LONDON BOROUGH OF RICHMOND UPON THAMES

London Borough of Richmond upon Thames
Local Flood Risk Management Strategy

Draft for Consultation

July 2014

CAPITA | URS

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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, 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.

Richmond Council is the Lead Local Flood Authority for the London Borough of Richmond upon Thames. This Local Flood Risk Management 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 Richmond Borough.

Although Richmond Borough has a relatively low susceptibility to surface water flooding, complex interactions exist between the pluvial, fluvial, tidal and sewer systems which could pose a risk.

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 Richmond Borough.

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 Richmond Borough. The Strategy outlines the priorities for local flood risk management and provides a delivery plan to manage the risk over the next five years. We have given consideration to the roles and responsibilities of other risk management authorities in Richmond Borough, including the Environment Agency and Thames Water, who have responsibility for managing the risk arising from Main Rivers and sewer flooding respectively, which interact and influence surface water and groundwater flood risk.

Our Local Flood Risk Management Strategy complements and supports the *National Strategy* published by the Environment Agency which outlines a National framework for flood and coastal risk management. In addition, the Local Strategy is aligned with the corporate priorities of Richmond Council's strategic plans. We have taken the guiding principles from these strategies into account when setting the following objectives for the management of local flood risk:

London Borough of Richmond upon Thames Objectives

- Encourage direct involvement in decision making through the establishment of and maintaining partnerships with key organisations, including the Environment Agency and Thames Water
- Improve our knowledge and understanding of the interactions between different sources of flooding in Richmond Borough
- Encourage residents, businesses and local landowners to take action and contribute to the management and reduction of flood risk
- Target resources where they have the greatest effect by adopting a risk-based approach
- Contribute to wider social, economic and environmental outcomes by encouraging sustainable multi-benefit solutions for the management of local flood risk

The Strategy is accompanied by an Action Plan setting out how we will deliver the objectives of the Strategy over the next five years. The Action Plan outlines the measures identified through this Strategy and the outcomes of each action are linked to the objectives of the Strategy so that we can monitor how we are delivering our local flood risk management measures.

Over the next five years we will continue to work with communities and businesses to help them understand the potential risks they face from all sources of flooding and what can be done to manage them. A range of individual, community and council-led actions and improved awareness will help manage the impacts and consequences of flooding and consequently lead to social, economic and environmental benefits to Richmond Borough's communities.

The development plan for the Borough and the development management process will ensure that developments across Richmond Borough, both redevelopments on existing built sites and new buildings, will integrate considerations of flood risk and sustainable drainage; this includes steering development to areas at lowest probability of flooding, ensuring that the proposed land uses are compatible with the potential flood risk that the development and its users may be exposed to, and overall aiming to achieve a reduction in flood risk.

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

GLOSSARY & ABBREVIATIONS

Term	Definition
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.
Flood Resilience	Resistance strategies aimed at flood protection.

Term	Definition
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 LBRuT.
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.
Pluvial Flooding	Flooding caused by rainfall
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 multiplied by the consequence of the event.
River Catchment	The areas drained by a river.
SuDS Approving Body	Statutory body responsible for the approval of Sustainable Drainage System (SuDS) systems in new planning applications, when enacted under the Flood and Water Management Act 2010.
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.
Tidal Flooding	Flooding 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 on average will occur once every 30 years. Also expressed as an event, which has a 3.33% probability of occurring in any one year.
1 in 100 year event	Event that on average will occur once every 100 years. Also expressed as an event, which has a 1% probability of occurring in any one year.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Flood Risk in South West London

1.1.1 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[1]. 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.

1.1.2 In 2012 the UK experienced a period of exceptionally wet weather from April to July and again in November, resulting in several significant flood events however these were not on the same scale as in summer 2007. The recent flooding in January 2014 involved rainfall events occurring in rapid succession and therefore high flows were sustained over a long period resulting in the highest recorded volume of water for any two and half month period since flow records began in 1883. The Thames Barrier was closed 50 times from 5th December 2013 to 5th March 2014. Of these closures, 41 have been classified as fluvial to protect west London from high flood flows arriving from upstream and 9 have been classified as tidal to protect London from high sea levels in the Thames estuary.

1.1.3 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.

1.1.4 Risks from tidal and fluvial flooding associated with the River Thames, River Crane, Hogsmill, Beverley Brook, and Whitton Brook 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. Local sources in Richmond Borough include the Longford River, Sudbrook and several unnamed ordinary watercourses which are shown together with the main Rivers in Figure 1-1.

[1] Environment Agency (2009) Flooding in England: A National Assessment of Flood Risk
https://www.gov.uk/government/publications/flooding-in-england-national-assessment-of-flood-risk

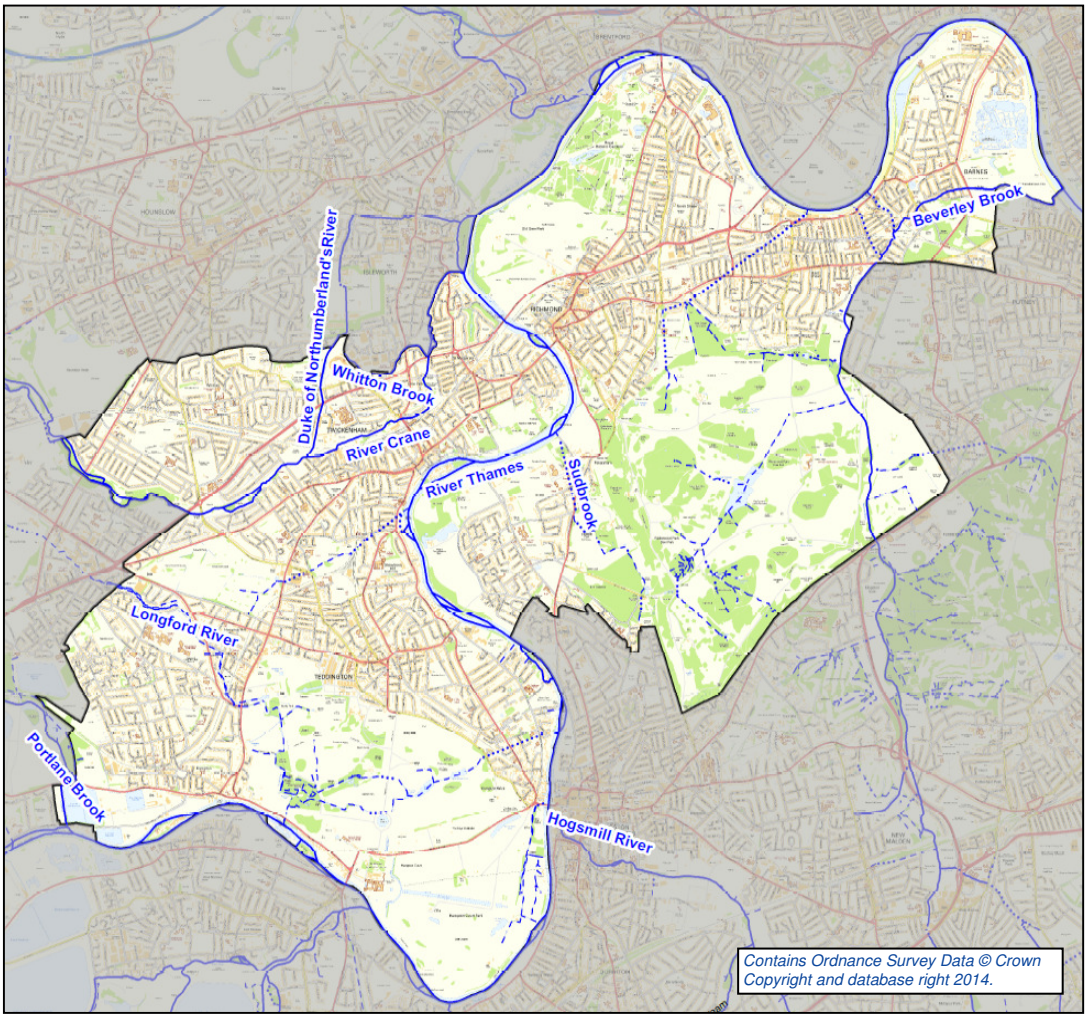


Figure 1-1 Watercourses within the London Borough of Richmond upon Thames

1.1.5 Parts of South West London have a particular susceptibility to surface water and sewer flooding due to the pressures from increasing urbanisation and climate change. Over recent years, severe surface water flooding has been experienced across the area causing damage to property and disruption to businesses and services. Details of historic flood records are provided in Section 2.

1.1.6 Modelling undertaken as part of the London Borough of Richmond upon Thames (LBRuT) Surface Water Management Plan (SWMP) in 2012 shows that the risk of surface water flooding to properties within LBRuT is considerable; up to 30,000 residential properties and 3,000 non-residential properties are modelled to be at risk of flooding during a rainfall event that has a 1 in 100 chance of occurring in any given year (1% Annual Exceedance Probability (AEP)). Further details 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 LBRuT SWMP, and initial high-level, borough-wide property counts undertaken to support this Local Flood Risk Management Strategy (LFRMS) indicate a reduction in the flood risk by comparison - 15,000 residential and 2,000 non-residential properties were found to be at risk of flooding to a varying degree during a 1 in 100 event. As part of LBRuTs ongoing local flood risk management work, the uFMfSW will be used to increase our understanding of local surface water flood risk and identify and prioritise those areas at greatest risk.

1.1.7 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

1.2.1 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[2] 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.

1.2.2 The Flood and Water Management Act 2010 (The Act)[3], enacted by Government in response to The Pitt Review, designated unitary authorities, including all London Boroughs, as Lead Local Flood Authority (LLFA). As LLFA, each London Borough has responsibilities to lead and co-ordinate local flood risk management. 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).

1.2.3 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 and the sea 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.

1.2.4 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').

1.2.5 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. Further details regarding the South West London Strategic Flood Group are included in Section 5.2.

1.3 The London Borough of Richmond upon Thames Strategy

1.3.1 The purpose of the LBRuT Strategy is to set out the approach to managing flood risk from local sources (i.e. surface water, ground water 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.

