APPENDIX A

LONDON BOROUGH OF BARKING AND DAGENHAM

LOCAL FLOOD RISK MANAGEMENT STRATEGY

FINAL DRAFT

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One borough; one community; London's growth opportunity

London Borough of Barking & Dagenham

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LONDON BOROUGH OF BARKING AND DAGENHAM

LOCAL FLOOD RISK MANAGEMENT STRATEGY

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FOREWORD

This Local Flood Risk Management Strategy sets out how Barking and Dagenham Council, working with its partners and stakeholders, will deal with flood risk in the Borough.

The Strategy communicates to all stakeholders, especially our residents, how various activities can assist in managing flood risk, such as better planning policy to ensure new development does not increase flood risk for its neighbours, the efficient management of surrounding landscape to reduce flooding at source and, to ensure that emergency responses are targeted where flood risk is greatest. There is also advice for residents on flood preparedness.

The activities identified in this Strategy can only contribute to the management of flood risk. It would not be realistic, even if we were not experiencing a period of austerity, to protect all property and infrastructure from flood risk. The activities ensure that the efforts of all involved, organisations and residents alike, reduce flood risk in practical ways, not only by reducing the probability of flooding, but also its impact by making sure that properties can cope in the event of a serious flood. The Strategy details the roles and responsibilities of all major stakeholders, including residents and community groups, so that there is better clarity and understanding about when different stakeholders should be involved.

Assessing levels of risk from flooding is a difficult task. With increasingly uncertain weather patterns, houses that have never been flooded in living memory may be at risk. We recognise householders may have concerns about using computer programmes that simulate rainfall events to determine areas of flood risk or areas likely to be at risk of flooding in the future, but these models are essential to ensure that available resources are used effectively in the highest risk areas to reduce the probability of properties being flooded and the consequent impacts.

This Strategy is our statement of intent as to what needs to be done to tackle flooding in Barking and Dagenham. We hope it will help you become better informed of everyone's responsibilities, how to find out your flood risk and what we can do to help you become safer.

Lynda Rice

Cllr Lynda Rice

Cabinet Member for Environment and Streetscene

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GLOSSARY

Term	Definition
Asset Management Plan	A five year plan for managing water and sewerage company infrastructure and other assets in order to deliver an agreed standard of service.
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.
Civil Contingencies Act	This UK Parliamentary Act delivers a single framework for civil protection in the UK. As part of the Act, Local Resilience Forums have a duty to put into place emergency plans for a range of circumstances including flooding.
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions.
Culvert	A channel or pipe that carries water below the level of the ground.
Environment Agency	Government agency reporting to Defra charged with protecting the environment and managing flood risk in England.
Indicative Flood Risk Areas	Areas determined by the Environment Agency as potentially having a significant flood risk, based on guidance published by Defra and the use of certain national datasets. These indicative areas are intended to provide a starting point for the determination of Flood Risk Areas by LLFAs.
National Flood and Coastal Erosion Risk Management Strategy	Strategy prepared by the Environment Agency. The strategy is required under the Flood and Water Management Act 2010 and describes what needs to be done by all involved in flood and coastal risk management to reduce the risk of flooding and coastal erosion, and to manage its consequences.
Flood defence	Infrastructure used to protect an area against floods such as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Risk Area	See entry under Indicative Flood Risk Areas.
Flood Risk Regulations 2009	Transposition of the EU Floods Directive into English law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.
Flood and Water Management Act 2010	An Act of Parliament which forms part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England and Wales. The Act was passed in 2010 and is currently being enacted in stages.
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a watercourse (river or stream).
Lead Local Flood Authority	Local Authority responsible for taking the lead on local flood risk management. The duties of LLFAs are set out in the Flood and Water Management Act 2010.
LiDAR	Light Detection and Ranging, a technique to measure ground and building levels remotely from the air, LiDAR data is used to develop topographic models typically called Digital Terrain Models and Digital Elevation Models.

Term	Definition
Local Resilience Forum	A multi-agency forum, bringing together all the organisations that have a duty to cooperate under the Civil Contingencies Act, and those involved in responding to emergencies. They prepare emergency plans in a co-ordinated manner and respond in an emergency. Roles and responsibilities are defined under the Civil Contingencies Act.
Local Planning Authority	The Local Authority or Council that is empowered by law to exercise planning functions for a particular area. This is typically the local borough or district Council.
Main River	Main rivers are a statutory type of watercourse in England and are usually larger streams and rivers, but may also include some smaller watercourses. A main river is defined as a watercourse marked as such on a main river map, and can include any structure or appliance for controlling or regulating the flow of water in, into or out of a main river. The Environment Agency's powers to carry out flood defence works apply to main rivers only.
Ofwat	The Water Services Regulation Authority responsible for economic regulation of the privatised water and sewerage industry in England and Wales.
Ordinary Watercourse	All watercourses that are not designated a main river, and which are the responsibility of Local Authorities or Internal Drainage Boards (where they exist) are termed ordinary watercourses.
Partner	A person or organisation with responsibility for the decision or actions that need to be taken.
Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England and Wales.
Pluvial Flooding	Flooding from water flowing over the surface of the ground; often occurs when the soil is saturated and natural drainage channels or artificial drainage systems have insufficient capacity to cope with additional flow.
Preliminary Flood Risk Assessment	Assessment required by the EU Floods Directive which summarises flood risk in a geographical area. Led by Local Authorities.
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, combined with the consequence of the flood.
Risk Management Authority	Defined by the Flood and Water Management Act as “the Environment Agency, a lead local flood authority, a district council for an area for which there is no unitary authority, an internal drainage board, a water company, and a highway authority”.
Sewer flooding	Flooding caused by a blockage or incapacity in a sewer, or a rainfall event that overwhelms the sewerage network.
Stakeholder	A person or organisation affected by the problem or solution, or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
Sustainable Drainage Systems	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques. Includes swales, wetlands and ponds.
Surface water	Rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving), and has not entered a watercourse, drainage system or public sewer. Refer to pluvial flooding.
Tidal	Relating to the actions or processes caused by tides.

ABBREVIATIONS

Term	Definition
AMP	Asset Management Plan
CFMP	Catchment Flood Management Plan
CLG	Government Department for Communities and Local Government
Defra	Government Department for Environment, Food and Rural Affairs
EA	Environment Agency
FRR	Flood Risk Regulations 2009
FWMA	Flood and Water Management Act 2010
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LRF	Local Resilience Forum
National FCERM Strategy	National Flood and Coastal Erosion Risk Management Strategy
NPPF	National Planning Policy Framework
PFRA	Preliminary Flood Risk Assessment
PLP	Property Level Protection
RBMP	River Basin Management Plan
RMA	Risk Management Authority
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plans
SUDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
TRFCC	Thames Regional Flood and Coastal Committee
TWU	Thames Water Utilities Ltd

EXECUTIVE SUMMARY

Flooding can have a negative impact on families, communities and livelihoods as seen during national flood events over the past 10 years, most notably during 2000, 2007 and 2012. Barking and Dagenham has a history of flooding with a considerable number of people working and living within areas that are susceptible to or have flooded in the past. As a result, it is important to consider how these risks can be minimised.

The Local Flood Risk Management Strategy for Barking and Dagenham sets out the framework for how the London Borough of Barking and Dagenham, as the Lead Local Flood Authority (LLFA), will carry out its duties and responsibilities under the Flood and Water Management Act 2010 and how it will work in partnership with other Risk Management Authorities (RMAs). This Strategy is an important tool, for both RMAs and the general public, to improve the knowledge and understanding of local flood risks through clear communication and the promotion of partnership working between RMAs to reduce flood risk to communities and business within the Borough.

Under the Flood and Water Management Act, local flood risk is defined as flooding from surface water, ordinary watercourses and groundwater. As a result, this Strategy has a greater focus on these flood risks in line with the Council's responsibilities, although where appropriate consideration has been given to interactions with other sources of flooding.

The Strategy sets out five key Objectives that have been selected by the Council to improve the management of local flood risk. These five Objectives are focussed on improving the current level of understanding of local flood risks, improving communication between RMAs and 'at risk' communities, enhancing flood management infrastructure and resilience measures, implementing appropriate emergency response systems, and promoting sustainable development. Through the development and implementation of these Objectives, local communities and businesses will ultimately become better informed and better prepared for future flood events.

Delivery of flood risk management measures will always be dependent on sufficient funding being available. As a result this Strategy sets out a framework for how the Council, other RMAs and key stakeholders aim to obtain the necessary funding to deliver the key Objectives and effectively manage local flood risks.

The Strategy is accompanied by an Action Plan which sets out the measures for how the Council will strive to meet the key Objectives over the next six years. The Action Plan will act as a tool for monitoring progress for delivery of local flood risk management measures. The Strategy should be viewed as a living document and will be updated in line with new information and any changes in policy, as well as being subject to a full review every six years to ensure that the strategy remains relevant and up to date.

1 INTRODUCTION

Recent history has shown the devastating impacts that flooding can have on lives, homes and businesses. A considerable number of people within Barking and Dagenham live and work within areas that have flooded in the past or that are susceptible to flooding in the future. Ideally communities and infrastructure should be moved away from these areas; however this is often not a practicable solution. For this reason careful consideration must be given to the range of alternative measures that can be put into place to minimise the risk to lives and livelihoods.

The London Borough of Barking and Dagenham is a **Lead Local Flood Authority** (LLFA) under the Flood and Water Management Act 2010. The Council must therefore prepare a Local Flood Risk Management Strategy that sets out the approach that has been adopted within the Borough to manage flood risks.

The Local Flood Risk Management Strategy is an important document for the on-going management of flood risk throughout the Borough. The Strategy sets out the framework for how the Council will work with other local flood risk management authorities and the general public to better understand and manage existing and future flood risks from all potential sources of flooding.

There are other risk management authorities also responsible for the management of flood risk within the Borough and surrounding area. These include:

- The **Environment Agency** who are the authority responsible for managing flooding from main rivers, such as the River Thames, and reservoirs;
- **Thames Water Utilities** who are the authority responsible for managing flooding from the public sewerage network;
- **Network Rail** and **Transport for London** who are responsible for managing flood risks within their railway and underground networks accordingly.

As LLFA, the Council will work to **ensure coordination between all relevant risk management authorities**. This will be reflected within the Strategy, with consideration also given to the way in which flooding from main rivers and the sewerage systems are managed.

The Strategy forms the framework within which communities have a greater say in local risk management decisions. In combination with the National Strategy, local strategies encourage more effective risk management by enabling people, communities, business and the public sector to work together.

The overall aim of this Strategy is to:

- Continue to improve understanding of flood risks within the Borough, both within the Council and general public;
- Ensure a clear understanding of the risks of flooding and erosion, nationally and locally, so that investment in risk management can be prioritised more effectively;
- Form links between the Local Flood Risk Management Strategy and local spatial planning;
- Continue to reduce flood risk to communities and business within the Borough, through fair and transparent means;
- Set out clear and consistent plans for risk management so that communities and businesses can make informed decisions about the management of the residual risk;
- Ensure good communication and coordination between the relevant risk management authorities for the management of flood risk;
- Encourage innovative management of flood and coastal erosion risks, taking account of the needs of communities and the environment (natural and historic);
- Ensure that emergency plans and responses to flood incidents are effective and that communities are able to respond properly to flood warnings; and
- Help communities to recover more quickly and effectively after incidents.

It will do this by acting as the evidence base for the decisions and actions required for managing flood risk. The minimum requirements for a local Strategy are summarised below:

- Identify Risk Management Authorities (RMAs) in the Local Authority's area;
- Describe the Flood and Coastal Erosion Risk Management functions that may be exercised by those Authorities in relation to the area;
- Set objectives for managing local flood risk;
- Describe the measures proposed to achieve those objectives;
- Define how and when the measures are expected to be implemented;
- Estimate the costs and benefits of those measures, and how they are to be paid for;
- Complete an assessment of local flood risk for the purpose of the Strategy;
- State how and when the Strategy is to be reviewed; and
- Show how the Strategy contributes to the achievement of wider environmental objectives.

THE PURPOSE OF THE STRATEGY

The Strategy is an important new tool to help understand and manage flood risk within Barking and Dagenham. The management of flood risk in the Borough will be marked by better knowledge of the risks in the region, better co-operation between organisations involved in flood risk management and better communication with the public about those risks and what can be done. One of the key purposes of this Strategy is to highlight the steps that are to be taken to ensure the above points are established and are operational.

