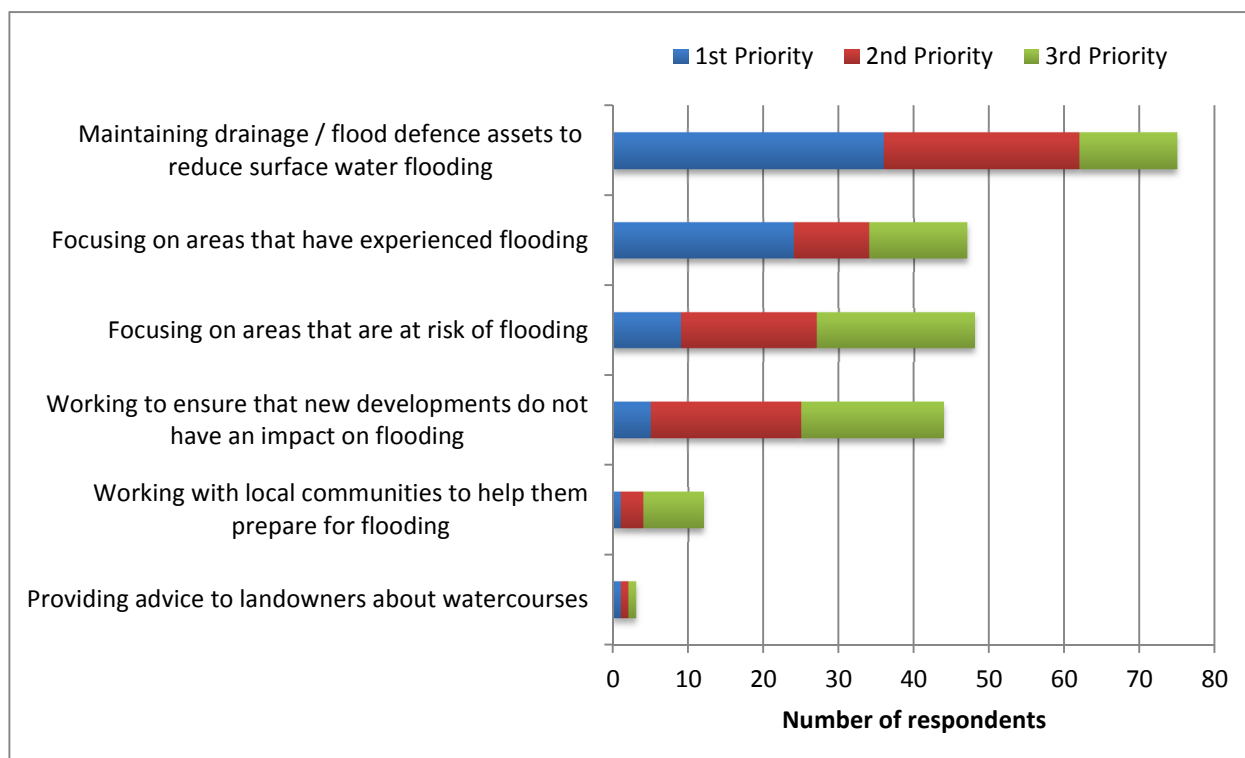
Concern	Number of respondents	% of respondents
Maintenance of drainage / flood prevention assets	51	48%
Effect of new developments on flooding	38	36%
Protecting my property against flooding	32	30%

Keeping people safe and protecting life is always the priority for flood management. Beyond this respondents were asked to identify what the priority for flood risk management within the borough should be. Figure C-6 indicates that respondents believe that reducing the risk of flooding to homes is a first priority. Reducing the risk of flooding to critical infrastructure is considered to be the next priority, followed by reducing flood risk to local services.



**Figure C-6: Flood risk management priorities for residents and businesses in Croydon**

Having identified the priorities for flood risk management within Croydon, respondents were subsequently asked how they thought that flood risk management would be best achieved in Croydon. Figure C-7 illustrates the approaches preferred by respondents on how best to achieve flood risk management.