[2] Cabinet Office (2008) Sir Michael Pitt Report 'Learning lessons learned from the 2007 floods' http://webarchive.nationalarchives.gov.uk/20100807034701/http:/archive.cabinetoffice.gov.uk/pittreview/_/media/assets/www.cabinetoffice.gov.uk/flooding_review/pitt_review_full%20pdf.pdf
[3] HMSO (2010) The Flood and Water Management Act 2010 http://www.legislation.gov.uk/ukpga/2010/29/contents

The LBRuT Strategy includes:

- Section 2 and Appendix A: **Assessment of local flood risk** (from surface water, groundwater and ordinary watercourses),
- Section 3: **Roles and responsibilities** for local flood risk management,
- Section 4: **Objectives** for managing local flood risk,
- Section 5 and Appendix B: Proposed **measures to deliver the objectives**, including timescales to implement measures, and how the measures will be paid for, identifying costs and benefits,
- Section 6: How the Strategy contributes to **achievement of Environmental Objectives**, and
- Section 7: How and when the Strategy will be **monitored and reviewed**.

Figure 1-2 Structure of the Strategy

1.3.2 The Strategy complements and supports the National Strategy[4], published by the Environment Agency, which outlines a National framework for flood and coastal risk management, balancing the needs of communities, the economy and the environment.

1.3.3 This Strategy has been developed by LBRuT Council in partnership with Risk Management Authorities (RMAs) 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.

1.3.4 In delivering flood risk management, LBRuT have the opportunity to deliver wider environmental objectives and requirements, as set out in European legislation including the Water Framework Directive[5]. The approach for addressing this, including the preparation of a Strategic Environmental Assessment (SEA) Scoping Report, is outlined in Section 6.

1.4 Community Engagement and Consultation

1.4.1 A community engagement exercise was undertaken between the 20th December 2013 and 28th February 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.

1.4.2 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 Richmond Council.

1.5 Supporting Plans and Documents

1.5.1 Over recent years, a number of documents have been prepared detailing the assessment and management of flood risk within LBRuT. 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

[4] 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
[5] European Union (2000) Water Framework Directive http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0060:EN:NOT

existing flood risk studies and plans into a single document that outlines how LBRuT will manage local flood risk going forwards.

1.5.2 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), Strategic Flood Risk Assessment (SFRA) and Preliminary Flood Risk Assessment (PFRA). These same documents and the partnerships forged between RMAs during their preparation are also built upon and formalised as part of the Strategy.

1.5.3 The Strategy also draws from wider environmental plans covering the Thames catchment including the Thames River Basin District Management Plan[6] and Thames Catchment Flood Management Plan[7] to ensure a coordinated approach to flood risk management across South West London.

[6] Environment Agency (2009) Thames River Basin District Management Plan
https://www.gov.uk/government/publications/thames-river-basin-management-plan
[7] Environment Agency (2009) Thames Catchment Flood Management Plan
https://www.gov.uk/government/collections/catchment-flood-management-plans

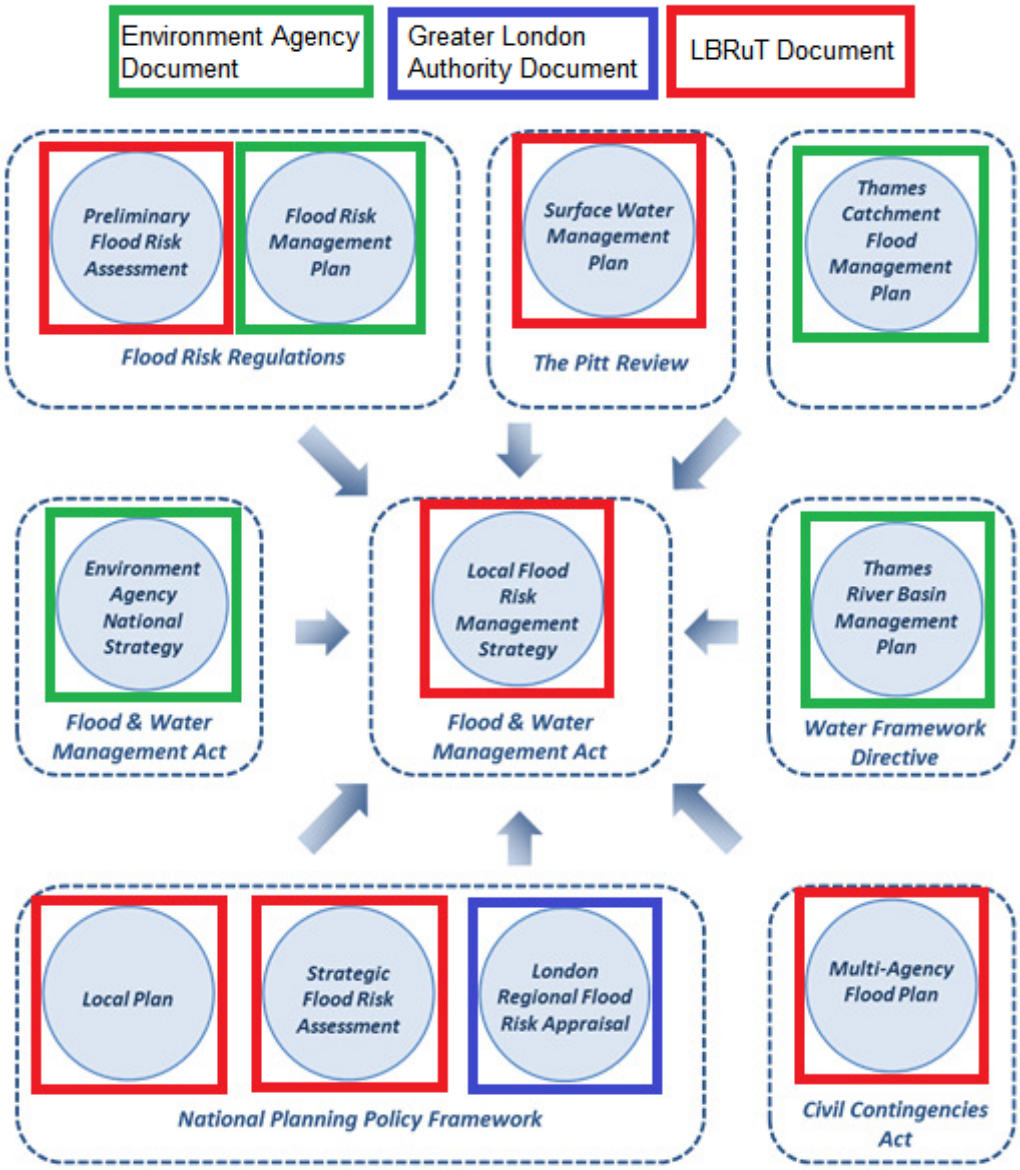


Figure 1-3 Legislative Drivers and Supporting Documents for the Strategy

Flood Risk Management Plan

1.5.4 As well as the duties under the Act to prepare the Strategy, LBRuT have legal obligations under the EU Floods Directive[8], which was transposed into UK Law through the Flood Risk Regulations 2009[9] ('the Regulations').

1.5.5 As part of the Greater London Flood Risk Area, LBRuT is required to contribute to the preparation of a Flood Risk Management Plan for the Thames River Basin District outlining significant flood risk, receptors and consequences across their administrative area.

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

[8] European Union (2007) EU Floods Directive http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007L0060:EN:NOT
[9] 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?

2.1.1 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.

2.1.2 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)

2.2 Local Sources of Flood Risk

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

2.2.2 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. Figures 1 – 3, presented in Appendix A, show historic records of flooding and modelled potential future impacts of flooding from these sources.

2.2.3 The main perceived source of flood risk identified from the online survey is large rivers or watercourses. Other perceived sources of flood risk include runoff from roads or impermeable areas and blocked road gullies or drains. There is little perceived risk of groundwater flooding or from runoff from playing fields or adjacent land.

Table 2-1 Flooding from Local Sources –Surface Water Flooding	
Description of Source	Surface water flooding usually occurs when high intensity rainfall generates runoff, when the ground is saturated and water can no longer infiltrate. This is exacerbated by the underlying impermeable London Clay which has a relatively slow infiltration rate. The runoff flows over the surface of the ground and ponds in low lying areas, before entering 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.
Supporting Documents	LBRuT Surface Water Management Plan [10] LBRuT Preliminary Flood Risk Assessment [11]
Historic Flooding	The PFRA and SWMP identify parts of LBRuT to be particularly susceptible to surface water flooding, including Barnes, Barnes Common, Hampton, Heathfield, South Richmond, North Twickenham, Teddington and South Twickenham. During the 2007 summer storms, surface water flooding was recorded along many of the streets within these areas. In the online survey 70% of respondents stated heavy rainfall as one of the possible causes of the flooding they had experienced. Historic records held by LBRuT show 23 reported incidents of surface water flooding which are shown in Appendix A Figure 1. However, these do not represent a complete picture of all historic flooding within the Richmond Borough.
Future Flood Risk	As part of the SWMP, direct rainfall modelling was undertaken to analyse the number of properties at risk of surface water flooding for a rainfall event with a 1 in 100 year probability of occurrence in any given year (1% Annual Exceedance Probability). It was determined that 28,494 residential and 2,725 non-residential properties are at risk of flooding to depths greater than 0.03m during a 1% AEP event. 51 residential and 12 non-residential properties are at risk of deep surface water flooding (i.e. depths greater than 0.5m) during a 1% AEP event. Seven Critical Drainage Areas (CDAs) were identified in LBRuT as a result of the SWMP modelling; the locations are shown in Appendix A Figure 8 and listed below: • 001 Twickenham • 002 St Margaret's • 003 Strawberry Hill • 004 Richmond and Mortlake • 005 Petersham • 006 Teddington • 007 Hampton Wick Appendix A Figure 8 also shows the Environment Agency uFMfSW, which shows relatively good correlation with the pluvial modelling presented in the SWMP. The uFMfSW shows surface water to be more constrained within roads and watercourses, which in part reflects the improved resolution of the modelling. An initial high-level, borough-wide assessment of the uFMfSW indicates a reduction in the extent of areas that could be affected by surface water flooding in the Borough. During a 1% AEP event, 15,404 residential and 2,135 non-residential properties were found to be at risk of flooding to a varying degree. Further, more detailed, analysis of the uFMfSW is required and will be carried out as part of LBRuT's local flood risk management work.