It should be noted that the London Borough of Barking and Dagenham, as a LLFA, is only responsible for management of **local flood risk** - **defined as surface water flooding, ordinary watercourse flooding and groundwater flooding**. This area of responsibility is defined by the Flood and Water Management Act 2010. Therefore, this Local Flood Risk Management Strategy only addresses local flood risk and the interactions it might have with other sources of flood risk.

The Strategy is a living document and can be updated as new information or best practice becomes available or policies change. Notwithstanding this, it will also be subject to a full review every **six years** to ensure that it continues to reflect the way in which flood risk is managed within the Borough.

The Strategy is accompanied by an **Action Plan** that sets out how the Council will deliver the Strategy over the next six 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.

THE STRUCTURE OF THE STRATEGY

It is not possible to entirely prevent flooding from ever occurring in Barking and Dagenham, however it is possible to reduce flooding and be better prepared for flooding, including being better prepared for the potential effects of climate change. This Strategy therefore sets out how the Council are approaching flood risk management to meet the **five key objectives** (see Section 2) that have been selected by the Council to reduce the risk to lives and livelihoods.

The structure of the Strategy is set out below, with a summary of what each section aims to achieve.

Vision and Objectives Legislation Roles and Responsibilities	The Strategy starts with an overview of what the Strategy aims to achieve, why the Strategy needs to be prepared, the legislation that is governing the preparation of the Strategy, and the roles and responsibilities of the key flood risk management authorities.
Summary of Flood Risk	This is followed by a brief summary of flood risk throughout Barking and Dagenham to provide the context from which the proposed actions and measures have been developed.
Five Key Objectives for Flood Risk Management	The middle sections review the national and local objectives for managing flood risk and are structured around the five key objectives that the Council have selected to improve the management of local flood risk. The Strategy describes the measures that are currently in place and/or the measures that are proposed to meet each of the five key objectives and who is responsible for implementing them.

Delivery and Funding Mechanisms	The Strategy provides a brief summary of the key sources of funding that may be available to the Council, other relevant authorities and the general public to help with the delivery of schemes and reduction of flood risk within the Borough.
Action Plan	The proposed measures are incorporated into an Action Plan that describes the proposed measures and the proposed timeframe for implementation. The Action Plan is a 'live' document that will be updated as measures are progressed and new measures are proposed. A copy of the Action Plan is provided in Annex A.

2 THE COUNCIL'S VISION AND OBJECTIVES

The Council's vision is to continually improve the way in which flood risks are managed throughout the Borough to reduce the impacts of flooding on lives and livelihoods.

A key aim of the Local Flood Risk Management Strategy is to establish a series of local objectives that can be taken forward to deliver effective risk management through local measures and actions. The following local objectives have been developed based on the guiding principles of the Environment Agency's National Strategy (see Section 3) and are specific to Barking and Dagenham. Sections 6 to 10 of this Strategy detail the local objectives that have been proposed for Barking and Dagenham, along with the measures that will be used to achieve them.

It should be noted that London Borough of Barking and Dagenham, as LLFA, is only responsible for management of local flood risk - defined as flooding from surface water, ordinary watercourses and groundwater. This area of responsibility is defined by the Flood and Water Management Act 2010 (see Section 3). Therefore, the local objectives and actions proposed within this Strategy only address local flood risk and the interactions it might have with other forms of flood risk.

THE COUNCIL'S PROPOSED OBJECTIVES FOR BARKING AND DAGENHAM

Objective 1: Improve knowledge and understanding of local flood risk	Continue to develop understanding of flood risk across the Borough. This will offer multiple benefits such as enabling the Council to identify those areas at greatest risk, prioritising measures to address known risks, validating the accuracy of modelled flood mapping, improving understanding of sewerage flooding and flooding from culverts and drains, raising awareness of risks to communities and developers, assisting with funding applications, and informing emergency response plans.
Objective 2: Manage and reduce flood risk	Maintain, and improve where necessary, local flood risk management infrastructure, the natural environment and related systems to reduce risk in targeted areas. Look to reduce the risk of flooding and the potential damages that can be caused by flooding. Investigate significant flooding events to better understand their causes and potential management options.
Objective 3: Communicate with communities and work together to manage risk	Work with communities and businesses located in at risk areas to collectively understand local risk, share up to date information and work together to manage risk. Clarity will be provided regarding the responsibilities of local communities and the ways in which local communities, with the support of the Council, can contribute to the management and reduction of flood risk and ultimately help themselves be more resilient to flooding.

Objective 4: Develop, maintain and implement emergency response and recovery plans	It is not possible to eliminate all flood risks therefore the Strategy will aim to raise awareness of flood warning and response systems for the benefit of local communities and others involved in the management of flood risks. Ensure emergency plans will be regularly updated with flood risk information and exercised with all relevant parties to provide a co-ordinated preparation, response and recovery plan.
Objective 5: Make sustainable policy and planning decisions informed by flooding issues	This objective focuses primarily on how flood risks and related environmental issues are considered in land use planning and development proposals to manage flood risk through consideration of development vulnerability and predicted flood hazard.

3 LEGISLATION

THE FLOOD AND WATER MANAGEMENT ACT 2010

The Flood and Water Management Act (2010) places new responsibilities on Local Authorities to manage and lead on local flooding issues. The Act requires Local Authorities to deliver new duties and responsibilities with regard to managing flood risk, including:

- Taking an active role leading flood risk management as LLFAs;
- Cooperating with other relevant authorities to manage local flood risk;
- Duty to investigate flood incidents and report upon them;
- Maintain an 'Asset Register' of infrastructure and assets that have a significant influence on local flood risk;
- Designate 'features' that have a significant influence on local flood risk;
- Regulation of works on 'ordinary watercourses';
- Development and implementation of a Local Flood Risk Management Strategy; and
- Acting as a Statutory Consultee in the planning process for matters relating to surface water management *(as of April 2015, this function replaced the previously defined Sustainable Drainage Systems Approval Body as originally defined in Schedule 3 of the FWMA).*

This Strategy is one of the new requirements of the Flood and Water Management Act. The Act reinforces the need to manage flooding holistically and in a sustainable manner. This has grown from the key principles within Making Space for Water (Defra, 2005) and was further reinforced by the summer 2007 floods and the Pitt Review (Cabinet Office, 2008), implementing several key recommendations of Sir Michael Pitt's Review of the summer 2007 floods.

Specifically, in relation to Local Flood Risk Management Strategies, Regulation 9 of the Act states:

9. Local flood risk management strategies: England

(1) A lead local flood authority for an area in England must develop, maintain, apply and monitor a strategy for local flood risk management in its area (a "local flood risk management strategy").

(2) In subsection (1) "local flood risk" means flood risk from -
  (a) surface runoff,
  (b) groundwater, and
  (c) ordinary watercourses.

(3) In subsection (2)(c) the reference to an ordinary watercourse includes a reference to a lake, pond or other area of water which flows into an ordinary watercourse.

(4) The strategy must specify -
  (a) the risk management authorities in the authority's area,
  (b) the flood and coastal erosion risk management functions that may be exercised by those authorities in relation to the area,
  (c) the objectives for managing local flood risk (including any objectives included in the authority's flood risk management plan prepared in accordance with the Flood Risk Regulations 2009),
  (d) the measures proposed to achieve those objectives,
  (e) how and when the measures are expected to be implemented,
  (f) the costs and benefits of those measures, and how they are to be paid for,
  (g) the assessment of local flood risk for the purpose of the strategy,
  (h) how and when the strategy is to be reviewed, and
  (i) how the strategy contributes to the achievement of wider environmental objectives.

(5) The strategy must be consistent with the national flood and coastal erosion risk management strategy for England under section 7.

(6) A lead local flood authority must consult the following about its local flood risk management strategy -
  (a) risk management authorities that may be affected by the strategy (including risk management authorities in Wales), and
  (b) the public.

(7) A lead local flood authority must publish a summary of its local flood risk management strategy (including guidance about the availability of relevant information).

(8) A lead local flood authority may issue guidance about the application of the local flood risk management strategy in its area.

(9) A lead local flood authority must have regard to any guidance issued by the Secretary of State about -
  (a) the local flood risk management strategy, and
  (b) guidance under subsection (8).

The Flood and Water Management Act also places additional duties on the Environment Agency to provide a national strategic overview role for flood risk management. The Environment Agency has therefore produced a National Strategy for Flooding and Coastal Erosion Risk Management (the National Strategy). The Local Strategy prepared by the Council aligns with the Environment Agency's National Strategy that is discussed in subsequent sections.

LAND DRAINAGE ACT 1991

The Environment Agency and Barking and Dagenham Council also have additional duties and powers associated with the management of flood risk under the Land Drainage Act 1991. As the Land Drainage Authority, the Council must give consent for any permanent or temporary works that could affect the flow within an ordinary watercourse in order to ensure that local flood risk is not increased. The Environment Agency has a similar role for any permanent or temporary works that could affect the flow within a main river. The Land Drainage Act specifies that the following works will require formal consent from the appropriate authority:

- Construction, raising or alteration of any mill dam, weir or other like obstructions to the flow of a watercourse;
- Construction of a new culvert;
- Any alterations to an existing culvert that would affect the flow of water within a watercourse.

The Land Drainage Act also sets out the maintenance responsibilities riparian owners have in order to reduce local flood risks. Riparian owners, who are land owners with a watercourse either running through their land or adjacent to, have the responsibility to ensure that the free flow of water is not impeded by any obstruction or build-up of material within the watercourse. A riparian owner has the duty to accept the natural flow of water from upstream and has the right to convey the flows unimpeded downstream.

If any ordinary watercourse is found to be blocked or restricting the flow of water, the Council have the enforcement powers to serve notice on the relevant land owner under Section 25 of the Land Drainage Act requiring works to maintain the flow of water to be undertaken. If no action is taken to restore the natural flow of water, the Council may carry out the necessary works and recharge the full costs incurred to the relevant land owner.

FLOOD RISK REGULATIONS 2009

The Flood Risk Regulations (2009) are the transposition of the European Union Floods Directive into English and Welsh law. The Regulations required three main types of assessment / plan to be produced:

a) Preliminary Flood Risk Assessments (PFRA) completed by all LLFAs and the Environment Agency, published by Barking and Dagenham Council in 2012. Flood Risk Areas, at potentially significant risk of flooding, were identified. Maps and management plans were developed on the basis of these flood risk areas.

b) Flood Hazard Maps and Flood Risk Maps. The Environment Agency, on behalf of LLFAs, produced Hazard and Risk Maps for all sources of flooding in 2013. These maps are publicly available on their website.

c) Flood Risk Management Plans. The Environment Agency and LLFAs were required to produce Flood Risk Management Plans for ‘Flood Risk Areas’. The Environment Agency has produced the Thames Flood Risk Management Plan for the London area published in 2016, including a local document specific to Barking and Dagenham.

Chapter 6 of the Barking and Dagenham PFRA shows that Barking and Dagenham is located within an indicative ‘Flood Risk Area’ as identified by the Environment Agency. Since publication of the PFRA, the Environment Agency has confirmed that all of greater London is classified as a Flood Risk Area.

NATIONAL PLANNING POLICY FRAMEWORK 2012

The National Planning Policy Framework (NPPF) was published in March 2012 and outlines national policy on development and flood risk assessment. The NPPF states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.

Of key importance within the NPPF is the aspiration of 'sustainable development'. The NPPF sets out the three key dimensions of sustainable development to include economic, social and environmental aspects. Economic considerations can include ensuring that sufficient land of the right type is available in the right places and providing the required infrastructure. Social considerations can include creating a high quality built environment and ensuing safe and healthy communities. Environmental considerations can include protecting and enhancing our natural, built and historic environment and, as part of this, helping to improve biodiversity and mitigate and adapt to climate change. All of these aspects are relevant to the management of flood risk and delivery of flood management schemes.

The NPPF is supported by the National Planning Practice Guidance. The Flood Risk and Coastal Change section of the guidance (April 2015) advises on how planning can take account of the risks associated with flooding and coastal change in plan-making and the application process.

NATIONAL STRATEGY FOR FLOOD AND COASTAL EROSION RISK MANAGEMENT

The Flood and Water Management Act 2010 requires the Environment Agency to develop, maintain, apply and monitor a strategy for flood and coastal erosion risk management in England. The National Strategy[1] states that Government will work with individuals, communities and organisations to reduce the threat of flooding and coastal erosion.

The National Strategy also sets out a statutory framework that will help communities, the public sector and other organisations to work together to manage flood and coastal erosion risk. It will make sure that risks are managed in a co-ordinated way across catchments and along each stretch of coast. This includes the development of Local Strategies by LLFAs, as well as their strategic overview of all sources of flooding and coastal erosion.