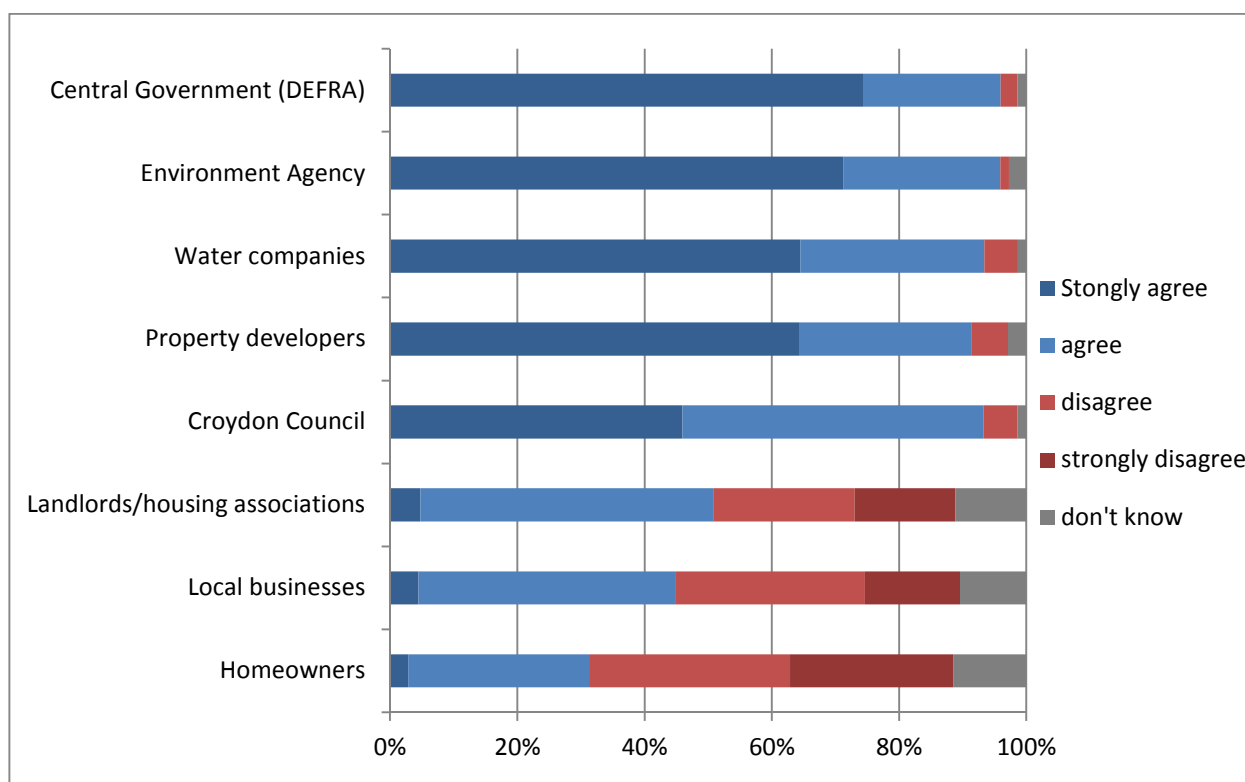
**Figure C-7: Preferred approaches to flood risk management in Croydon**

## Funding for Flood Risk Management

The Department for Environment, Food and Rural Affairs (Defra) is the main source of funding for flood prevention measures. The funding available is normally divided across projects across the country on a cost / benefit basis. This means that where local businesses and communities are to benefit from flood prevention measures, the government asked for contributions from those who benefit, which can greatly improve the likelihood of a project receiving funding.

Respondents were asked to what extent they agreed or disagreed that the following should contribute financially to flood alleviation scheme. As illustrated in Figure C-8, respondents most strongly agreed with the following contributing financially to flood alleviation schemes:

- Central Government,
- Environment Agency,
- Water companies, and
- Property developers.



**Figure C-8: Respondent support for funding source options**

### How has this feedback influenced the strategy?

- Respondents to the survey indicated that they would like to receive more information on the flood risk in their local area and what work is being carried out in Croydon to manage flood risk. Croydon Council is committed to increasing understanding of local flood risk and prioritising flood risk management work in areas of highest flood risk to maximise the effectiveness of available funding.
- In order to improve public awareness about the sources of flooding in Croydon, the council is committed to publishing more information on local flood risk and what residents, businesses and communities can do to better prepare themselves for flooding through property-level resilience and other local measures.

- The council has taken on board respondent's concerns regarding road drainage through establishing measures to prioritise gully cleansing work in areas of highest flood risk, and by committing to focus resources in known flooding hotspots through effective prioritisation and maximising external funding opportunities.
- Respondents showed concern about the impact of local development, as well as the paving over of gardens on surface water runoff. An objective of the London Borough of Croydon Strategy is to work with planners to minimise the impact of flooding from new development. The council will continue to hold regular meetings of the Croydon Flood Group to understand and manage local flood risk across the borough and will seek to improve information sharing between council departments, RMAs and local stakeholders.