[10] Capita Symonds URS (2011) London Borough of Richmond upon Thames Surface Water Management Plan http://www.richmond.gov.uk/surface_water_management_plan
[11] Capita Symonds URS (2011) London Borough of Richmond upon Thames Preliminary Flood Risk Assessment http://www.richmond.gov.uk/preliminary_flood_risk_assessment.htm

Table 2-2 Flooding from Local Sources – Groundwater Flooding	
Description of Source	Groundwater flooding occurs as a result of water rising up from an 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, tidal 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 pluvial,fluvial and tidal flooding by reducing rainfall infiltration capacity, and to increase the risk of sewer flooding through sewer / groundwater interactions. In permeable substrates, groundwater levels can rise, causing flooding problems in subsurface structures or at the ground surface. The following areas within the Borough have permeable superficial deposits and the mechanisms for groundwater flooding may occur; • Clay bedrock with thin layers of sand exposed above the soil in Richmond Park, • Superficial aquifers along the River Thames, River Crane and Beverley Brook, and in other various locations • Impermeable (silt and clay) areas down slope of superficial aquifers in various locations • Artificial ground in various locations. Due to the thickness of the underlying London Clay Formation within the area, the risk of groundwater flooding is limited to these areas of permeable superficial deposits only. The geology for Richmond Borough is shown in Appendix A Figure 3.
Supporting Documents	LBRuT Surface Water Management Plan LBRuT Preliminary Flood Risk Assessment
Historic Flooding	Basements and other below ground level installations are particularly vulnerable to groundwater flooding, although property and land above ground level can be at risk. Twenty two incidents of groundwater flooding have been reported within the Borough over the last thirteen years. Most were reported during the winter of 2000/2001 due to exceptional rainfall. The incidents are spread across the Borough with the majority occurring within the Taplow Gravel or Kempton Park Gravel formations, twelve concern basement flooding. Appendix A Figure 1 shows records of historic flooding from local sources including groundwater. In the online survey only 10% of respondents stated groundwater as one of the possible causes of the flooding they had experienced.

Table 2-2 Flooding from Local Sources – Groundwater Flooding	
Future Flood Risk	The Environment Agency Catchment Abstraction Management Strategies (CAMS) are for the management of water resources at a local level, they assess the amount of water available for further abstraction licensing, taking into account what the environment needs. Richmond is covered by The Thames Corridor Abstraction Management Strategy (June 2004). The Environment Agency advises that the reduction in groundwater abstraction is not anticipated to cause any further rise in groundwater levels and is not considered a significant issue. All risk of groundwater flooding within Richmond borough is considered as a response of seasonal rainfall recharge. Groundwater flooding in the LBRuT could increase as a result of climate change, changes in flood management or a shift in drainage policy with increased infiltration SUDS. Changes in flood defences along the Thames Estuary may increase groundwater flood risk from increased perched groundwater levels. Climate change could increase the risk of flooding by groundwater due to increased winter recharge of aquifers.

Table 2-3 Flooding from Local Sources – Ordinary Watercourses (incl. small ditches and land drains)	
Description of Source	Ordinary watercourses include every river, stream, ditch (whether dry or not), 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 flooding). The responsibility for ordinary watercourses fall to riparian owners who typically own land on either bank and therefore are deemed to own the land to the centre of the watercourse. The Longford River is an artificial watercourse located in the south of the Borough and running south east through Hampton Hill and Bushy Park towards Hampton Court, it then discharges to the Thames. The Sudbrook runs north west from Dann's Pond in Richmond Park to Ham Gate where it forms two ponds before continuing through Sudbrook Park after which it is culverted for 1km and outfalls to the Thames at River Lane. The remainder of the ponds and streams in Richmond Park drain north east towards the Beverly Brook. An unnamed watercourse, the majority of which is culverted, runs from Richmond Park to its outfall into the Thames at Mortlake. Another unnamed watercourse drains Fulwell Golf Course north east to an outfall at Cross Deep. The locations of ordinary watercourses are shown in Appendix A Figure 5.
Supporting Documents	LBRuT Surface Water Management Plan LBRuT Preliminary Flood Risk Assessment
Historic Flooding	Appendix A Figure 1 shows records of historic flooding from local sources including ordinary watercourses. There are limited records of fluvial flooding from ordinary watercourses, and no flooding events have been reported as being directly related to ordinary watercourses. Many of the flooding events within the Borough are attributed to interlinked flooding mechanisms; it is likely that the ordinary watercourses have contributed to the flooding events reported as pluvial flood events. Only 4% of respondents from the online survey indicated the flooding they had experienced was due to blocked ditches or streams and 9% of respondents consider smaller ditches and streams to be a source of flood risk that needs to be addressed.

Table 2-3 Flooding from Local Sources – Ordinary Watercourses (incl. small ditches and land drains)	
Future Flood Risk	The SWMP models predict limited flooding along the ordinary watercourses in the Borough for all return periods. Appendix A Figure 2 shows the Environment Agency uFMfSW which generally correlates with the SWMP. However in the uFMfSW the ditches and streams linking the ponds in Richmond Park to the Beverley Brook show a much greater extent of flooding.

2.3 Other Sources of Flood Risk

2.3.1 Parts of South West London are also at risk of flooding from *other* sources including the tidal River Thames, 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 LBRuT have been identified to aid understanding and management of local flood risk in the area.

Table 2-4 Flooding from Other Sources – Main Rivers	
Description of Source	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. The following Main Rivers are present within the LBRuT; The River Thames, River Crane, Beverley Brook, Duke of Northumberland River, Whitton Brook, and Portlane Brook. The River Thames flows through the centre of the Borough from Hampton Court to Barnes, Richmond Borough is at risk from both fluvial and tidal flooding and is the only London borough that spans on both sides of the Thames. Teddington Weir represents the formal tidal extent of the River Thames, the reach between Richmond and Teddington is considered to have a combined tidal and fluvial risk. Downstream of Teddington Weir, the borough is protected against tidal flooding through the Thames Tidal Defence (TTD) system which provides protection through a combination of raised defences and the Thames Barrier. The current estimated standard of protection provided by the TTD is 0.1% per annum (1:1000). The risk of tidal flooding to the borough is therefore a residual risk, in the event of a failure or overtopping of these flood defences. Between Richmond and Teddington the existing tidal defences provide some protection against fluvial flooding – although this is not the intended purpose. The current estimated standard of protection provided by these defences at Teddington is 3% per annum (1 in 30). At present, the Thames Barrier can be closed to reduce this fluvial flood risk. Flood events along the River Thames also affect communication and transport links which can cause additional disruption. Areas adjoining the River Thames corridor in Barnes, Mortlake, Kew, North Sheen, Richmond Town, St Margaret's, Twickenham, Strawberry Hill, Teddington and Hampton are potentially at risk of fluvial and tidal flooding and are situated within Flood Zone 3a and have a high probability of flooding from the River Thames; some of these areas, especially in the undefended parts alongside the river are also within Flood Zone 3b, i.e. the functional floodplain and subject to regular flooding The River Crane flows from Hounslow to St Margaret's and has culverted sections in urbanised areas. The Beverley Brook largely runs through Richmond Park and flows between Merton and Wandsworth, along the north eastern boundary of the Borough. The Duke of Northumberland River is a distributary of the River Crane running north through Kneller Gardens and the Mogden Sewage Treatment Works before turning east to join the Thames at Isleworth Ait. The Whitton Brook (also known as the Birket's Brook) flows east from Rugby Road and joins the River Crane north of Chertsey Road. The Portlane Brook is located along the western boundary of the Borough, flowing south to join the Thames at Grand Junction Island. The Beverley Brook catchment is susceptible to 'flash' floods due to the impermeable underlying soils and relatively steep topography.
Supporting Documents	LBRuT Strategic Flood Risk Assessment[12] River Thames Catchment Flood Management Plan[13] Environment Agency Flood Maps[14]

[12]London Borough of Richmond upon Thames Strategic Flood Risk Assessment,2010
[13] Thames Catchment Flood Management, 2009
[14] https://www.gov.uk/government/organisations/environment-agency

Table 2-4 Flooding from Other Sources – Main Rivers	
Historic Flooding	In 2003, low lying areas to the west of London suffered severe damage to homes and businesses. Flooding events from the River Crane and Beverley Brook are often much 'flashier' (shorter duration but increased hazard) due to smaller catchment size. Flash events are difficult to accurately predict and therefore have resulted in unforeseen flooding around these watercourses. There are two recorded fluvial events along the River Crane in the west of the Borough, at Cheyne Avenue and on River Way. There is a cluster of records in the St Margarets area along the River Thames, just south of the railway line. There are also recorded fluvial flood events along the west bank of the Thames at Strawberry Hill. These events have been recorded at locations that sit behind the Thames flood defences. Figure 1 Appendix A shows the Environment Agency Historic Flood Map and a selection of recorded fluvial events that have occurred within Richmond borough.
Future Flood Risk	Appendix A Figure 4 shows the Environment Agency Flood Zones 2 and 3 and the areas which benefit from defences. This is the 'Flood Map for Planning' which is used to determine the suitability of sites for development. However the main product which members of the public will use to understand their flood risk is the 'Flooding from Rivers and Sea' that takes into account the presence of defences and also uses a different risk classification – High, Medium, Low and Very Low. The NPPF defines Flood Zones associated with tidal and river flooding based upon the probability of flooding. Fluvial flooding from the Thames upstream of Teddington is a greater risk than tidal flooding. The fluvial tidal interaction at Teddington is complex, however a better understanding will be achieved through modelling as part of the River Thames Scheme Datchet to Teddington, the Environment Agency's strategy for managing the fluvial section of the Thames within Richmond Borough. This scheme consists of large scale engineering work to construct a flood channel, improvements to three of the existing Thames weirs, installation of property level products for up to 1,200 homes and improved flood incident response plans. The Thames Tidal Defence, in conjunction with the Thames Barrier aim to protect the Borough against tidal flood risk. At present, the Thames Barrier is closed to reduce fluvial flood risk in West London. However, this use is likely to be significantly reduced in future in order to conserve the barrier for tidal flood risk management. This means that vulnerable areas will increasingly have to rely upon floodplain management and localised defence measures. Future tidal flood risk along the Thames is expected to increase as sea levels rise induced by climate change. The Environment Agency has produced the Thames Estuary 2100 (TE2100) Plan[15] which sets out the strategic plan to manage flood risk on the Thames estuary to the end of the century. For the first 60 years of the plan period (from 2010 to 2069), improving the existing defence system is recommended From 2070, rising sea levels will require a different approach to be taken. The two 'front runner' options are a continuation of defence improvements including major improvements to the Thames Barrier, or a new downstream barrier at Long Reach.