The measures set out by the Council, as LLFA, within this Local Strategy are therefore compatible with the Environment Agency's National Strategy. The strategic aims and objectives of the National Strategy are illustrated in Figure 1.

[1] Defra, Environment Agency (2011) The National Flood and Coastal Erosion Risk Management Strategy for England https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228898/9780108510366.pdf

Figure 1 Strategic aims and objectives of the National Strategy

The National Strategy states that the Government will work with individuals, communities and organisations to reduce the threat of flooding and coastal erosion by:

- 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;
- Avoiding inappropriate development in areas of flood and coastal erosion risk and being careful to manage land elsewhere to avoid increasing risks;
- 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;
- 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;
- 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.

The National Strategy outlines six high level principles; these have been used to develop the five local objectives detailed from Section 6 of this report:

- **Community focus and partnership working**

  RMAs need to engage with communities to help them understand the risks, and encourage them to have direct involvement in decision-making and risk management actions. Working in partnership to develop and implement Local Strategies will enable better sharing of information and expertise, and the identification of efficiencies in managing risk;

- **A catchment and coastal "cell" based approach**

  In understanding and managing risk, it is essential to consider the impacts on other parts of the catchment or coast. Activities must seek to avoid passing risk on to others within the catchment or along the coast without prior agreement. In developing Local Strategies, LLFAs should ensure that neighbouring LLFAs within catchments are involved in partnerships and decision making. Strategic plans such as Catchment Flood Management Plans (CFMPs) and Shoreline Management Plans (SMPs) should be used to help set strategic priorities for local strategies. Regional Flood and Coastal Committees will have an important role in this approach;

- **Sustainability**

  LLFAs should aim to support communities by managing risks in ways that take account of all impacts of flooding (for instance on people, properties, cultural heritage, infrastructure and the local economy) and the whole-life costs of investment in risk management. Where possible, opportunities should be taken to enhance the environment and work with natural processes. Risk management measures should also be forward looking, taking account of potential risks that may arise in the future and being adaptable to climate change;

- **Proportionate, risk-based approaches**

  It is not technically, economically or environmentally feasible to prevent all flooding and coastal erosion altogether. A risk-based management approach targets resources to those areas where they have greatest effect. All aspects of risk management, including the preparation and implementation of Local Strategies, should be carried out in a proportionate way that reflects the size and complexity of risk. The assessment of risk should identify where the highest risks are and therefore the priorities for taking action. The Local Strategy provides an opportunity to agree a local framework for risk based decisions and interventions with local communities and stakeholders;

- **Multiple benefits**

  As well as reducing the risks to people and property, Flood and Coastal Erosion Risk Management can bring significant economic, environmental and social benefits. In developing and implementing Local Strategies, LLFAs should help deliver broader benefits by working with natural processes where possible and seeking to provide environmental benefits, including those required by the Habitats, Birds and Water Framework Directives. Measures such as the use of Sustainable Drainage Systems (SuDS) to manage risk should be considered wherever possible as they can also deliver benefits for amenity, recreation, pollution reduction and water quality. Further benefits can be realised in relation to regeneration, growth and emergency planning;

- **Beneficiaries should be encouraged to invest in risk management**

  The benefits achieved when flood and coastal erosion risks are managed can be both localised and private, through the protection of specific individuals, communities and businesses. In developing Local Strategies, LLFAs should consider opportunities to seek alternative sources of funding for managing local flood risk rather than relying solely on Government funds. However, LLFAs should consider the balance they wish to achieve in relation to major coastal and fluvial schemes, where the scale of local contributions required to make up partial national funding may be much more significant than that usually needed for surface water management schemes.

OTHER RELEVANT LEGISLATION

Flood Risk Management is affected by a range of other guidance and legislation. Some of these include:

- Public Health Act (1936);
- Wildlife and Countryside Act (1981);

- Countryside and Rights of Way Act (2000);
- Strategic Environmental Assessment Directive (2001);
- Civil Contingencies Act (2004);
- Water Framework Directive (2007);
- Climate Change Act (2008); and
- Conservation of Habitats and Species Regulations (2010).

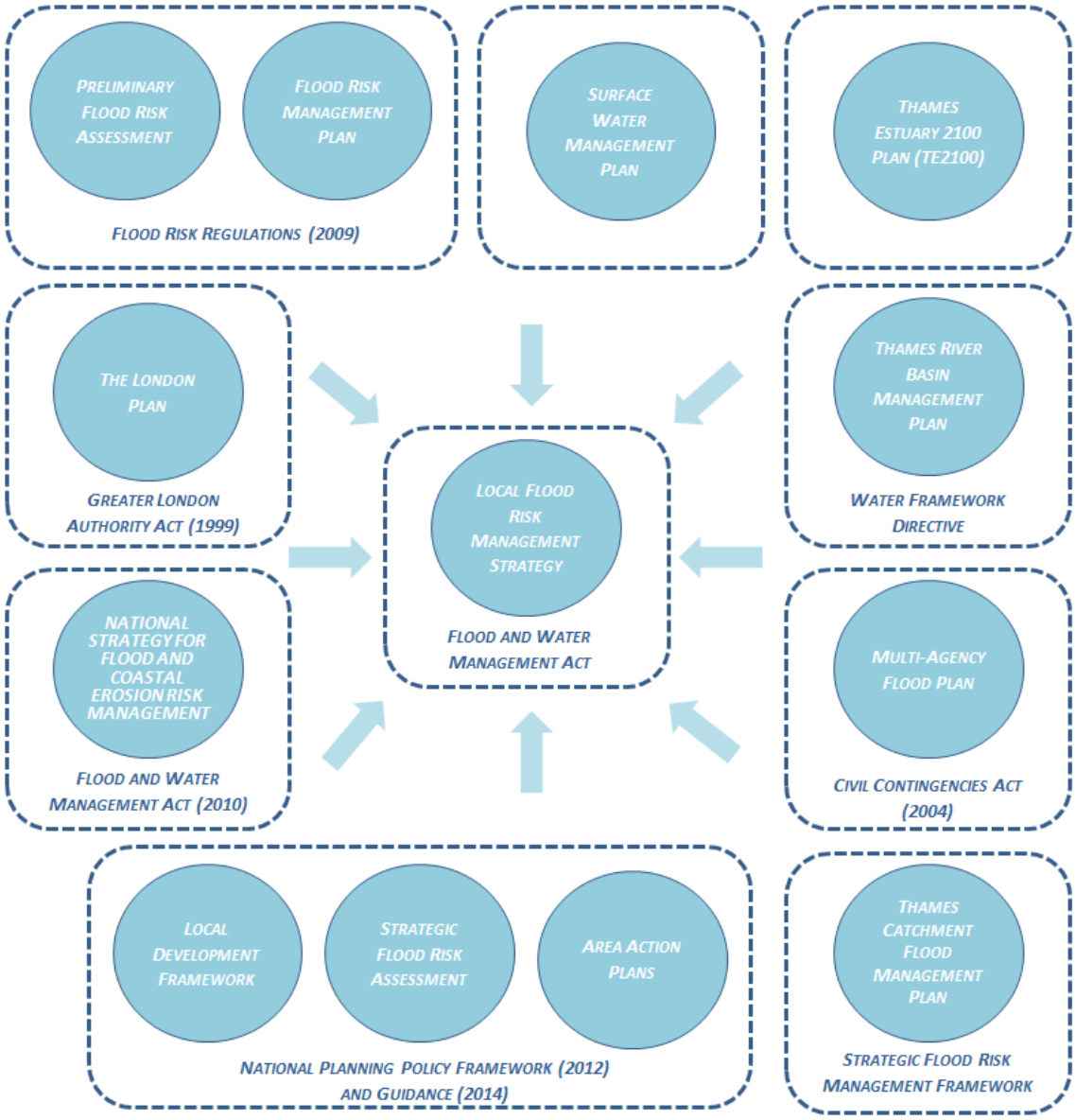
RELATED DOCUMENTS

A number of related documents have been prepared which provide details on the assessment and management of flood risk within Barking and Dagenham. It is intended that the Strategy is an over-arching document, drawing together existing flood risk plans and assessments into a single document that outlines how the Borough will manage local flood risk going forwards.

As part of the assessment of flood risk, the Strategy draws on technical information and historic records of flooding presented in the Surface Water Management Plan (SWMP)[2], Strategic Flood Risk Assessment (SFRA)[2] and Preliminary Flood Risk Assessment (PFRA)[2]. The Strategy also draws from wider environmental plans covering the Thames catchment including the Thames River Basin District Management Plan (Thames RBMP) and Thames Catchment Flood Management Plan (Thames CFMP) to ensure a coordinated approach to flood risk management across London. Figure 2 shows the key related documents and associated legislation. Information relating to these key documents can be found in Section 5.2.

[2] Available on request via Barking and Dagenham Council

Figure 2 Legislative drivers and supporting documents for the Strategy



4 ROLES AND RESPONSIBILITIES

4.1 OVERVIEW

Risk Management Authorities (RMA) are defined in the Flood and Water Management Act. Within Barking and Dagenham they comprise one of the following:

- London Borough of Barking and Dagenham as the relevant LLFA;
- The Environment Agency;
- Thames Water Utilities as the incumbent sewerage provider; and
- Transport for London and Network Rail.

The majority of responsibility for flood risk management in Barking and Dagenham resides with the key RMAs as outlined below. A detailed summary is provided in the following sections.

Table 1: Responsibilities of key flood risk management authorities

Source of flooding	Environment Agency	Barking and Dagenham Council	Thames Water Utilities	Transport for London & Network Rail
Main Rivers	✓			
Tidal Estuaries	✓			
Ordinary Watercourses		✓		
Surface Water Runoff		✓		
Highway Assets		✓		✓
Rail Assets				✓
Public Sewerage System			✓	
Groundwater		✓		
Reservoirs	✓			

The most significant flood risk issues in Barking and Dagenham are typically associated with fluvial (river) and tidal sources, most notably from the defended River Thames. However, following the significant nation-wide floods of 2007, greater consideration has been given to the potential risks posed by local sources of flooding such as surface water, groundwater and sewerage flooding.

A summary of the key risk management authorities is provided below, along with a description of the type of flood risk that each authority is responsible for managing:

4.2 BARKING AND DAGENHAM COUNCIL

Under the Flood and Water Management Act the London Borough of Barking and Dagenham, as the LLFA, is the lead authority responsible for managing **local flood risk** and fulfilling the LLFA's responsibilities under the Act as summarised in Section 3 of this Strategy. Local flood risk is typically associated with flooding from **surface water**, **groundwater** and **ordinary watercourses** as described in greater detail below.

FLOODING FROM ORDINARY WATERCOURSES

Any watercourse that is not designated as a main river is classed as an ordinary watercourse. Ordinary watercourses are usually smaller watercourses that are not considered strategic or critical in terms of flood risk and environmental status. However, ordinary watercourses still have the potential to cause significant localised flooding and this has been recognised within the Flood and Water Management Act. Ordinary watercourses can also include smaller lakes, ponds or other areas of water that flow into an ordinary watercourse and/or are the responsibility of the Council, such as Parsloes Lake. A map of key rivers within Barking and Dagenham is provided within Annex B.

Similar to main rivers, fluvial flooding from ordinary watercourses can occur when a watercourse has insufficient capacity to contain the river's flow, causing water to burst or overtop the riverbanks. Fluvial flooding can also be as a result of a breach in local formal or informal flood defences, blockage within the river channel, defective outfall structures, or inability of the river to discharge to a tidally influenced river due to high tide levels.

There are a number of ordinary watercourses located throughout Barking and Dagenham. The vast majority of these are located within the south of the Borough, south of the A13 and within the areas of Creekmouth, Dagenham Docks and the land in-between. Other significant ordinary watercourses include the upper reaches of Gores Brook between Parsloes Park and Goresbrook Park. The majority of ordinary watercourses flow in open channels, although many of these are maintained channels.

FLOODING FROM SURFACE WATER RUNOFF

Flooding from surface water is typically attributed to surface water runoff that has not entered a watercourse, land drainage system or public sewer. Surface water flooding can also often be attributed to groundwater emergence or sewer flooding (as discussed below) as these sources of flooding also result in the overland flow of water not associated with a watercourse or the sea. Similarly, it is common for burst water mains to be incorrectly identified as a surface water flooding incident.

Surface water flooding typically follows the ground's topography, flowing overland from areas of higher ground towards areas of lower ground. Predictive surface water modelling flood maps use this assumption to map areas that are most likely to be susceptible to surface water flooding, i.e. those areas that are located at the lowest elevations in the Borough or within local 'dips' in topography. Predictive surface water modelling flood maps also take into account barriers to the flow of water, such as elevated railway embankments, although smaller features such as boundary walls are harder to take into account.