[15] Environment Agency (2012) The Thames Estuary 2100 Plan https://www.gov.uk/government/publications/flooding-thames-estuary-2100-te2100-plan

Table 2-5 Flooding from Other Sources – Sewer Flooding	
Description of Source	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, (c) the system surcharges due to high water levels in receiving watercourses, and/or (d) the system surcharges due to the ingress of ground water, either through the fabric of the sewer or due to inundation above the surface. Sewer flooding generally results in localised short term flooding. Management of sewer flooding from public sewers (but not from private drains or land drainage) is the responsibility of Thames Water as the sewerage undertaker, although it is often difficult to disassociate from surface water runoff and groundwater flooding. The majority of the sewer system across the LBRuT is combined, taking both foul and surface water flows, the combined systems then discharge to the sewage treatment works. The capacity of the sewer system is therefore limited and is only expected to accommodate a 1 in 10 or 1 in 15 year storm event. Any rainfall event exceeding this probability will likely result in overland flow and may cause a risk of flooding. High river levels due to rainfall or high tides can block drains by submerging river outlets. Surcharging can occur when pipes become blocked or rainfall entering the drainage system exceeds the capacity of the drains. Water may overflow into streets and houses if water is unable to escape.
Supporting Documents	Preliminary Flood Risk Assessment
Historic Flooding	As part of the SWMP and PFRA, Thames Water provided the DG5 database which details the total number of properties at risk of sewer flooding (both internally and externally) based on historic flooding over the previous 10 years. Thames Water focus their efforts on removing properties from the DG5 register that have flooded in the past and therefore this dataset may not accurately represent those properties currently at risk or at risk in the future. The DG5 register highlights the areas of Barnes (east), Barnes (west), South Twickenham and Whitton as being at greatest risk of sewer flooding. The PFRA sewer flooding incidents map (Annex 6 Figure 3) highlights the postcode areas of SW14 8, SW1 55, KT1 4, KT7 0, KT2 5 and TW7 7 as having the greatest number of recorded sewer flood incidents. Many of the recorded flood incidents have been attributed to a combination of pluvial and sewer related flooding. This is because if flooding during an event exceeds the level of service that the sewers provide, flood events can be classified as pluvial flooding. This is the case within the Strawberry Hill area, along Strawberry Vale and Michelham Gardens and also along Amyand Park Road, Beaconsfield Road and Arlington Road in Teddington. There are a cluster of flood events reported as directly resulting from sewer flooding in the South of Teddington. Along Albert Road, Luther Road, Elfin Grove, Teddington Park, Gloucester Road and Stanley Road. In Whitton there are similarly reported incidents, along Redway Drive, Kneller Road, Nelson Road and Wills Crescent.
Future Flood Risk	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. Notwithstanding the above mentioned limitations, the DG5 register has been used to provide an indication of potential future impacts.

Table 2-6 Flooding from Other Sources – Artificial Sources	
Description of Source	Artificial sources include any water bodies not covered under other categories and typically include canals, lakes and reservoirs. There are permanent water bodies in the Borough; small lakes, ponds and water features within Richmond Park and Bushby Park, as well as several reservoir storage areas in the south west of the Borough; Stain Hill West and East Reservoirs, Sunnyside Reservoir and Grand Junction Reservoir.
Supporting Documents	Environment Agency Reservoir Flood Maps
Historic Flooding	There are no reported incidents of flooding from lakes, canals or reservoirs within the Borough.
Future Flood Risk	The Environment Agency Reservoir Inundation mapping highlights the areas within the Borough that are at risk of flooding should a large reservoir fail and release all of the water it holds. Listed below are the reservoirs which would have an impact on each area. It should be noted that the depth and speed of flooding from the reservoirs in the area are also available on the Environment Agency's website. **Teddington;** Wraysbury, Queen Mary, Queen Elizabeth II, Queen Mother, King George VI **Twickenham;** Staines North, Wraysbury, Island Barn, Walton – Knight, Walton – Bessborough, Queen Mary, Staines South, Queen Elizabeth II, Queen Mother, King George VI **Richmond;** Wraysbury, Island Barn, Walton – Knight, Walton – Bessborough, Queen Mary, Staines South, Queen Elizabeth II, Queen Mother, King George VI **Kew;** Queen Mary, Queen Mother, **Barnes;** Queen Mary, Queen Elizabeth II, Queen Mother

2.4 Critical Infrastructure

2.4.1 The survey identified that one of the top flood risk management priorities for residents and businesses within LBRuT is reducing risk of flooding to critical infrastructure, such as electricity substations. For the purposes of this LFRMS Critical Infrastructure within Richmond Borough was defined as shown in Table 2-7 and shown in Appendix A Figure 6A together with the Environment Agency uFMfSW and in Figure 6B with the Environment Agency Flood Zones. Electricity substations are shown in Figures 7A and 7B with the Environment Agency uFMfSW and Flood Zones respectively.

Table 2-7 Critical Infrastructure	
Schools, Healthcare and Nursing Homes	School/University/College
	Surgery/Health care centre
	Residential Care Home
Emergency Services	Fire/Ambulance
	Police Station
	Hospital
	Lifeboat Station
Power and Water Services	Sewage Treatment
	Water Filtration/Waster & recycling
	Electricity
	Telephone infrastructure
Transport Infrastructure	TfL roads
	Railway Lines

2.5 Flood Warning Areas

2.5.1 The Environment Agency provided their current flood warning areas in April 2014. The flood warning areas and the Environment Agency Area that issues the warning are shown in figure 2-1.

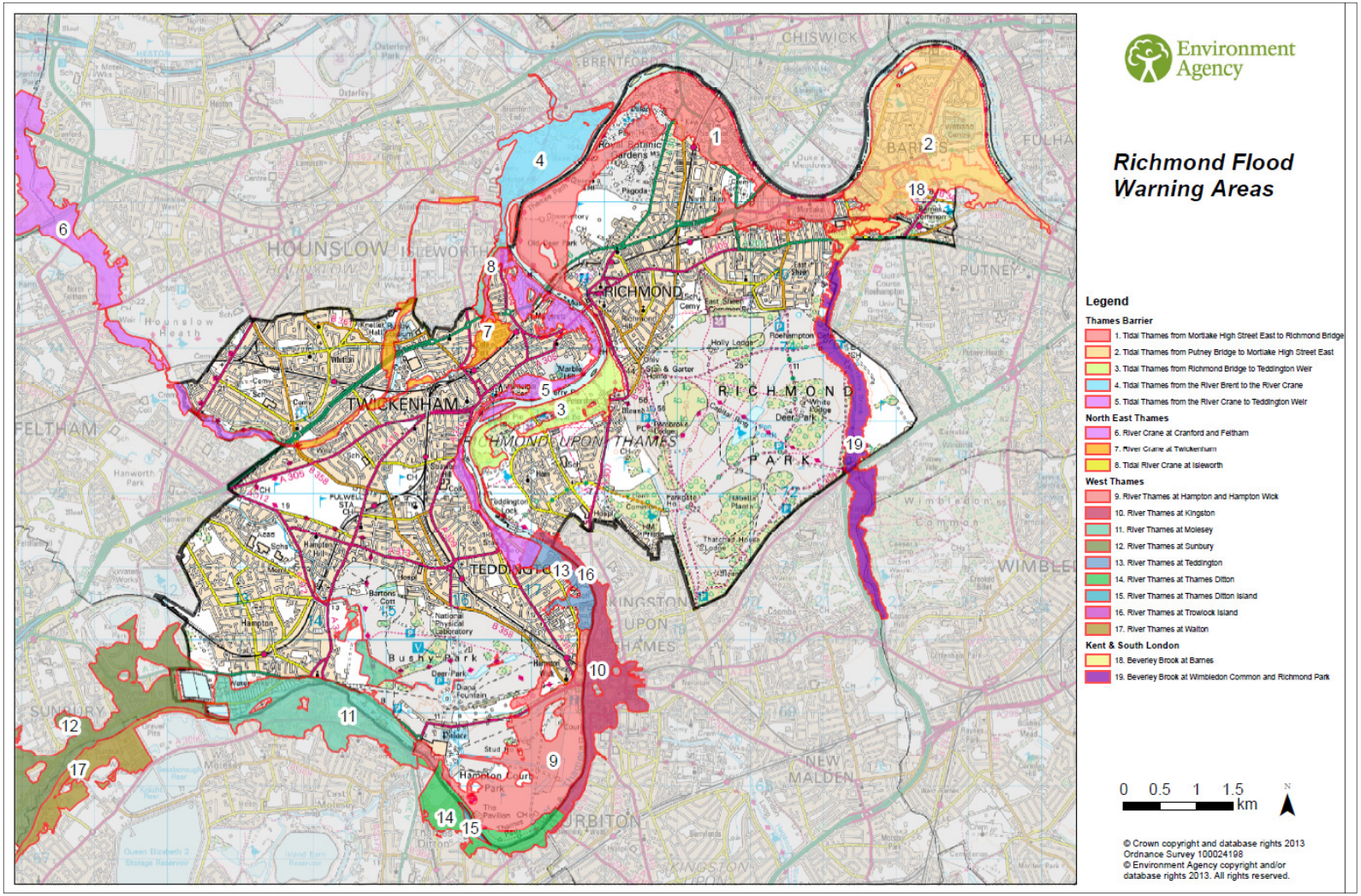


Figure 2-1 Environment Agency Flood Warning Areas

2.6 Impact of Climate Change

2.6.1 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 to the UK Climate Projections 2009[16]. 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.

Implications for Flood Risk

2.6.2 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.

2.6.3 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.

2.6.4 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 the future.

2.6.5 The Thames Barrier is currently used for the protection of West London from fluvial flooding. Climate change will increase the number of closures required to protect against rising tides and with increased and more intense rainfall, fluvial flood risk will also increase. The TE2100 plan states that Thames Barrier will be less and less available to assist with managing this fluvial flood risk as it will need to be conserved for tidal flood risk management – the purpose for which it was designed. The annual number of closures for the Barrier must be limited to reduce the risk of failure and therefore its use for fluvial flood risk management will be gradually reduced in the future.

Adapting to a changing climate

2.6.6 It is essential we respond and adapt to a changing climate 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.

2.6.7 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 LBRuT Flood Risk Management

2.6.8 Existing flood risk studies, covering LBRuT and the wider catchment, have assessed the impacts of climate change and flood risk and provide the evidence base for understanding

[16] United Kingdom Climate Projections 2009 http://ukclimateprojections.defra.gov.uk//

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.

2.7 Summary

2.7.1 This Section has afforded a summary of past and future flood risk associated with local sources in LBRuT 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 LBRuT are considered to be from main rivers and surface water.

3. RESPONSIBILITIES FOR FLOOD RISK MANAGEMENT

3.1 Overview

3.1.1 The responsibility for managing flood events can often lie with a number of different organisations or individuals. To add further complexity, the roles of organisations can vary according to the severity of the flood event for example a 1 in 10 year flood may be dealt with by the sewerage undertaker and the LLFA, whereas a 1 in 200 year event in the same location could involve all RMAs, emergency responders and central government. 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.

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

- Lead Local Flood Authority i.e. London Borough of Richmond upon Thames
- Environment Agency
- Sewerage undertaker i.e. Thames Water Utilities
- Highways Authority i.e. London Borough of Richmond upon Thames and Transport for London

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

3.1.4 In addition, other legislation (such as the Highways Act 1980, Land Drainage Act 1991[17], Water Resources Act 1991[18], Civil Contingencies Act 2004) place duties and powers upon specific organisations and individuals of relevance to local flood risk management.

3.1.5 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 Richmond upon Thames

…as the Lead Local Flood Authority

3.2.1 LBRuT 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.

…as a Highways Authority

3.2.2 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[19] requires that LBRuT ensure that highways are drained of surface water and where necessary maintain all drainage systems.

…as a Category 1 Responder

[17] HSMO (1991) Land Drainage Act http://www.legislation.gov.uk/ukpga/1991/59/contents
[18] HMSO (1991) Water Resources Act http://www.legislation.gov.uk/ukpga/1991/57/contents
[19] HSMO (1980) Highways Act http://www.legislation.gov.uk/ukpga/1980/66/contents

3.2.3 LBRuT is a Category 1 Responder under the Civil Contingencies Act 2004[20] 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 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 LBRuT has prepared a multi-agency flood plan[21] to allow all responding parties to work together on an agreed coordinated response to severe flooding.

…as a Local Planning Authority

3.2.4 As a Local Planning Authority, we have a responsibility to consider flood risk and sustainable drainage in our strategic land use planning documents and in the development of our Local Plan[22]. We are also required to consider and take account of flood risk when making decisions on planning applications.

3.2.5 The National Planning Policy Framework[23] (NPPF) and supporting guidance[24] require LPAs to undertake a SFRA and to use their findings, and those of other studies, to inform strategic land use planning including the application of the Sequential Test which seeks to steer development towards areas of lowest flood risk prior to consideration of areas of greater risk. The LBRuT SFRA was produced in 2008 and updated in 2010 to support the Local Plan. When considering applications for development, site-specific flood risk assessments are a requirement of the NPPF. Local requirements for these are outlined in the LBRuT Strategic Flood Risk Assessment. LBRuT may consider removing householder permitted development rights for impermeable hard standings as urban creep is a contributor to surface water flooding.

…as Regulator of Ordinary Watercourses

3.2.6 LBRuT has the powers of ordinary watercourse consent under the Land Drainage Act 1991[25], which were transferred from the Environment Agency to LLFAs as of the 6th 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. LBRuT 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.

[20] HSMO (2004) Civil Contingencies Act http://www.legislation.gov.uk/ukpga/2004/36/contents
[21] London Borough of Richmond Upon Thames Multi Agency Flood Plan, 2012 http://www.richmond.gov.uk/lbrut_flood_plan.pdf
[22] See LBRuT website for latest version of Local Plan http://www.richmond.gov.uk/local_plan
[23] Communities and Local Government (2012) National Planning Policy Framework http://planningguidance.planningportal.gov.uk/
[24] Communities and Local Government (2014) National Planning Policy Guidance http://planningguidance.planningportal.gov.uk/
[25] HMSO (1991) Land Drainage Act http://www.legislation.gov.uk/ukpga/1991/59/contents

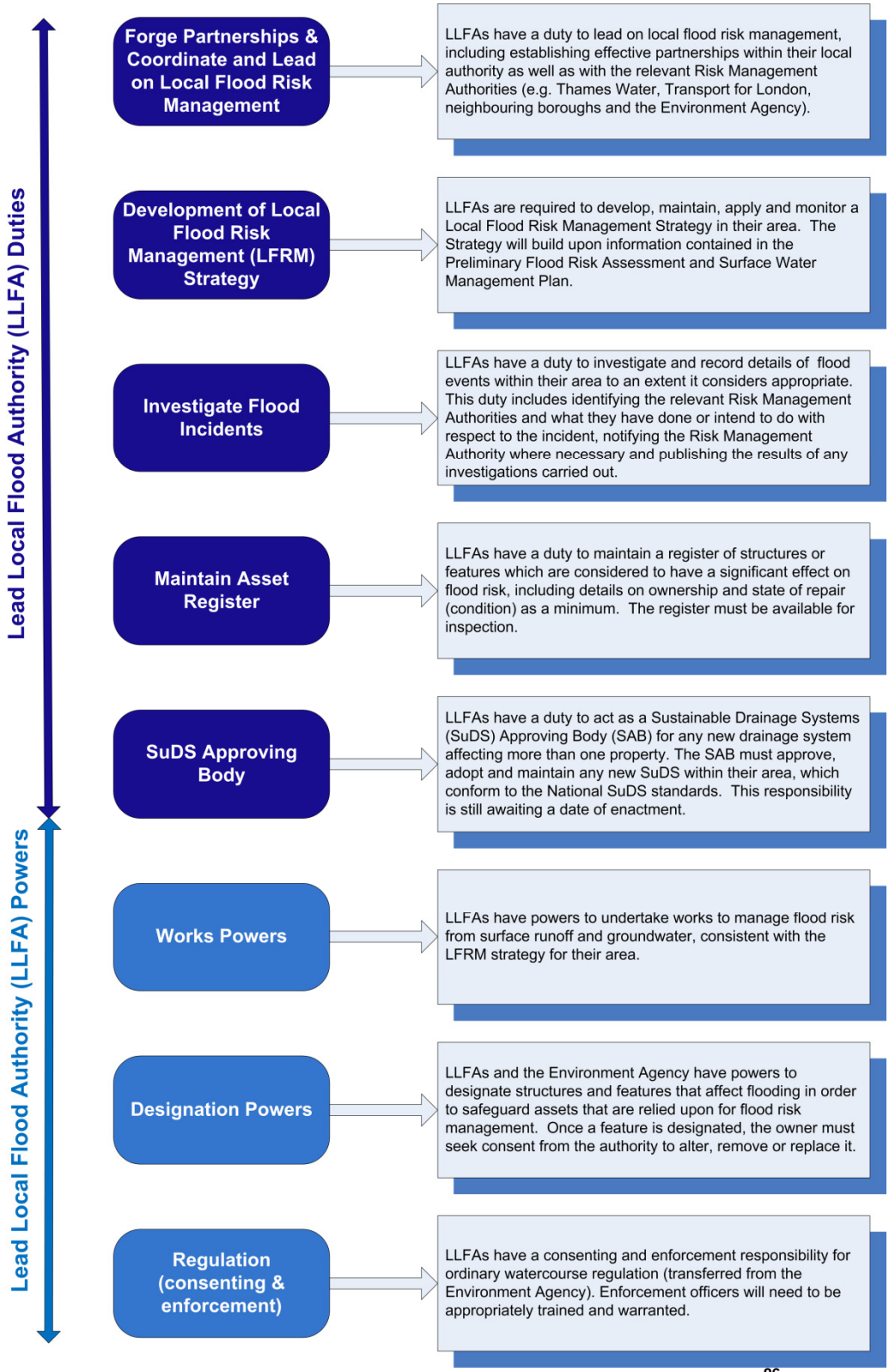


Figure 3-1 Duties and Powers for LBRuT under the Act[26]

[26] LBRuT will become a SuDS Approving Body upon the enactment of Schedule 3 of the Flood and Water Management Act 2010

Environment Agency

3.2.7 The Environment Agency are designated a RMA under the Act. The Environment Agency are responsible for managing flooding from main rivers or the sea and have a responsibility to provide a strategic overview for all flooding sources and coastal erosion. The Environment Agency are a statutory consultee on flood risk in the planning process and also regulate third party works on main rivers.

Thames Water Utilities Ltd

3.2.8 As the Sewerage undertaker serving LBRuT, Thames Water is designated a RMA under the Act.

3.2.9 Thames Water is responsible for removing wastewater from premises and draining surface water from the roofs and yards and outbuildings appurtenant to premises.

3.2.10 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[27].

Transport for London

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

3.2.12 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 Responsibilities of Other Organisations / Individuals

3.3.1 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).
- **Individuals** can reduce flood risk by taking action such as disposing of leaf litter rather than letting it block drains and getting involved in local flood risk management activities.

3.3.2 LBRuT 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

3.3.3 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

[27] Thames Water Utilities website http://www.thameswater.co.uk/

the publication 'Prepare your property for flooding' available on the Environment Agency website[28] and in Part H of the Building Regulations.

Riparian Owners

3.3.4 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, this includes piped and buried watercourses. 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.

3.3.5 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 LBRuT for formal consent for any works in or adjacent to an ordinary watercourse,
- To apply to the Environment Agency for formal consent for development within 8m of a Main River or 16m of the landward side of the Thames Tidal Defences.

3.3.6 LBRuT 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 Agency for Main Rivers. Further information for riparian owners is available in the Environment Agency publication 'Living on the Edge'[29] and the government licence information[30].