FLOODING FROM GROUNDWATER

Groundwater emergence typically occurs after prolonged periods of heavy rainfall, causing the water table to rise. This can often cause flooding to underground structures such as basements

or services. Groundwater could also rise as far as the ground's surface and be recognised as overland flow. Groundwater flooding usually occurs in catchments which have a high water table, perched water table and/or responsive underlying geology such as chalk or gravels.

Groundwater emergence can also occur as a result of changes in adjacent tide and/or river levels that may cause a localised rise in hydraulically linked groundwater levels.

Groundwater flooding is often confused or masked by surface water flooding, as discussed above, as well as by burst water mains.

FLOODING FROM HIGHWAY ASSETS

The Council is also the local highways authority and, as such, is responsible for managing flood risk associated with **highway assets** in the Council's ownership (excluding infrastructure managed by Network Rail or Transport for London).

Flooding from highway assets typically includes flooding from the highway's surface water drainage system and structures such as culverts that pass beneath the carriageway. The Council is responsible for managing flood risk from adopted roads and adopted highway assets that are within the Council's ownership, which include the majority of highways within the Borough.

Flooding from highway assets typically occurs when there is insufficient capacity within the drainage network to cope with unusually high flows, or when drains/culverts become blocked thus reducing capacity to cope with 'normal' flows.

OTHER DUTIES

As the **local highways authority**, the Council is responsible for the adoption of public highways that are not adopted by Highways England, including the adoption of drainage assets (including SuDS) that serve the public highway. The Council must undertake regular inspection & maintenance to ensure highway drainage systems are clear and blockages cleared, where reasonably practicable, and has powers to undertake works to prevent the highway from flooding and to divert or carry out works to an ordinary watercourse as necessary.

The Council is also the relevant **Land Drainage Authority** and is therefore responsible for the consenting of works to ordinary watercourses and has powers to enforce un-consented and non-compliant works. This includes any works (including temporary) that affect flow within the channel of any ordinary watercourse (such as in channel structures or diversion of watercourses).

As the **Local Planning Authority**, the Council are responsible for the preparation of the local development plan, supported by an appropriate assessment of flood risk (in accordance with NPPF) and determining planning applications. The Council also ensures new development applications are supported by appropriate drainage proposals.

The Council is also a **category one responder** under the Civil Contingencies Act (2004) and the role is set out in the Borough's Multi Agency Flood Plan. The Council is responsible for the development of Emergency Plans and Business Continuity Plans; providing advice and assistance to businesses and voluntary organisations regarding business continuity management; developing arrangements for civil preparedness; making information available for public use; and maintaining a system for warning, informing and advising the public in the event of an emergency.

The Council also holds a **Memorandum of Understating** with the Environment Agency to attend blockages at Mayes Brook Outlet Trash Screen and Kingsbridge Tidal Sluice Trash Screen during major flooding incidents whereby the Environment Agency operatives may be overstretched and unable to attend.

4.3 ENVIRONMENT AGENCY

The Environment Agency is responsible for taking a strategic overview of the management of all sources of flooding and coastal erosion throughout England – as set out within the National Flood and Coastal Risk Management Strategy discussed in Section 3. The Environment Agency also has operational responsibility for managing the risk of flooding from **main rivers**, **estuaries**, **the sea** and **reservoirs**, and is also responsible for **flood forecasting** and **flood warning**.

The Environment Agency reviews the assessments, plans and maps produced by the London Borough of Barking and Dagenham to ensure compliance with the Flood Risk Regulations 2009. They provide grants to local RMAs to support the implementation of their powers and issue levies to LLFAs to support the implementation of coastal erosion and flood defence schemes. They support collaboration, knowledge-building and sharing of good practice.

The Environment Agency support communities to be flood resilient through sharing best practice and provision of information. They advise on the planning process and are a Statutory Consultee for the majority of development proposed in Flood Zones 2 and 3, and for works within or located within 20m of the top of the bank of a main river. The Environment Agency are also the consenting authority for Flood Risk Activity Permits for any works within 8m of the bank of a main river, or 16m if it is a tidal main river, and within 16m of a sea/tidal defence structure.

FLOODING FROM MAIN RIVERS

Main rivers are typically larger rivers or rivers that are considered critical in terms of flood risk or environmental status. Main rivers within Barking and Dagenham include the River Thames, River Roding, Barking Creek, Loxford Water, Mayes Brook, Ship and Shovel Relief Sewer, Gores Brook, Wantz Stream, Dagenham Breach and Beam River. A map of key rivers within Barking and Dagenham is provided within Annex B.

Fluvial flooding from main rivers can occur when a watercourse has insufficient capacity to contain the river's flow, causing water to burst or overtop the riverbanks. Fluvial flooding can also be as a result of a breach in local formal or informal flood defences, blockage within the river channel, defective outfall structures, or inability of the river to discharge to a tidally influenced river due to high tide levels.

The majority of main rivers flow in open channels, although within Barking and Dagenham many of these are maintained channels or culverts (specifically sections of Loxford Water, Mayes Brook, Ship and Shovel Relief Sewer and upper reaches of Wantz Steam).

FLOODING FROM TIDAL SOURCES AND ESTUARIES

The River Thames experiences a high tidal range at Barking and Dagenham, and typically this large tidal rage and potential for tidal surge poses the greatest flood risk to the Borough. Many of the other watercourses within Barking and Dagenham are significantly influenced by the tidal range of the River Thames, including the River Roding, Barking Creek, Dagenham Breach and Beam River.

Tidal flood risks are often attributable to tidal surges, wave overtopping, breach in tidal defences, or during an event greater than the standard of protection offered by tidal defences. Risks can also often be a result of high fluvial flows combined with high tide levels that prevent water from discharging to the downstream tidally influenced watercourse.

The Thames Estuary 2100 (TE2100) Plan is a strategic flood risk management document which sets out a number of recommendations and actions needed to manage flood risk to the end of this century. Further information on TE2100 is provided in Sections 5 and 6.

FLOODING FROM RESERVOIRS

Reservoir flooding is rare but could occur following the breach or overtopping of the reservoir embankments. A reservoir under the jurisdiction of the Environment Agency is typically defined as one that holds over 25,000 m^3 of water. Bodies within Barking and Dagenham that are large enough to be classified as a reservoir include the Beam Washlands and Mayes Brook Park Lakes. Reservoirs located in neighbouring Boroughs also pose a flood risk to Barking and Dagenham.

The likelihood of reservoir failure is low and all large reservoirs are stringently governed under the Reservoirs Act 1975. However, a large volume of water could escape with little or no warning if a failure were to occur. As such, the Environment Agency completed a programme of breach assessments to ascertain the areas at potential risk. However, the maintenance and regular inspection of the reservoirs is the responsibility of the owners. There are also a number of smaller lakes, balancing ponds and other water bodies in the Borough; the residual risk of flooding from these water bodies is unknown.

4.4 THAMES WATER UTILITIES LTD

The relevant water and sewerage authority, in this case Thames Water Utilities, is responsible for managing the risks of flooding from surface water, foul or combined **public sewerage systems** that serve more than one property. This can include sewer flooding, burst pipes or water mains or floods caused by system failures. Where there is frequent and severe sewer flooding, water and sewerage undertakers are required to address this through their capital investment plans. Funding priorities are defined using a five year cycle called Asset Management Plans (AMP). The AMP is the programme of work agreed with the Regulator (Ofwat). Thames Water Utilities are in the AMP6 period (2015 – 2020) and will soon be consulting on their 2020-2025 plan which will set out how Thames Water Utilities will provide water and sewerage services and the required investments during that period.

Thames Water Utilities have duties to act consistently with the National Strategy, have regards to the relevant Local Flood Risk Management Strategy, and cooperate with other authorities, including the sharing of data. Thames Water Utilities, as reservoir owners, also have responsibilities under the Reservoirs Act to produce on site plans.

Thames Water Utilities often adopt private sewers and sewers offered for adoption by developers and are a Statutory Consultee in the planning process when any connections to a public sewer are required. For existing sewers, Thames Water Utilities adopt existing sewers that pass Section 102 of the Water Industry Act 1991 - this requires the sewers to be properly designed, constructed and maintained. For new sewers, an agreement can be made with Thames Utilities to adopt a sewer prior to construction and developers will need to apply for a Section 104 Sewer Adoption. Sewers that are adopted by Thames Water Utilities will become part of the Thames Water Utilities sewerage network and maintained at their expense.

A key distinction between the responsibility for surface water and sewer flooding between Thames Water Utilities and the London Borough of Barking and Dagenham is that Thames Water Utilities have an agreed level of service with their industry regulator, Ofwat, for sewerage capacity. The agreed level of service states that *"Increased demands on the sewerage system should not put properties at risk of flooding from storm events with a return period less than 1 in 20 years".* If flooding occurs during an event that exceeds this defined level of service, then it is classified as surface water flooding. Thames Water Utilities is responsible for internal and external property flooding caused by sewer systems operating under their normal design conditions.

FLOODING FROM THE SEWERAGE SYSTEM

Sewers typically flood when there is insufficient capacity within the sewerage network to cope with unusually high flows, or when sewers become blocked thus reducing capacity to cope with 'normal' flows. Within Barking and Dagenham, flooding from sewers may also occur if their outfall is below the receiving river water level, particularly during times of high tide within tidally influenced rivers. Water will typically emerge from manholes or gullies, subsequently flowing overland from areas of higher ground towards areas of lower ground. As many of the sewers within Barking and Dagenham are combined sewers (i.e. carrying both foul and surface water flows) this water can often be heavily polluted and can pose a risk to health.

Flooding from sewers can be difficult to predict as it is often dependent on the capacity of the sewers during a rainfall event (i.e. presence of a partial or full blockage). However, if a sewer were to surcharge and cause flooding, the areas at greatest flood risk would most likely be similar to those at risk from surface water flooding as any water that emerges from the sewerage network would respond to surrounding topography in a similar way to rainfall.

Flooding from sewers is often confused or masked by surface water flooding or groundwater emergence, as discussed above. Sewer flooding and surface water flooding is also intrinsically linked, as surface water flooding typically occurs when there is insufficient capacity within the sewerage system (or the sewerage system is overwhelmed by rainfall intensity) for the system to receive surface water runoff.

4.5 OTHER RESPONSIBLE AUTHORITIES

Network Rail and **Transport for London** are responsible for the effectual drainage of surface water from their infrastructure and for managing flood risks that are associated with or may affect their assets. They are responsible for ensuring that drains, including kerbs, gullies and ditches, and the pipe network which connect them to the sewers, are effective and correctly maintained.

4.6 LANDOWNERS AND DEVELOPERS

Although not classified as a key risk management authority, landowners that own land through which an ordinary watercourse or main river flows are the responsible '**riparian owner**' for the watercourse. The Environment Agency has developed a guide entitled "Living on the Edge" that provides specific advice regarding the rights and responsibilities of riparian landowners.

Landowners and developers have the primary responsibility for protecting their land and property against the risk of flooding, but must not build defences that have an adverse impact to adjacent properties. They are also responsible for managing the drainage of their land without increasing flood risk elsewhere, and for the management of flood risks from private sewerage systems.

The responsibilities of landowners and developers are discussed in greater detail in Section 8.

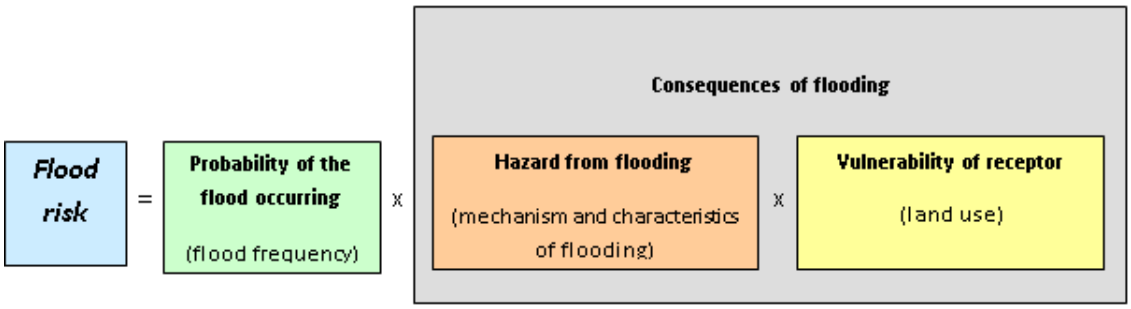
5 SUMMARY OF FLOOD RISK

This section of the Strategy provides an overview of flood risk throughout the Borough to provide the context from which the objectives and associated measures will be derived.