[28] Environment Agency website - 'Prepare your property for flooding' https://www.gov.uk/prepare-for-a-flood
[29] Environment Agency (2012) 'Living on the Edge' https://www.gov.uk/government/publications/riverside-ownership-rights-and-responsibilities
[30] https://www.gov.uk/flood-defence-consent-england-wales

4. OBJECTIVES FOR MANAGING LOCAL FLOOD RISK

4.1 London Borough of Richmond upon Thames's Local Objectives

4.1.1 LBRuT's objectives for managing local flood risk, which emerged as a result of discussions between LBRuT officers and representatives from RMAs, are set out below:

London Borough of Richmond upon Thames Objectives

- Encourage direct involvement in decision making through the establishment of and maintaining partnerships with key organisations, including the Environment Agency and Thames Water
- Improve our knowledge and understanding of the interactions between different sources of flooding in Richmond Borough
- Encourage residents, businesses and local landowners to take action and contribute to the management and reduction of flood risk
- Target resources where they have the greatest effect by adopting a risk-based approach
- Contribute to wider social, economic and environmental outcomes by encouraging sustainable multi-benefit solutions for the management of local flood risk

4.2 National Flood Risk Management Objectives

4.2.1 The objectives for the LBRuT Strategy have been developed in line with the Environment Agency's National Flood and Coastal Erosion Risk Management Strategy for England[31]. This 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,
- **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.

[31] Environment Agency (2011) National flood and coastal erosion risk management strategic for England https://www.gov.uk/government/publications/national-flood-and-coastal-erosion-risk-management-strategy-for-england

Guiding Principles for Local Flood Risk Management

4.2.2 The National Strategy 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. Richmond Council has used these to guide the development of objectives and identification of measures to deliver local flood risk management within Richmond Borough.

Table 4-1 Guiding Principles for Local Flood Risk Management

Proportionate and risk based approach	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.
A catchment based approach	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.
Community focus and partnership working	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.
Beneficiaries encouraged to invest	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.
Sustainability	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.
Multiple benefits	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.

5. DELIVERY OF LOCAL FLOOD RISK MANAGEMENT

5.1 Overview

5.1.1 This section describes the measures and actions that form the basis of the London Borough of Richmond upon Thames Local Strategy, outlining:

- Proposed measures to deliver the objectives,
- Timescales to implement measures, and
- How the measures will be paid for, identifying costs and benefits.

5.1.2 It is appreciated that there is overlap and interaction between the delivery of specific local flood risk management measures and the general exercising of duties and powers by LBRuT under the Act. As a result, this Section firstly provides a brief description of how LBRuT is proposing to discharge its duties and responsibilities under the Act, followed by identification of the proposed local flood risk management measures and how they will be delivered.

5.1.3 The LBRuT website[32] provides the latest information on flood risk management in LBRuT.

5.2 Delivery of Duties under the Act

Forge Partnerships and Lead on Local Flood Risk Management

Richmond Flood Group

5.2.1 Richmond Council's Environment Directorate leads on local flood risk management. This includes officers from Development and Street Scene, Planning Policy, Highways, Health/Safety & Resilience, Network management and Street Care. The Richmond Flood Group also liaises when and where required with other departments, including with ICT and GIS, for example for mapping purposes. This group also reports, as and when required, to the Council's Strategic Cabinet Member for Environment, Planning, Parks and Highways.

Local Stakeholders

5.2.2 Local resident associations and community groups, local groups with environmental interests and interests in flood risk management, including for example the South West London Environment Network and Friends of the River Crane Environment (FORCE), as well as local retail and business associations.

South West London Strategic Flood Group

5.2.3 The South West London Strategic Flood Group was formed in 2011 and reports to the Thames Regional Flood and Coastal Committee. The South West London Strategic 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 meets quarterly to share best practice and understanding of flood risk across South West London, and, where possible, provide coordinated and collaborative management of flooding.

[32] LBRuT Council http://www.richmond.gov.uk/flooding

Regional Flood and Coastal Committee

5.2.4 The Thames Regional Flood and Coastal Committee[33] (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,
- 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.

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

Investigate Flood Incidents

5.2.6 Section 19 of the Flood and Water Management Act states that, on becoming aware of a flood in its area, a lead local flood authority, must to the extent that it considers is necessary or appropriate, investigate the cause and notify the relevant authority who have the duty to resolve the flooding.

5.2.7 The Council will therefore carry out an initial appraisal where internal flooding of a single residential property, business or office premises has occurred, or where a flooding incident impacted on an identified item of critical infrastructure (as detailed in section 2-4). This initial appraisal will determine the main source of flooding and therefore the risk management authority responsible for resolving the incident, who will then be notified.

5.2.8 Where the source of flooding is deemed to be the responsibility of Richmond Borough Council ie. flooding from ordinary watercourses, surface water or groundwater, a full investigation will be carried out, except where the source of flooding is ground water and where this only affects one single property.

5.2.9 A summary of the results of the full flood investigations will be published on the Council's website. All flood reports will be recorded to extend the Council's historic incident records.

Maintain an Asset Register

5.2.10 Richmond Council has collected gully asset inventory data and keeps a record of blocked gullies; any new assets are added as and when notified. The asset register also contains Thames Water assets for clean water and waste water. Data from the Drain London Portal and the Environment Agency is also available.

5.2.11 In the future all data will be evaluated and where appropriate transferred to FloodStation, the central asset register. This is a web-based asset management tool for drainage assets developed by the London Drainage Engineers Group (LoDEG) to be used by all London boroughs.

[33] Environment Agency Website: Thames Regional Flood and Coastal Committee https://www.gov.uk/government/groups/thames-regional-flood-and-coastal-committee

SUDS Approving Body

5.2.12 Richmond Council will take the appropriate steps to enable the new SuDS Approving Body (SAB) function to be delivered within the timescales required by Defra, once further information and updates on the SAB implementation and final confirmed dates have been published.

Powers to do Works and Designate Structures

5.2.13 There are no formal procedures specific to Richmond Borough, however should any structures requiring designation be identified, Richmond Council would use the guidance notes produced by Defra that outline the formal procedure for undertaking this process.

Regulation of Ordinary Watercourses

5.2.14 LBRuT has powers of ordinary watercourse consent under the Land Drainage Act 1991, which were transferred from the Environment Agency to LLFAs as of the 6th 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.

5.3 Delivery of Local Flood Risk Management Measures

5.3.1 For each of the local flood risk management objectives, potential measures were identified for further consideration. The measures in the Action Plan and as set out in Table 5-1 below were informed by discussions between Council officers, RMAs and the results from the online survey undertaken as part of the community engagement exercise described in Appendix C.

5.3.2 Table 5-1 outlines the measures agreed to deliver the local flood risk management objectives for the LBRuT.

Table 5-1 LBRuT Local Flood Risk Management Objectives and Measures

Objective	Measures to achieve the objective
Encourage direct involvement in decision making through the establishment of and maintaining partnerships with key organisations, including the Environment Agency and Thames Water	• Clarify roles and responsibilities of all risk management authorities and key stakeholders involved in dealing with flood risk in Richmond Borough • Lead and maintain the Richmond Council Flood Group and work together to understand and manage local flood risk issues • Establish and continue collaborative working relationships with neighbouring LLFA officers to manage cross-boundary flood risks, particularly with South West London boroughs • Establish effective data and information sharing agreements, particularly with all other risk management authorities, including the Environment Agency and Thames Water

Table 5-1 LBRuT Local Flood Risk Management Objectives and Measures	
Improve our knowledge and understanding of the interactions between different sources of flooding in Richmond Borough	• Collate and review information on ordinary watercourses • Develop a comprehensive flood investigation protocol, including a process map for reporting flood incidents, and agree thresholds for formal investigation to ensure that flood events are investigated where the Council deems it necessary and appropriate • Where necessary undertake studies with the support of key stakeholders to investigate potential flood risk interactions, and ensure additional modelling will be undertaken to fully assess the joint probability of fluvial and tidal floods • Compile and maintain a register of key structures and features that could affect flood risk in the Borough, including their significance, condition and ownership • Identify, and where necessary designate, privately owned structures or features to ensure they are protected and encourage their owners to maintain these assets
Encourage residents, businesses and local landowners to take action and contribute to the management and reduction of flood risk	• Develop strong and targeted communications to improve awareness and explain the level of risk affecting the residents and businesses of the Borough by providing a clear overview of the different types of flooding affecting the Borough • Enable and empower all partners, businesses and residents to respond effectively to flooding events by providing information and guidance through engagement activities (such as consultations, workshops etc) and highlight which actions they should be taking to manage flood risk • Work with the Environment Agency to understand the uptake of the flood warning service and encourage all other residents and businesses that are at risk of flooding to register for this service • Integrate updated and improved flood risk modelling, in particular in relation to surface water flood risks, into future flood emergency plans and procedures
Target resources where they have the greatest effect by adopting a risk-based approach	• Avoid building within flood affected areas, ensure new developments are designed to minimise and reduce flood risk and consider developing planning policies or guidance for areas that are susceptible to surface water flooding , taking account of future legislation and guidance on Sustainable Drainage Systems • Continue a pro-active approach to the management of the Council's assets, and target known problem areas e.g. gully clearing, ditches, leaf clearing • Develop an action plan and a robust approach for prioritising spending on schemes that are designed to reduce flood risk and improve the cost/benefit ratio
Contribute to wider social, economic and environmental outcomes by encouraging sustainable multi-benefit solutions for the management of flood risk	• Ensure that flood risk management schemes and works in the Borough enhance and improve biodiversity, water quality and the natural environment where possible and take account of the likely effects of climate change • Ensure that flood risk management schemes and works in the Borough have wider benefits which bring about positive social development • Ensure that flood risk management schemes bring about economic benefits

5.3.3 The Action Plan included in Appendix B sets out the actions proposed to deliver the above described measures, including timescales for delivery and opportunities for partnership working to deliver multiple benefits.

Prioritisation of Measures

5.3.4 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). 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.

5.3.5 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 including funding for biodiversity and ecology drivers,
- The measure delivers benefit and mitigation to areas identified as being at risk through LBRuT'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.

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

5.3.7 Current applications for Environment Agency Levy funding to carry out surface water investigations include:

- Haliburton Road – This site is adjacent to the River Crane, subject to fluvial and tidal flooding and located within Flood Zone 3b.
- Heath Road, Twickenham – Pluvial modelling shows surface water is flowing in an easterly direction towards the River Thames and pools at low points in the highway including the rail crossing at Heath Road. This has been verified using Council records from July 2007, however details of the flood source and exact location are not available. Further investigation has revealed flooding at Heath Road rail crossing may occur as frequently as four times a year.
- Mogden Lane – concerns have been raised over the capacity of storm drains in the Mogden Lane area, servicing the large wastewater treatment facility. It is perceived that subsequent storms in close succession may rapidly overload the system resulting in localised flooding.
- Petersham Road – Local topography has led to flood incidents in the past in the Petersham Farm area. Pluvial modelling has identified that surface water from the common in the east flows onto the Petersham Road and where kerb heights allow, pools at the lowest point which is an area of residential property and associated car parking at Petersham Farm.
- Burton's Road Ditch – Burtons Road has a history of localised flooding in recent years due to an existing ditch running alongside the highway. The ditch is prone to blockages due to over grown vegetation, debris and other blockages. There are some sections of the ditch which are piped culvert with insufficient diameter to carry the water from the ditch on to the Fulwell Golf Course causing overspill onto the highway.
- Ferry Road, Teddington – Ferry Road has a high occurrence of flooding, affecting both residential and commercial properties. Flap valves on the outfalls at the end of the road prevent surface water discharging into the Thames during high tide, causing water to back up in the road.
- Hampton Court Road – This site is situated largely within Flood Zone 3a and also within Flood Zone 3b the functional floodplain. Trowlock Island and the surrounding area is particularly vulnerable, subject to flooding in a 5% (1 in 20 year) event and it is recommended that the open space areas are preserved for flood storage purposes.
- Waldegrave Road – The junction between Waldegrave Road and Strawberry Vale has flooded during recent storms, highway manholes were dislocated due to overspill in the drainage system, causing flooding on the highway.

Quick Wins

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

- Create an online system for reporting flooding incidents from all sources
- Evaluate and transfer asset data to the central asset register FloodStation
- Review and consolidate Richmond Council's flood related web pages and combine the information into one easily accessible location on the website

5.4 Including Allowances for Climate Change in Local Flood Risk Management

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

5.4.2 In taking forward local flood risk management measures LBRuT 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 LBRuT 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 Funding Sources

5.5.1 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.

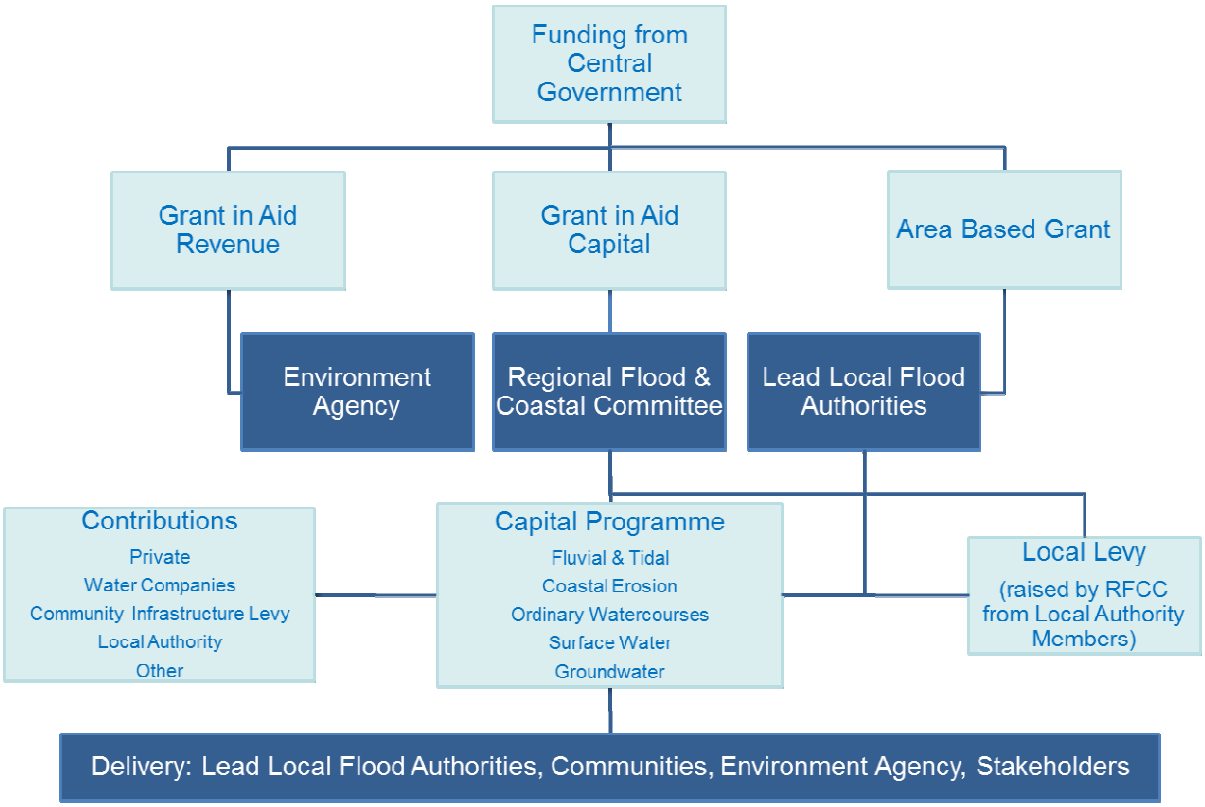


Figure 5-1 Summary of Lead Local Flood Authority Potential Funding Streams

Funding for Lead Local Flood Authorities Responsibilities

5.5.2 The Government has committed funding annually to support LLFAs in their 'new' flood management roles up to 2015. 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.

Funding for Lead Local Flood Authorities SuDS Approving Body Preparation

5.5.3 Defra has made additional funding available, for 2014-2015, to assist LLFAs in setting up and preparing for their role as a SAB under Schedule 3 of the Flood & Water Management Act 2010. The funding is intended to assist LLFAs to put the required systems, procedures and resources in place to fulfil their duties as a SAB, when they are enacted. The funding is a one-off payment and it is intended that future funding of this duty will, at least in part, be funded through application fees, prescribed by central government, for SuDS Drainage Applications.

Funding for Flood Risk Management Studies and Schemes (Projects)

5.5.4 Flood risk management projects are mainly 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)

5.5.5 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 process, cased on local willingness to contribute towards the benefits that would be delivered,
- The programme of capital works will be prioritised based on the damages being prevented by the project, and
- A higher proportion of capital projects can be eligible for some government funding, subject to resources being available.

Local Levy

5.5.6 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.

5.5.7 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

5.5.8 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.

5.5.9 In taking forward flood risk management activities Richmond Council will need to consider securing funding from alternative sources, including Central Government, other RMAs and stakeholders and private beneficiaries. One of the key aspirations of Richmond Council is to maximise multi-beneficial outcomes of new schemes or activities. This could open up more avenues of internal revenue than purely flood risk management, particularly where measures address existing core activities for the Council.

5.5.10 Whilst the process of attracting funding from private sources is still in its infancy, Table 8-1 highlights possible sources of funding that could contribute to the delivery of flood risk management projects or schemes.

Table 5-2 Potential Sources of Funding	
Funding Source	**Description**
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)[34]	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 and 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. From April 2015, the pooling of Section 106 contributions towards a specific type or piece of infrastructure will be limited to not more than five planning obligations; this will mean that CIL will be the principal means of generating developer contributions towards new infrastructure provision, and Section 106 obligations will be restricted to site-specific matters only.
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.

5.5.11 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.

5.5.12 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.

5.5.13 Further information on the different funding sources is available in the Defra guidance document 'Partnership Funding and Collaborative delivery of local flood risk management'[35].

Maintenance Activities

5.5.14 In the current financial climate, there are significant pressures on the Council budget and funding for maintenance activities. Using the strategy Action Plan, historic flood evidence and communication with residents, Richmond 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

[34] 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
[35] 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

maximise effectiveness of limited funding. At the same time, we will seek to maximise income from external sources, including asset owners and riparian owners, for flood risk management.

5.6 LBRuT Action Plan

5.6.1 The LBRuT Action Plan is included in Appendix B. This details how the identified measures will be taken forward, the timescales for doing this, delivery partners and potential costs and funding routes.

5.6.2 The Action Plan will be reviewed annually or following a significant flood event and updated, where applicable, to reflect current priorities, funding availability, timescales for delivery and completed actions.

6. DELIVERY OF WIDER ENVIRONMENTAL OBJECTIVES

6.1 Overview

6.1.1 A Strategic Environmental Assessment (SEA) and Habitats Regulations Screening Assessment[36] (HRA) have been undertaken in accordance with the European Union adopted Directive 2001/42/EC[37].

6.1.2 Both the HRA and the SEA were developed alongside this Strategy and have been used to inform sustainable decision making throughout, including the development of social, economic and environment objectives, and the consideration of alternative options.

6.2 Strategic Environmental Assessment (SEA)

6.2.1 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.

6.2.2 A summary of the SEA process and findings are included in Appendix D

6.3 Habitats Regulations Assessment (HRA)

6.3.1 HRA involves assessing the impact of implementing the strategy objectives and measures on European Designated Sites, a summary of the HRA process and findings are included in Appendix D.

6.4 Water Framework Directive (WFD)

6.4.1 The strategy will complement work that is currently underway to comply with the requirements of the EU WFD. The Directive seeks to improve the management, protection and enhancement of the water environment. 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.

6.4.2 The chemical and biological water quality of the borough's rivers is in need of improvement. River water quality is affected, among other things, by urban run-off and polluted surface water outfalls. Under the Water Framework Directive (WFD), there are four river water-bodies in this borough that have been classified under the WFD – the Beverley Brook, the River Crane, the River Thames and the Portlane Brook (which includes the Longford River). The WFD classification scheme for water quality includes five status classes: high, good, moderate, poor and bad. All of the borough's water bodies fail to achieve the 'good' status under the WFD. The Beverley Brook, the Thames (upstream of Teddington) and the Crane water-bodies have been classified as having 'poor' ecological status and the Longford River has 'moderate' ecological status.

[36] Capita URS for the London Borough of Richmond upon Thames (2014) South West London Local Flood Risk Management Strategy – HRA for the London Borough of Richmond upon Thames
[37] European Union (2001) Strategic Environmental Assessment Directive
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32001L0042:en:NOT

7. STRATEGY MONITORING & REVIEW

7.1 Overview

7.1.1 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

7.2.1 LBRuT 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 LBRuT Flood Group and the South West London Flood Group.

7.3 Review

7.3.1 The Strategy has been developed to deliver a short to medium (5-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 LBRuT.