5.1 HOW FLOOD RISK IS QUANTIFIED

Flood risk is defined as a combination of the *chance* (or probability) of a particular flood occurring and the *impact* (or consequence) that the flood would cause if it occurred. This is illustrated in Figure 3.

Figure 3 Conceptual definition of flood risk



The consequences of flooding are typically assessed based on the hazard that flooding would pose to potential receptors (such as the depth or velocity of flood waters), as well as the vulnerability of the receptors to flooding (for example a residential care home would be considered more vulnerable than a leisure facility).

The consequences of flooding can also be assessed in quantitative financial terms to help prioritise and direct funding. Analysis of financial consequences can also help with applications for additional external funding. However, the consequences of flooding can be difficult 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 local objectives for managing future flood risk in Barking and Dagenham.

The likelihood or chance (i.e. the probability) of a flood occurring is often identified in terms of the 'return period' or 'annual probability'. For example, a 1 in 100 year flood event has a 1 in 100 (or 1%) annual probability of occurring. Table 2 provides the conversion between commonly used return periods and annual probabilities.

Table 2 Flood probability conversion table

Return Period (years)	2	5	10	20	50	100	200	1000
Annual Probability (%)	50	20	10	5	2	1	0.5	0.1

Scientific consensus is that the global climate is changing as a result of human activity. While there remain uncertainties in how a changing climate will affect areas already vulnerable to flooding, it is expected to increase risk significantly over time. Generally, it is considered that rainfall events will become shorter and more intense, with an increase in average rainfall in the winter months and a reduction in average rainfall in the summer months. It should be noted that

most drainage systems in the UK have been designed to take prolonged light rainfall events; the consequence of the climatic change could therefore overwhelm our existing systems.

The Environment Agency has recently published updated climate change guidance to be taken into account in the planning and design of new development. This is available at GOV.UK[3] and, in regard to Barking and Dagenham, provides recommended allowances for three different aspects:

- Recommended increase to peak rainfall intensities, which will have the greatest effect on flooding from surface water and drainage systems;
- Recommended increase to peak river flows, which will have the greatest effect on flooding from fluvial sources associated with main rivers and ordinary watercourses;
- Recommended increase to sea level rise, which will have the greatest effect on flooding from tidal sources, including risks to the overtopping or breach of flood defences.

The implications of these recommendations are discussed in detail in the Barking and Dagenham Strategic Flood Risk Assessment. In summary, over the next 100 years climate change is predicted to increase river flow by an average of 25%, rainfall intensity by an average of 20% and sea levels by an average of 1.2m.

5.2 KEY SOURCES OF INFORMATION

A number of previous studies have been undertaken to assess and map flood risks within Barking and Dagenham. The best and most up to date of these sources are listed below, and all are readily available from the Council and Environment Agency for use by the general public and risk management authorities:

- Indicative flood maps published via the Environment Agency's website[4]
- Strategic Flood Risk Assessment (SFRA), 2016
- Surface Water Management Plan (SWMP), 2011

A brief summary of these key sources of information is provided below.

ENVIRONMENT AGENCY INDICATIVE FLOOD MAPS

The Environment Agency Indicative Flood Maps provide the most comprehensive and up to date overview of flood risks from fluvial, tidal, surface water and reservoir sources throughout England. The maps are updated regularly following periodic review and/or following changes to flood management infrastructure. The most useful maps in terms of understanding flood risk include:

- Flood Map for Planning (Rivers and Sea)
- Risk of Flooding from Rivers and the Sea
- Flood Warning Areas
- Risk of Flooding from Surface Water
- Risk of Flooding from Reservoirs

[3] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances
[4] http://maps.environment-agency.gov.uk/wiyby/

FLUVIAL AND TIDAL FLOOD RISK

The Environment Agency's Flood Map for Planning (Rivers and Sea) shows the natural fluvial (river) and tidal (sea) floodplain, ignoring the presence of defences and, therefore, areas potentially at risk of flooding from rivers or the sea.

The Flood Map for Planning is principally used to inform land use planning and uses the terminology of high, medium and low probability 'Flood Zones' to align with the terminology of the NPPF to indicate the predicted annual probability of flooding from fluvial and tidal sources. In summary, for planning purposes all land within England is indicated to fall within one of the following Flood Zones:

- Flood Zone 1 (low probability) - less than 0.1% annual probability of flooding from fluvial or tidal sources.
- Flood Zone 2 (medium probability) - between 1% and 0.1% annual probability of flooding from fluvial sources, or between 0.5% and 0.1% annual probability of flooding from tidal sources.
- Flood Zone 3 (high probability) - greater than 1% annual probability of flooding from fluvial sources, or greater than 0.5% annual probability of flooding from tidal sources.

Table 3 summarises the relationship between Flood Zone category and the identified flood risk.

Table 3 Flood Zones for Planning

Flood Risk Area	Identification	Annual Probability of Fluvial Flooding	Annual Probability of Tidal Flooding
Zone 1	Low Probability	<0.1%	<0.1%
Zone 2	Medium Probability	1% – 0.1%	0.5% – 0.1%
Zone 3a	High Probability	>1%	>0.5%
Zone 3b	Functional Flood Plain	>5%*	>5%*

* The functional floodplain, Flood Zone 3b, is defined as those areas in which "water has to flow or be stored in times of flood". Typically this includes areas subject to flooding up to the 1 in 20 year / 5% annual probably flood event, or that are designed to flood up to the extreme 1 in 1000 year / 0.1% annual probability flood event.

The Environment Agency has also published a second set of flood maps called the Risk of Flooding from Rivers and the Sea maps. These illustrate similar extents of fluvial and tidal flooding as that illustrated within the Environment Agency's Flood Map for Planning, but delineates the likelihood of flooding from rivers and the sea whilst considering the presence and effect of all flood defences and predicted flood levels. It describes the probability of flooding in accordance with one of four categories:

- High - greater than 3.3% annual probability of flooding from fluvial or tidal sources.
- Medium - less than 3.3% but greater than 1% annual probability of flooding from fluvial or tidal sources.
- Low - less than 1% but greater than 0.1% annual probability of flooding from fluvial or tidal sources.
- Very Low - less than 0.1% annual probability of flooding from fluvial or tidal sources.

It is important that users of these resources do not confuse the description of risk within the Environment Agency's Risk of Flooding from Rivers and the Sea map with the mapped zones as provided within the Environment Agency's Flood Map for Planning.

Flooding from many smaller watercourses is not illustrated within the Flood Map for Planning (Rivers and Sea) or the Risk of Flooding from Rivers and the Sea map, usually due to the size of the watercourse catchment. Flood risk associated with these watercourses are usually better defined by the surface water flood risk maps, as presented within the SWMP and discussed below.

FLOOD WARNING

The Environment Agency's Flood Warning map indicates those areas that benefit from the Environment Agency's flood warning schemes. The schemes have been set up for a number of areas that are considered to be at particular risk from fluvial and tidal flooding. These areas are called Flood Warning Areas. Within these areas, the Environment Agency can warn residents in advance when flooding may be likely and how severe the flooding could be. Information about registering for these warnings is available on the Environment Agency's website.

SURFACE WATER FLOOD RISK

The Environment Agency's Risk of Flooding from Surface Water map shows the approximate areas that would flood as a result of rainfall being unable to soak into the ground or enter a drainage system, leading to overland flow. As with the Environment Agency's Risk of Flooding from Rivers and the Sea map, the probability of flooding from surface water is defined as being high, medium, low or very low in line with the definitions below:

- High - greater than 3.3% annual probability of flooding.
- Medium - less than 3.3% but greater than 1% annual probability of flooding.
- Low - less than 1% but greater than 0.1% annual probability of flooding.
- Very Low - less than 0.1% annual probability of flooding.

The maps are very indicative and, depending on the location, may not accurately represent all flow paths, for example pipe drainage systems or small culverts on watercourses may not be included. The purpose of the map is to highlight those areas potentially at risk of flooding.

The Environment Agency's Risk of Flooding from Surface Water map is currently deemed the best available information for local sources of flood risk, and supersedes the mapping provided within SWMP (discussed below). However a comparison between the two datasets indicates that they are in close agreement and therefore the flooding hotspots identified within the SWMP are still considered valid.

RESERVOIR FLOOD RISK

The Environment Agency's Risk of Flooding from Reservoirs map shows the likely extent of flooding in the event of reservoir failure. All large reservoirs are stringently governed under the Reservoirs Act 1975 and therefore the likelihood of such an occurrence is low. However, a large volume of water could escape with little or no warning if a failure were to occur.

STRATEGIC FLOOD RISK ASSESSMENT

The Strategic Flood Risk Assessment (SFRA) is a statutory document required under the NPPF that must be prepared by Barking and Dagenham Council, as the local planning authority, to inform the Local Plan, risk management, and the planning and design of development within the Borough. The SFRA has recently been updated (2017) and provides a detailed overview of flood

risk throughout Barking and Dagenham from all sources of flood risk, now and in the future, taking account of the impacts of climate change, and assesses the impact that land use changes and development in the area will have on flood risk.

Specifically the SFRA is used to:

- Determine the variations in risk from all sources of flooding.
- Inform the sustainability appraisal of the Local Plan, so that flood risk is fully taken into account when considering allocation options and in the preparation of plan policies.
- Apply the Sequential Test and, where necessary, the Exception Test in accordance with National Planning Policy Framework when determining land use allocations.
- Identify the requirements for site-specific flood risk assessments in particular locations, including those at risk from sources other than river and sea flooding.
- Set out the recommended approach to the management of flood risk that can be applied through the design and planning of development within the Borough.
- Determine the acceptability of flood risk in relation to emergency planning capability.
- Consider opportunities to reduce flood risk to existing communities and developments.

The SFRA is informed by flood data primarily obtained from the Environment Agency and uses the same terminology as that used within the Environment Agency's indicative flood maps.

SURFACE WATER MANAGEMENT PLAN

Surface Water Management Plan (SWMP) studies are undertaken in partnership with key local stakeholders who are responsible for surface water management and drainage. Within Barking and Dagenham, key stakeholders include the Environment Agency, The Greater London Authority, London Councils, Thames Water Utilities, Transport for London and Network Rail. The partners work together to understand the causes and effects of surface water flooding and agree the most cost effective way of managing surface water flood risk for the long term.

The Barking and Dagenham SWMP was completed in 2011 as part of the Drain London Project. The project sought to gain better understanding of flood risks from overland flow and ordinary watercourses, and made a number of recommendations for the improved management of identified flood risks going forward.

In order to assess the risk of flooding, 2D pluvial (rainfall) modelling was completed. The output from the model was then used to identify the critical locations within the Borough at risk from surface water flooding and designate flooding hotspots, known as Local Flood Risk Zones (LFRZs), which in turn were used to define 'Policy Areas' reflecting strategic issues and recommendations.

In addition to the surface water mapping, the SWMP developed an increased Potential for Elevated Groundwater map (iPEG). The purpose of this mapping was that it would be used in conjunction with the surface water maps to identify where groundwater may emerge and, if so, the flow route the water may take.

5.3 OTHER SOURCES OF INFORMATION

A number of other studies have been completed to better understand flood risks within Barking and Dagenham and are also readily available from the Council and Environment Agency, as appropriate, for use by the general public and risk management authorities:

- Preliminary Flood Risk Assessment (PFRA), 2012

- Thames Catchment Flood Management Plan (CFMP), 2016
- Thames Estuary 2100 (TE2100)

A brief summary of these sources of information is provided below.

PRELIMINARY FLOOD RISK ASSESSMENT

The Preliminary Flood Risk Assessment (PFRA) was commissioned by the Council in 2012. It is a statutory document required under the Flood Risk Regulations 2009 that provides a relatively high level assessment of flood risk from all sources of flooding to identify designated 'Flood Risk Areas' that warrant further examination through the production of maps and management plans.

The whole of Barking and Dagenham, and the majority of Greater London, was defined as a Flood Risk Area and, as such, requires the production of a flood management plan. The Environment Agency has produced the Thames Flood Risk Management Plan (FRMP) for the London area published in 2016, including a local document specific to Barking and Dagenham.

The PFRA provides an overview of flood risk from all sources of flooding although this has largely been superseded by the updated SFRA.

THAMES REGION CATCHMENT FLOOD MANAGEMENT PLAN

The Environment Agency has produced Catchment Flood Management Plans (CFMPs) for each river catchment providing recommendations for managing flood risk over the next 50 – 100 years. The plans also take into account the likely impacts of climate change and how areas could be developed to meet our present day needs without compromising the ability of future generations to meet their own needs.

As part of the Thames Region CFMP a policy appraisal was carried out. Six standard policies for managing flood risk within the Thames catchments were considered. This policy will tend to be applied to those areas where the case for further action to reduce flood risk is most compelling, for example where there are many people at high risk, or where changes in the environment have already increased risk. Taking further action to reduce risk will require additional appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options. The proposed actions to implement the preferred policy are the following:

- To deliver actions recommended in Flood Risk Management Strategies;
- To encourage partners to develop policies, strategies and initiatives - in the short-term - to increase the resistance and resilience of all new development at risk of flooding. Land that might be needed to manage flood risk in the future will need to be protected. Working with partners to identify opportunities for this and recreate river corridors in urban areas will be essential.
- In the long-term, land and property owners will need to adapt the urban environment to be more flood resilient. This includes the refurbishment of existing buildings to increase resilience and resistance to flooding.
- To promote the management of flood consequences. Working with partners will improve public awareness and local emergency planning (i.e. identifying infrastructure at risk and producing community flood plans.

The Thames catchment was divided into 43 sub-areas. The selected strategic policy for the Beam and Ingrebourne catchments is to "take further action to sustain the current level of flood risk into the future, responding to the potential increases in risk from urban development, land use

change and climate change". The selected strategic policy for the Lower River Roding catchment is to "take further action to reduce flood risk".

THAMES ESTUARY 2100

The Thames Estuary 2100 (TE2100) is a strategic flood risk management plan for London and the Thames Estuary through to the end of the century. TE2100 covers the whole of the tidal portion of the Thames and its floodplain from Teddington in the west to Sheerness / Shoeburyness in the east, dividing the area into 23 sub-areas.

The selected strategic policy for Barking and Dagenham is to "take further action to keep up with climate change and land use change so that flood risk does not increase".

The findings of TE2100 show that the Thames estuary has the best coastal flooding defence in the UK. These findings provide well founded reassurance to the communities throughout Thames Gateway and estuary, showing tidal flooding is not a barrier to sustainable economic development.

5.4 A SUMMARY OF FLOOD RISK WITHIN BARKING AND DAGENHAM

This section provides an overview of flood risks within the Borough of Barking and Dagenham. Areas that have been identified to be at risk of flooding have been informed through a mixture of local knowledge, recorded historic flood events and predicted (modelled) flood events. As discussed above, a much more detailed summary of flood risk is available through review of the Environment Agency's Indicative Flood Map and the Council's SFRA and SWMP.

Identification of areas known or predicted to be at risk of flooding will help prioritise the need for further investigation and/or measures to manage or reduce the identified risks. Unfortunately it is not possible to predict all flood scenarios and flooding may still occur in areas that have not been identified to be at risk. Similarly, the erratic nature of the UK's weather can also mean that flooding can occur in a different way than recorded in previous events or than predicted by flooding models. However, by building up an understanding of known flood risks based on historic events and by undertaking more detailed studies into those areas that are predicted to be at significant risk, a greater level of confidence can be achieved.

As highlighted in the sections above, flooding can originate from a number of sources, namely:

- Fluvial flood risks from 'main rivers'.
- Fluvial flood risks from 'ordinary watercourses'.
- Tidal and coastal flood risk from the sea, estuaries, or tidally influenced rivers such as the River Thames.
- Pluvial (rainfall) that causes overland surface water flow.
- Groundwater emergence.
- Emergence from the below ground sewerage system.
- Artificial sources, such as reservoirs.

It is often hard to distinguish the source of a flooding event, principally because flooding is often from multiple or interdependent sources, such as a heavy rainfall event that causes overland flow and surcharging of the public sewerage system. Within Barking and Dagenham, the tidally influenced River Thames can have a significant impact on the risk of fluvial and surface water flood risk as watercourses and drainage systems may be unable to discharge at periods of high tide.

The catchments within Barking and Dagenham are principally urban, with approximately two-thirds of the Borough classified as urban and approximately one-third of the Borough classified as green space containing areas of wildlife habitat, including Eastbrookend Country Park and the Chase, Beam Parklands and the River Thames. Urban catchments can significantly contribute to local flood risk as rainfall will land on hard, impermeable, surfaces and quickly flow towards the lower areas of the catchment. Adding to this, very little water will be able to naturally infiltrate into the ground as it would in a natural environment.

Whilst the physical size of the Borough is relatively small compared to other counties and boroughs throughout England, the population density within the Borough is relatively high with over 5,000 people per square kilometre. As is the case in many areas of England, an ever increasing 'squeeze' is evident through competing needs for government funding for flood defence and an increasing potential risk of flooding due to pressure for future development and climate change. For this reason, a key focus of the Thames CFMP is the need to proactively deliver a reduction in flood risk through the planning process – in simple terms, guiding vulnerable development away from areas that are most at risk, and adopting sustainable design techniques.

USE OF HISTORIC AND MODELLED FLOOD DATA

The use of historic flood records is invaluable when trying to understand flood risk and prioritise the management of flood risk throughout the Borough of Barking and Dagenham. The historic flood data available for Barking and Dagenham ranges from 1707 to the present day and is summarised within the SFRA. However, the way in which historic flooding events have been recorded is not consistent or complete and, following a review of the records held, many of the events are unlikely to reoccur due to improvements made to flood defences and drainage infrastructure in the Borough. It is also often difficult to ascertain the cause of observed flooding or the magnitude of the event that caused the flooding, particularly after the flood waters have receded.

The use of modelling software to 'predict' where flooding may occur is essential in understanding those areas of the Borough that are at greatest risk and most vulnerable to flooding from all sources of flood risk. Predictive modelling can provide clarity to those areas that have flooded in the past (i.e. to better understand why the flood occurred and magnitude of event that would have resulted in flooding) and information about how and where flooding may occur in the future. Predictions of flood risk are produced using combinations of hydrological and hydraulic modelling and analysis of past hydrological records to make future predictions. A detailed summary of predictive flood modelling and the techniques used to generate this modelling is provided within the SFRA and SWMP.

The outputs from models are only as good as the data and software used to run the model. Most previous models have made a series of assumptions due to cost, time and computing limitations. It is Barking and Dagenham's plan to proceed with an enhanced model of the Borough to eliminate as many assumptions as feasible to generate a model that has a high level of confidence in its flood predictions. This enhanced model is likely to be complete in summer 2017. The enhanced model will better inform the Council's applications for funding to mitigate flood risk and will also update the Environment Agency's Risk of Flooding from Surface Water mapping for the Borough.

A brief summary of flood risk associated with each potential source of flooding is provided below, with information obtained from both historic records and current predictive modelling. For a detailed overview, the reader should refer to the Environment Agency's Indicative Flood Map and the Council's SFRA and SWMP.

TIDAL AND COASTAL FLOOD RISK

The greatest source of flood risk to Barking and Dagenham, and arguably the greatest risk to the greater London area, is from the tidal River Thames. The natural floodplain of the River Thames within London is now almost fully developed and land within the south of Barking and Dagenham that adjoins the River Thames is identified to be at significant risk of tidal and coastal flooding. This can be attributed principally to flooding from the River Thames, although tidal flood risk can also occur from the tidally influenced watercourses that discharge to the River Thames. For the most part, tidal and coastal flood risk has been well managed by the construction of tidal and coastal flood defences along the banks of the River Thames, River Roding and Beam River, and through the use of flow control structures such as sluice gates, penstocks and flapped outfalls.

The greatest flood risks associated with tidal and coastal flooding would be as result of breach of the flood defences, failure of flow control structures, or a restriction of the discharge of water from upstream fluvial watercourses into tidal watercourses that subsequently causes tidally-influenced fluvial flooding. Modelling of breach scenarios was completed to inform the preparation of the SFRA and indicated an extreme risk to the majority of Barking Town Centre, Creekmouth, Dagenham Dock and land to the south of the A13 and A1306.

The most significant extent of undefended tidal flood risk is associated with the River Roding that is predicted to occur to the north of the Barking Bypass and encompass the areas around Gascoigne Road, Boundary Road and The Shaftesburys. Flood defences have been constructed along the banks of the River Roding and downstream on the banks of Barking Creek and, for the most part, provide a standard of protection up to the 1 in 100 (1%) annual probability event. However, the standard of protection is reported to be less within the area of Barking Town Centre and may only provide a standard of protection up to the 1 in 20 (5%) annual probability event.

The Environment Agency operates a flood warning service for the areas within Barking and Dagenham identified to be at tidal flood risk.

FLUVIAL FLOOD RISK FROM MAIN RIVERS

Fluvial flood risk from main rivers within Barking and Dagenham is generally limited to land and properties located immediately adjacent to the Beam River, Mayes Brook and Gores Brook. Extensive areas of predicted fluvial flood risk are located in the south of the Borough in the area of Dagenham Dock. The majority of these areas are currently defended by existing flood defences located adjacent to the Beam River, Mayes Brook and Wantz Stream. However, consideration should still be given to residual risks within these areas associated with over topping or breach of the flood defences. The rate of inundation associated with over topping or breach of the flood defences is provided within the Council's SFRA.

The largest extent of undefended fluvial flood risk associated with the Mayes Brook is predicted to occur along the north of River Road, encompassing land adjacent to Bastable Avenue and Thames Road. This flood risk is most likely attributed to insufficient capacity within the Mayes Brook, possibly associated with restricted discharge into the tidally influenced River Roding/Barking Creek.

Large areas of undefended flood extents are also shown within the Dagenham Dock areas, most likely associated with Gores Brook and Dagenham Breach that could also be partially attributed to restricted discharge into the tidally influenced River Thames and Beam River.

FLUVIAL FLOOD RISK FROM ORDINARY WATERCOURSES

Flooding from ordinary watercourses is accounted for within the surface water flood risk modelling, presented within the Environment Agency's Risk of Flooding from Surface Water maps and the Council's SWMP, and (particularly for larger catchments) within the Environment

Agency's fluvial and tidal flood mapping. For the most part, the flood extents of ordinary watercourses that were modelled during fluvial and tidal flood studies are similar to those modelled for the surface water flood studies.

During the 1 in 100 (1%) annual probability event, the upper reaches of Gores Brook are predicted to cause flooding within Goresbrook Park. This risk may be attributed to the capacity of the culvert under Goresbrook Road, and could be exacerbated by blockages or reduced capacity within the culvert. Shallow flooding is also predicted to occur within the rear gardens of properties in Treswell Road on the southern fringe of Goresbrook Park.

Fluvial flood risk associated with the network of ordinary watercourses south of the A13 and within the areas of Creekmouth and Dagenham Docks has not been extensively modelled, beyond modelling that was undertaken to inform the understanding of surface water flood risks. Modelling indicates many isolated areas where surface water could collect with potential to affect roads, notably River Road, Thames Road, and areas around Bastable Avenue and King Edwards Road. Ponding on the A13 may also occur at various locations and within the Ripple Road Sidings that form the eastern portal of High Speed 1.

Predictive flood mapping cannot predict all scenarios that may result in localised flooding. For example, it cannot predict blockages within the river channel or defective outfall structures that may restrict the discharge of water. Due to the typically small nature of ordinary watercourses, blockages that cause water to 'back up' the watercourse may be more likely.

SURFACE WATER FLOOD RISK

Recent flooding in June 2016 affected multiple properties and roads across the Borough including areas around Saxham Gardens, Whiting Avenue, River Road and A13 underpass. The source and characteristics of this flood event are currently being investigated by the Council.

Predictive surface water mapping identifies those areas that are more likely to be vulnerable to surface water flooding based on a review of local topography and potential barriers to the flow of water. For the purpose of informing the Environment Agency and SWMP surface water flood maps, surface water was considered to include flooding associated with pluvial runoff, sewers and small ordinary watercourses or ditches that may occur during heavy rainfall events in urban areas.

Surface water flood maps take into account the public sewerage network by assuming that the sewers have capacity for a moderate volume of runoff before the sewers surcharge and subsequently result in overland flow. However, sewers can often have a greater influence on surface water flood mapping as they can effectively intercept and 'transport' surface water flooding into a different catchment. For example, surface water may be re-routed below ground and emerge within a different area of the Borough, thus effecting the predicted flooding associated with surface water runoff. It is difficult to consider these interactions within the surface water flood modelling and mapping until an enhanced integrated modelling exercise has been completed.