7.3.2 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 FRR 2009 to revise the Flood Risk Management Plans.

7.3.3 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.

APPENDIX A – FLOOD RISK MAPS

APPENDIX B – ACTION PLAN

APPENDIX C – SUMMARY OF COMMUNITY ENGAGEMENT

LBRuT wanted to engage the local community at an early stage in developing their Local Flood Risk Management Strategy in order to understand the perceptions and priorities that the general public have with respect to local flood risk and how it should be managed.

Online Survey

LBRuT ran an online survey between 20th December 2013 and 28 February 2014. Questions covered 5 broad areas:

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

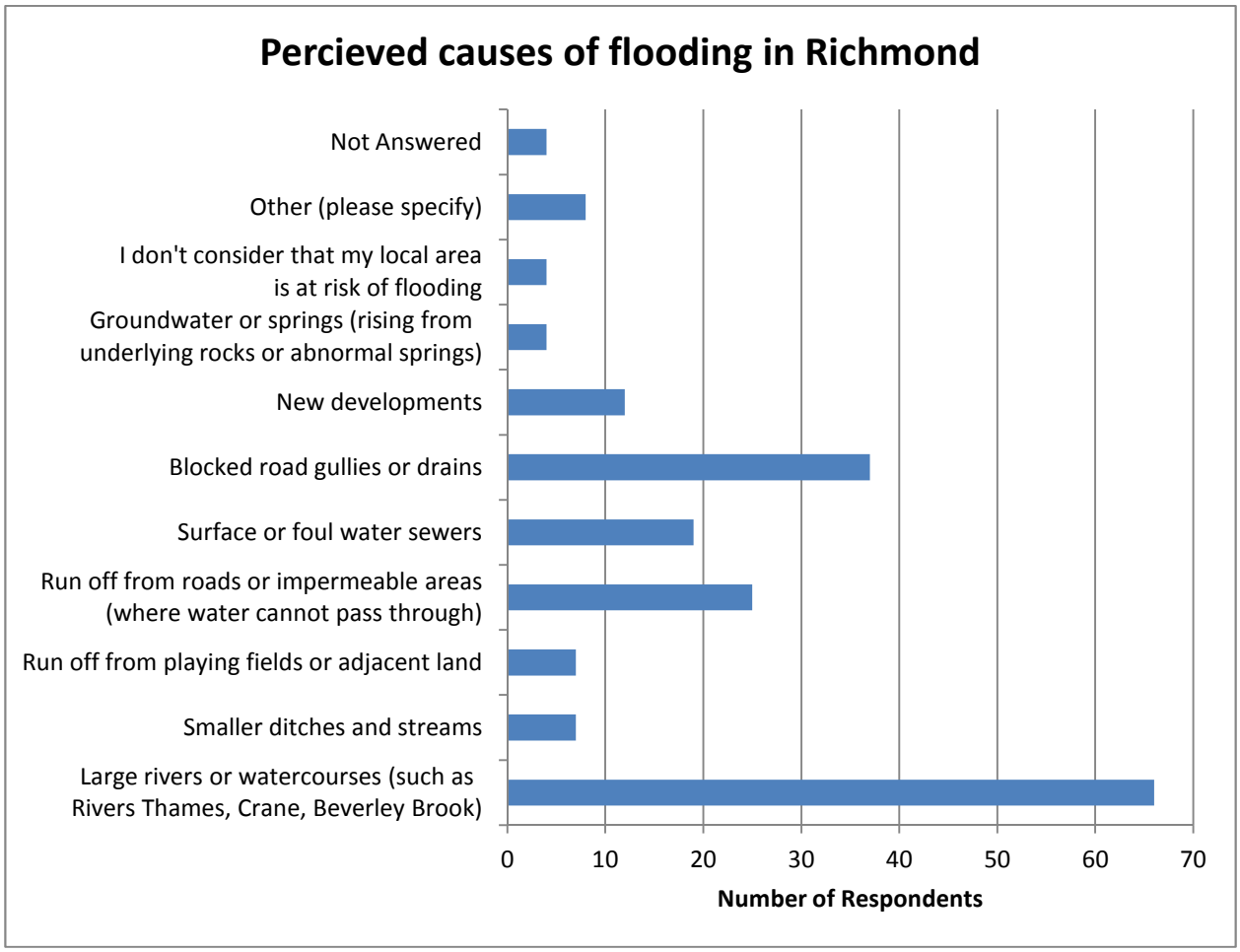
To promote the survey, LBRuT created a dedicated page on the Council website, distributed paper copies and issued a press release.

Survey Results

Responses

78 survey responses were received, the spatial distribution of these responses are shown in Figure 9 Appendix A.

Current understanding of flood risk in LBRuT



Greatest concern among respondents was flooding from large rivers or watercourses accounting for 85% of responses. 47% of responses stated blocked road gullies or drains as a main source of flood risk and 32% runoff from roads or impermeable areas. LBRuT records of historic flooding show approximately equal numbers of pluvial, fluvial and sewer flooding incidents suggesting surface water is actually more prevalent than perceived by residents.

Experiences of flooding in LBRuT

54% of respondents provided details of locations where flooding had been experienced, these are shown in Figure 9, Appendix A.

The three main causes of flooding were reported as:

Reported flooding sources
Large river overflown or burst its banks
Heavy Rainfall
Blocked road/or drain

The most commonly affected receptors were roads, driveways and gardens.

Communication of flood risk information

The top three responses to how people would like to be communicated within LBRuT regarding flooding were;

Method	Percentage Response
Council Website	71%
Leaflets and letters posted through your door	53%
Information and articles in local newspapers	27%

Priorities for Flood Risk Management

Respondents are concerned about:

- The effect of new development on flooding
- Availability of property insurance
- Availability of funding to building flood alleviation schemes and flood defences

The top three flood risk management priorities for residents and businesses in LBRuT are:

Priority	Percentage Response
Reducing risk of flooding to critical infrastructure, such as electricity substations	85%
Reducing risk of flooding to homes	81%
Keeping transport networks functioning (major roads and rail lines)	56%

Respondents think that flood risk management would be best achieved in LBRuT by

Priority	Percentage Response
Work with planners to ensure new development does not make flooding worse and where possible , reduce the risk of flooding	76%
More maintenance to reduce surface water flooding e.g. clearing road gullies and watercourses	56%
Undertaking work where opportunities arise, such as incorporating flood risk management measures during street improvements/maintenance work	55%

Funding for Flood Risk Management

The top three responses to who should contribute financially to flood risk management activities were:

- Property developers
- Central Government
- Environment Agency

How has this feedback influenced the strategy?

- In order to educate people about the sources of flooding in LBRuT, the Council are committed to reviewing and updating Richmond Council's flood related web pages to ensure all relevant information is in one easily accessible location. An article will also be published in the village newsletters on how residents can manage their own flood risk. Community groups will be contacted to raise awareness of the flood risk information available and briefing sessions will be held with business groups to inform those in flood risk areas where to go for further information.
- Richmond Council will continue a pro-active approach to drainage maintenance and asset management by prioritising key areas.
- Richmond Council has taken on board people's concerns regarding planning and will avoid building within flood affected areas, ensuring new developments are designed to minimise and reduce flood risk.
- Richmond Council will consolidate information on ordinary watercourses and work with both the Environment Agency and Thames Water to understand the interactions between fluvial and tidal flooding and the sewer system in order to address the causes of flooding in Richmond Borough.

APPENDIX D – SUMMARY STRATGIC ENVIRONMENTAL ASSESSMENT AND HABITAT REGULATIONS ASSESSMENT

Strategic Environmental Assessment (SEA)

The main aim of the EU SEA Directive is to "provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development". The Directive was transposed into English law as the Environmental Assessment of Plans and Programmes Regulations[38] (Statutory Instrument No. 1633) on 21 July 2004.

The SEA has been undertaken in 2 stages:

- **Scoping Report** – a combined Scoping Report has been produced for all six South West London LFRMS[39]. It sets out the framework for undertaking a SEA for the Strategies, together with the scope of the assessment, including the environmental issues that may be significantly affected by implementing the Strategies, evidence base and review of related plans, programmes and policies to inform that assessment.

- **Environmental Report** – an Environmental Report[40] has been produced for LBRuT that 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.

Both the Scoping Report and the Environmental Report have been subject to statutory consultation with the Environment Agency, Natural England, and English Heritage. Non-statutory organisations, including the London Wildlife Trust and the Wandle Trust have also been consulted.

The SEA objectives (for all of the South West London Boroughs) are as follows and have been assessed against each of the LBRuT objectives:

1. Protect and enhance human health and wellbeing
2. Raise awareness and understanding of local flooding and its dangers
3. Conserve and enhance biodiversity, wildlife corridors and habitats
4. Protect and enhance the water quality and hydromorphology of watercourses, WFD waterbodies and groundwater.
5. Minimise the risk of flooding on existing and future key assets, infrastructure, homes and businesses
6. Manage and mitigate the future effects of climate change in new and existing development
7. Conserve and enhance the historic environment, heritage assets and their settings
8. Protect, conserve and enhance the quality, character and availability of open spaces and natural resources

[38] HMSO (2004) Environmental Assessment of Plans and Programmes Regulations http://www.legislation.gov.uk/nisr/2004/280/contents/made
[39] Capita URS for the South West London Flood Group (2014) South West London Local Flood Risk Management Strategy SEA - Scoping Report
[40] Capita URS for the London Borough of Richmond upon Thames (2014) South West London Local Flood Risk Management Strategy SEA - Environmental Report for the London Borough of Richmond upon Thames

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').

Habitats Regulations Assessment (HRA)

The requirement for a Habitats Regulations Assessment (HRA) is set out within Article 6 of the EC Habitats Directive 1992 (92/44/EEC)[1], and interpreted into British law by Regulation 48 of the Conservation (Natural Habitats &c) Regulations 1994[2]. The ultimate aim of the HRA is to "maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest" (Habitats Directive, Article 2(2)). This aim relates to habitats and species, not the European sites themselves, although the sites have a significant role in delivering favourable conservation status.

A Habitats Regulations Assessment (HRA) screening assessment has been undertaken as part of the Strategy development. This screening exercise has assessed 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 Richmond Borough. 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.

The key findings of the HRA Screening assessment are set out in the Habitats Regulations Assessment for the Strategy.