The overland flow routes associated with surface water flooding across the Borough generally follow naturally occurring drainage pathways, some of them containing watercourses, some following the route that a watercourse would have taken before being culverted.

There are numerous predictions for surface water flooding through Barking and Dagenham as illustrated within the SWMP and Environment Agency's Risk of Flooding from Surface Water map. This is typical for any city as surface water flood mapping simply assesses the natural flow of rainfall and surface water runoff within urban area. The surface water flood maps simply highlight the likely flow routes for this runoff and the likely end points or 'receptor areas' where surface water runoff will pond in areas of lower topography and/or become trapped by a barrier to the flow of water, such as a road or railway embankment.

Recognising that areas identified to be at risk of surface water flooding can be highly indicative, the SWMP included a validation exercise of modelled flood risk, with data considered to be validated if it met one or more of the following criteria:

- One or more historic records confirm predicted surface water flooding.
- Good correlation with Environment Agency Flood Map for Surface Water [now superseded by the Risk of Flooding from Surface Water map].
- Site visit undertaken and probable flood mechanism confirmed.

The SWMP identified that many of the areas identified to be at risk of surface water flooding are considered to be non-validated. The Council therefore propose to undertake an enhanced integrated modelling exercise to improve confidence and reduce uncertainty of those areas most likely to be at risk (discussed further under Objective 1, Section 6).

FLOOD RISK FROM GROUNDWATER EMERGENCE

Geology within Barking and Dagenham predominantly comprises relatively impermeable London Clay which suggests a low risk of groundwater flooding. However, the geology of certain areas of Barking and Dagenham comprise alluvial drift deposits, such as gravels, that sit over the top of the London Clay. In these areas, 'perched' water tables can occur, formed by rainwater that has percolated through the upper permeable superficial deposits and effectively become trapped on top of the impermeable bedrock geology.

Groundwater flooding may also occur in areas of alluvium and river terrace deposits in those areas near to tidally influenced watercourses. As the water levels in the watercourse rises, this can cause groundwater that is hydraulically linked to the watercourse to rise as well. There is evidence within adjoining Boroughs of groundwater emergence occurring some distance from the Thames and its tributaries as a result of water finding a pathway through the gravels during high river levels. A large proportion of the River Thames corridor is characterised by gravely soils referred to as 'Thames Gravels' and there are large swathes of gravel deposits throughout Barking and Dagenham. As water levels within the river rise, the water table rises within the gravel layer, resulting in groundwater flooding. Also, in other parts of London, areas characterised by these gravel deposits have been noted for their shallow groundwater table and perched groundwater tables. These areas respond rapidly to rainfall and can cause minor groundwater emergence.

Maps for increased Potential for Elevated Groundwater (iPEG) have been prepared to define broad areas of groundwater flooding susceptibility based on geology of superficial deposits and topography, essentially identifying those areas where groundwater may rise to within 2m of the ground's surface. These are included within the SFRA.

Based on a review of these maps, a number of areas within Barking and Dagenham are considered to be at greater risk of groundwater emergence. These areas are located adjacent to the River Roding, Loxford Water, Mayes Brook, Gores Brook, Beam River and scattered within the wards of Thames, River, Gascoigne, Eastbury, Village, Longbridge, Mayesbrook, Parloes, Alibon, Becontree, Heath, Whalebone and Chadwell Heath.

It should be recognised, however, that although the iPEG map may provide an indication of where ground water may emerge, once at the surface the resultant flow is likely to follow the topography. It is therefore not necessarily those areas susceptible to groundwater emergence that are at risk, but the areas that are located downhill of those areas.

FLOOD RISK FROM RESERVOIRS

The Environment Agency Risk of Flooding from Reservoirs Map indicates the west of the Borough between the River Roding and the A406 to be at risk of flooding from the Basin Reservoir in Wanstead and the Perch Pond Reservoir in Wanstead Park. The east of the Borough, in the vicinity of Choats Manor Way and the railway line, is shown to be at risk of flooding from the Washlands Flood Storage Area.

FLOOD RISK FROM SEWERS

Risks pertaining to flooding from the public sewerage network are provided by Thames Water Utilities who are responsible for the maintenance of public sewers within Barking and Dagenham. Flood records are provided for postcode areas (i.e. RM5 2) rather than on a property-level basis and it is therefore difficult to accurately map this source of flooding. However, these records do indicate that flooding incidents occur throughout the Borough.

It is also recommended that consideration is given to the Environment Agency's Risk of Flooding from Surface Water map, as discussed above, as this will provide an indication of likely flow routes should surcharging of the sewerage system occur.

The causes of incidents of flooding from the sewerage network are currently unknown and flooding could be attributed to a number of factors such as blockage, reduced capacity, restricted outfall and/or exceedance of the sewerage system caused by high rainfall intensity.

6 OBJECTIVE 1: IMPROVE KNOWLEDGE AND UNDERSTANDING OF LOCAL FLOOD RISK

6.1 OVERVIEW

Identification of areas known or predicted to be at risk of flooding is essential to understanding those areas at greatest risk and will help prioritise the need for further investigation and/or measures to manage or reduce the identified risks.

Unfortunately it is not possible to predict all flood scenarios and flooding may still occur in areas that have not been identified to be at risk. Similarly, the erratic nature of the UK's weather can also mean that flooding can occur in a different way than recorded in previous events or than predicted by flooding models. However, by building up an understanding of known flood risks based on historic events and by undertaking more detailed studies into those areas that are predicted to be at significant risk, a greater level of confidence can be achieved.

As summarised in Section 5, a significant amount of data is available that identified the areas within Barking and Dagenham that are at greatest risk of flooding from fluvial, tidal, surface water, groundwater and sewers. The best source of data is recorded data of historic flooding events that have occurred within Barking and Dagenham. However, the accuracy and reliability of this data is dependent on the quality of data that has been captured and, as discussed, the way in which historic flooding events have been recorded is not consistent or complete.

Predictive flood modelling has been completed for fluvial, tidal, surface water and groundwater sources. This data provides a good overview of areas within Barking and Dagenham that are likely to flood, but actual flooding may be very different from predicted flooding that can only make assumptions about how certain areas will respond to high rainfall and/or high river flows. It is also difficult for predictive flood modelling to take into account issues such as blockages or reduced capacity.

In order to continue to improve the understanding of flood risk within the Borough, the Council will continue to record and investigate flooding events as well as continue to improve understanding of flood risk through the completion of flood management studies.

In summary:

Understanding flood risk throughout the Borough to achieve the aims of Objective 1 will be met through the following key measures:

- Recording of flood events and maintaining flood records to improve knowledge of flooding;
- Investigation of flood events to improve knowledge of flooding, identify responsible parties and recommend required action;
- Strengthening and developing understanding of flood risk issues by all stakeholders through the use, review and completion of flood risk studies;
- Improving understanding and communication of vulnerable land uses and communities/infrastructure at greatest risk;
- Undertaking a Borough-wide enhanced surface water modelling exercise to eliminate as many assumptions as can be achieved in a cost effective way.

The activities required to meet this objective comprise a mixture of maintaining current recording and investigation measures and procedures, as well as proposed improvements to these existing systems and datasets as discussed in greater detail below.

6.2 MAINTAINING FLOOD RECORDS

Barking and Dagenham Council holds historic flood data for a number of events that have occurred within Barking and Dagenham from 1707 to the present day. However, prior to the Pitt Review and subsequent Flood and Water Management Act, local authorities that are now identified as LLFAs were not required to investigate significant flood events or collate records of flooding within their boundaries and, therefore, the quality and completeness of historic flood records currently held by the Council is limited.

Known records of past flooding events are summarised within the Council's SFRA, SWMP and PFRA. These records provide a good indication of areas that may be at risk of flooding, but are considered somewhat incomplete in the context of modern recording requirements. In particular, where flooding events have been recorded in the past, this has not been undertaken in a consistent manner and, similarly, little is known about the consequences of these flooding events, for example the number of properties affected or lives put in danger.

The Council is implementing a new system for recording larger flooding events using a multi-functional software package called FloodStation. However, the Council recognise the importance of clarifying the criteria for how and where flood events are recorded, including the criteria for which events are recorded in FloodStation and which events are recorded elsewhere. This will include flood events that pose risk to property, highways, critical services and other non-critical infrastructure.

HISTORIC FLOOD RECORDS

One of the Council's first actions will be to review and document the historic flood records currently held by the Council. This will provide a record of the historic flood records that are available to Council staff including details of the source of this data, the information collected, the format that the data is held in, if the records can be geo-referenced, and where the data is saved/filed. During this exercise the Council will strive to combine all known historic flood records

into a single location or into a format that is compatible with other records. Where possible, the next step will be to collate suitable datasets into a Global Information System (GIS) layer to enable easy mapping of these events to inform future flood management and planning activities.

IMPROVED APPROACH FOR RECORDING FLOOD EVENTS

The Council propose to continue to use FloodStation for the recording of notable flood events that occur within Barking and Dagenham. The Council also propose to develop an improved method of working that clarifies the procedures for recording information and aspirations regarding the extent and type of useful information to be captured.

The method of recording data and the detail to be recorded for each flood event will be dependent on the nature and significance of the flood event and will therefore take the characteristics of each flood event into account. At minimum, it is proposed that significant flooding events associated with local sources of flooding (in particular those that warrant a Section 19 Investigation as discussed in Section 6.3) will be recorded in FloodStation. Other smaller events maybe recorded in FloodStation or maybe recorded in a standalone spread sheet or database format.

The method of recording flood events will be discussed and agreed with the relevant departments of the Council prior to implementation. The information to be captured for each flood event will also depend of the nature and significance of the flood event and it is proposed that this will adopt an approach similar to that summarised in Table 4. Of key importance will be ensuring that the 'core' data of each flood event (i.e. that considered a minimum for minor or isolated events) is recorded in a consistent manner regardless of the nature or significance of the flood event.

The Council also intends to enable captured flood records to be geo-referenced to allow the graphical visualisation of historic flooding. This will enable to Council to gain a better understanding of areas at risk and how these areas may interrelate, as well as inform better decision making with regards to pro-active maintenance regimes and advice for land use planning.

Where applicable, flood events will be linked to known assets associated with the flood event. For example, where a flood event is the result of a blocked culvert in an ordinary watercourse, the event will be linked to that asset as listed within the asset register (as discussed in Section 7 of this document).

Table 4: Data to be captured commensurate with flood event characteristics

Characteristics of flood event		
Very minor or isolated events that caused no internal property flooding or travel disruption	Minor to major flooding events associated with local sources of flooding that may have caused some internal property flooding or travel disruption, but that are not classified as Section 19 events	Major flooding events associated with local sources of flooding that warrant a Section 19 Investigation (discussed in Section 6.3)
Type of data to be collected		
Date Location Primary source of flooding Affected receptors	Date Duration Location Primary and secondary sources of flooding Description of event Depth of flooding No. of residential properties internally flooded No. of commercial properties internally flooded Addresses of flooded properties Roads flooded Photographs	Date Duration Location Primary and secondary sources of flooding Description of event Depth of flooding Flow paths Rainfall/river gauge data No. of residential properties internally flooded No. of commercial properties internally flooded Addresses of flooded properties Roads flooded Name and extent of flooded roads Critical infrastructure affected Photographs Recommended actions

Other key risk management authorities with relevance to Barking and Dagenham, most notably the Environment Agency and Thames Water Utilities, maintain their own records of flooding that are attributable to their assets. For all authorities, these records are essential for driving future investment. As per above, the level of detail recorded will depend on the type and consequence of the flooding event, for example all authorities record more information for flooding events that have caused internal property flooding when compared to those events that only caused flooding of external gardens.

The sharing of data between the key risk management authorities is important to ensure a full understanding of the risks within Barking and Dagenham. The Council therefore propose to build a closer relationship with the Environment Agency and Thames Water Utilities, including an aspiration to share records of flooding that has occurred within the Borough every quarter. This is likely to be associated with flood events that are considered to be 'significant', in accordance with Section 19 of the Act.

The Council's Ambition 2020 requires the relevant, resilient, infrastructure to be in place to grow the Borough in a sustainable way to meet expectations and, while under mounting financial pressure, to effectively prioritise the approach to mitigating the flood risk in the Borough. In line with the Council's Ambition 2020 aspirations, other ways to capture flooding events that are reported by the public are to be investigated. The current method of capturing data requires members of the public to report issues to the Council's call centre. This method will still be promoted, particularly when the Council may be required to respond to a flooding incident, but alternative methods of post-event data capture could also prove useful in building up a more complete picture of issues throughout the Borough. The use of an on-line data capture system

will be investigated that will allow anyone to upload information about a flooding incident to the Council's website.

In response to this and to meet the aims of Objective 1:

The Council proposes to improve the way in which flooding events are recorded to meet the requirements of the Flood and Water Management Act. The consistent recording of flooding events will enable the Council to better understand those areas at greatest risk, communicate this risk to the relevant stakeholders and, where necessary, inform the need to take mitigating action to reduce the risk of reoccurrence. The Council also proposes to improve the sharing of data between key risk management authorities.

Specifically, the Council will:

- → Review, document and, where appropriate, collate historic datasets into a single location or into a format that is compatible with other records.
- → Review current methods of recording flooding events and develop an improved method of working that reflects the nature and scale of the event, and which will allow graphical visualisation.
- → Implement an agreed method of sharing flood event data with other key risk management authorities.

6.3 INVESTIGATING FLOOD EVENTS

Prior to the Pitt Review and subsequent Flood and Water Management Act, Local Authorities that are now identified as LLFAs were not required to investigate significant flood events. However, Section 19 of the Flood and Water Management Act places a duty on the LLFA to investigate significant flood events within their area. This duty includes identifying which authorities have flood risk management functions with respect to the incident and what they have done or intend to do. LLFAs are required to publish the results of any investigations carried out and notify any relevant risk management authorities.

Specifically, Section 19 of the Act states:

19 Local authorities: investigations

(1) On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate -
  (a) which risk management authorities have relevant flood risk management functions, and
  (b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.

(2) Where an authority carries out an investigation under subsection (1) it must -
  (a) publish the results of its investigation, and
  (b) notify any relevant risk management authorities.

The investigation of flooding events will help to identify the causes of flooding, the risk posed to people and infrastructure, and the likelihood of reoccurrence. This will ultimately inform the need to undertake further analysis, take mitigating action and/or liaise with other risk management authorities.

In accordance with the Act, only events that have 'significant harmful consequences' will be investigated by the Council. There is no national definition of 'significant harmful consequences' as local receptors respond in different ways. However, Barking and Dagenham Council will be adopting the approach summarised in Table 5 below that takes into consideration impacts to human health, the economy, the environment and cultural heritage.

Table 5 Proposed criteria for flood investigations

Impact	Parameter	Threshold	Justification
Human Health	Number of People	20 persons/8.46 properties (assuming 2.36 people per property) flooded internally	One order of magnitude less than national threshold set by DEFRA
	Critical Services, for example: → Hospitals, health centres, clinics, surgeries, pharmacies, care homes → Schools, colleges, day nurseries → Police, fire, ambulance stations → Electricity stations and substations, gas stations → Railway stations	1 service disrupted	Disruption to critical services can have a significant impact
Economic Activity	Non-residential Properties	10 non-residential properties flooded internally	Significant impact to local businesses
	Roads and Rail	20 linear metres of Primary Route flooded to 30cm depth, or 50 linear metres of rail flooded to any depth	Disruption to key transport links has a significant impact on economic activity
Environment	Non-statutory designated sites, locally designated sites, and sites important for amenity value	1 or more sites where flooding has damaged the ecological value and/or prevented amenity access for 2 weeks or more	Potential impacts to be identified and reviewed on a case-by-case basis (i.e. some habitats may benefit from seasonal flooding)
	Number of nationally / internationally important heritage features	1 or more features adversely impacted by flooding	Potential impacts to be identified and reviewed on a case-by-case basis (some features may not be detrimentally impacted by flooding)

It is important to note that it is not only the events that meet the criteria above that will be investigated by the Council. Other smaller events will also be investigated to a degree that is considered appropriate to the magnitude, severity and consequences of the event – however these events will not be classified as 'Section 19 events' in accordance with the Act.

The Council propose to develop a protocol for the investigation of significant flooding events in accordance with Section 19 of the Act and the proposed significance 'criteria' as set out within Table 5. This will clarify how significant events are identified, who is responsible for undertaking the investigation, the data that needs to be collected, how the findings of the investigation are documented, and how the findings of the investigation shared with other departments, risk management authorities and the public as appropriate. It will also clarify how overall priority for further investigation will be determined, as summarised below.

Table 6 presents a matrix for determining overall priority for further investigation based on the parameters in Table 5. Each parameter (No. of Residential Properties, Critical Service etc.) has a threshold. According to that threshold it is decided whether each parameter is of low, medium or high priority for each ward. Each parameter is then assigned a score of 1, 3 or 5 according to the priority classification. The overall score for all of the parameters in each ward is the one used to populate the Overall Investigation Priority (Table 6) according to the Overall Investigation Priority ranges which are presented below:

- → High = 19+
- → Medium = 8 to 18
- → Low = 0 to 7

An example of the priority classification and the scoring system can be found in the Annex C.

Table 6 Parameter priority scoring and classification (Preliminary)

Parameter	Priority Classification and Score		
	More than zero but less than Threshold	**Equals or Exceeds Threshold**	**Significant Historic Flooding Experienced**
Number of People	Low (1)	Medium (3)	High (5)
Critical Services	Low (1)	High (5)	High (5)
Non Residential Properties	Low (1)	Medium (3)	High (5)
Roads and Rail	Low (1)	Medium (3)	Medium (3)
Internationally or Nationally Designated Site	Low (1)	High (5)	High (5)
Number of Nationally or Internationally Important Heritage Features	Low (1)	High (5)	High (5)

If a flooding event that is considered to have significant harmful consequences occurs multiple times in the same locality, the Council do not propose to undertake multiple investigations of that event. However, should repeat flooding supplement data that was collected during the initial investigation, this will be added to the initial investigation and taken into consideration.

The other key risk management authorities, namely the Environment Agency and Thames Water Utilities, have their own processes for investigating flooding events that are dependent on the type and consequence of the flooding event. These prioritise the investigation of events that have resulted in internal property flooding. As discussed in Section 6.2, the Council propose to build a closer relationship with the Environment Agency and Thames Water Utilities, including an aspiration to share records of flooding that has occurred within the Borough every quarter.

In response to this requirement and to meet the aims of Objective 1:

The Council proposes to develop a protocol for the investigation of all significant flood events that occur within the Borough of Barking and Dagenham in line with the requirements of the Flood and Water Management Act to better understand the causes and effects of flooding and identify the need for further action. The investigations completed by the Council will be made available to other risk management authorities, stakeholders and the public.

The Council will continue to investigate other smaller events to a degree that is considered appropriate to the magnitude, severity and consequences of the event.

6.4 COMPLETION OF FURTHER STUDIES

The Council has completed a number of robust studies to better understand flood risks within the Borough, most notably the SFRA, SWMP and PFRA. These are updated as and when is necessary to reflect updates in predicted modelling data, historic flooding incidents and improvements to flood management infrastructure – most recently demonstrated through the updates to the SFRA in 2017. The Council are also in regular communication with the Environment Agency who review their indicative flood maps on a regular basis to ensure that they reflect the best available information.

The SWMP included an Action Plan of recommended activities to improve the understanding and management of local sources of flooding throughout Barking and Dagenham. Many of these activities are addressed within this Strategy, such as the need to maintain an asset register and improve the recording of flood events, but others relate to improving the understanding of risk through further analysis and, where necessary, looking to undertake capital works.

The Council propose to undertake further analysis to supplement the data already presented within the SWMP. One such action will be the development of an enhanced integrated pluvial (surface water) model that includes Thames Water Utilities' infrastructure and removes many of the assumptions made in the current SWMP models. It is intended that this will be complete by summer 2017. The outputs of the enhanced modelling will be considered against fluvial (river) and groundwater risks to demonstrate the interaction between all forms of flood risk in the Borough.

The outputs from this proposed enhanced modelling will aid scheme prioritisation and potential solutions for reducing identified and historic flood risk. The costs associated with delivering potential solutions will heavily influence if and when these activities can be undertaken, but the Council are committed to reviewing the recommendation of the SWMP in detail to understand

which activities align best with the implementation of this Strategy, which activities are likely to offer greatest benefit, and which activities can be achieved within the 6 year programme of this Strategy.

To meet the aims of Objective 1:

The Council are committed to ensuring that, wherever practicable, the most up to date flood data is made available to all relevant stakeholders and used in the delivery of all flood risk management activities.

The Council also propose to review the findings of the Surface Water Management Plan and, where appropriate and achievable, undertake the activities as outlined within the SWMP Action Plan. One such activity will be developing enhanced modelling outputs to better inform the assessment and selection of potential solutions.

7 OBJECTIVE 2: MANAGE AND REDUCE FLOOD RISK

7.1 OVERVIEW

It is not possible to eliminate the risk of flooding within Barking and Dagenham. However, the Council are committed to managing flood risks as far as practicable whilst taking into consideration factors such as the source of flood risk, frequency, hazard, the vulnerability of the affected communities and infrastructure, available funding and community support.

This section sets out the processes that are currently in place to manage the likelihood and impacts of flooding, and any improvements to these processes that could be explored further. There are a large number of initiatives that are considered within this Objective and in summary these include:

Managing the likelihood and impacts of flooding throughout Barking and Dagenham to achieve the aims of Objective 2 will be met through the following key measures:

- → Communication with relevant Council departments, other risk management authorities and adjacent London Boroughs;
- → Maintaining a register of assets that are considered important for flood risk management;
- → Undertaking maintenance of assets that are considered important for flood risk management;
- → Developing a clear method of prioritising those communities that are considered to be at greatest risk, and prioritising the most appropriate measures for managing flood risks;
- → Delivery of schemes to mitigate and reduce areas identified to be at risk of flooding.

The activities required to meet this objective comprise a mixture of maintaining current asset management practices and flood management works, as well as proposed improvements to these existing systems as discussed in greater detail below.

7.2 COMMUNICATION

Flooding typically originates from multiple sources and is rarely attributable to one single source. Effective communication between all key risk management authorities and other affected stakeholders is therefore essential to the effective management of flood risk. This will include communication with the adjacent London Boroughs as flooding is regularly a cross-boundary issue, particularly as many of the watercourses that flow through Barking and Dagenham originate outside of the Borough's administrative area.

As discussed in Section 4, the key RMAs within Barking and Dagenham include the Council (as LLFA, Land Drainage Authority, Local Highway Authority and Local Planning Authority), the

Environment Agency and Thames Water Utilities. Communication between these organisations is therefore paramount, as is communication with the adjacent London Boroughs of Redbridge, Newham and Havering. However, there are a number of other key stakeholders that will play an important part in the management of flood risk, such as the Council's Civil Protection Team, Transport for London, Network Rail, the North East London Local Resilience Forum as well as local communities – particularly through riparian ownership responsibilities.

The Council intend to improve communication with the Environment Agency and Thames Water Utilities, principally to discuss areas within Barking and Dagenham that are at risk of flooding risk and to identify any opportunities to reduce flood risk in a collaborative manner. In addition to the proposed sharing of flood records on a quarterly basis, the Council will aspire to meet with the Environment Agency and Thames Water Utilities on a yearly basis to discuss flood management activities and opportunities. Collaboration between the risk management authorities is often key in the delivery of schemes, particularly those that may offer multiple opportunities and that, therefore, may secure funding from multiple sources.

The East London Partnership, formed from the Drain London programme, consists of Barking and Dagenham Council, Havering Council and Redbridge Council. These three Boroughs meet on a quarterly basis to discuss flood risk management matters. Also invited are the Thames Regional Flood and Coastal Committee member for the partnership, together with representatives from the Environment Agency, Thames Water and London Councils. The purpose of the Drain London partnerships are to enable Boroughs to work together to better understand surface water flood risk and build capacity to manage these risks. The initial focus of the Drain London partnerships was to establish ownership of London's drainage assets, assess their condition and secure a better understanding of the risk from surface water flooding, so that Boroughs and the GLA could manage and improve drainage assets and mitigate the risk from this type of flooding. The partnership now focuses on how sustainable drainage techniques can be used to address flood risk in the area, sharing best practice, and ensuring cross-borough coordination and collaboration with the valuable input of our key RMA partners.

In summary, to meet the aims of Objective 2:

> The Council will undertake periodic consultation with key stakeholders for the purpose of understanding areas at greatest risk of flooding, exploring opportunities for reducing flood risks, and discussing opportunities for collaboration.

Communication between these key authorities is also essential for the management of risk during and after a flood event. A good example of this communication is the Memorandum of Understating between the Council and Environment Agency to attend blockages at Mayes Brook Outlet Trash Screen and Kingsbridge Tidal Sluice Trash Screen during major flooding incidents whereby the Environment Agency operatives may be overstretched and unable to attend. Further demonstration of the importance of good communication is provided in Section 9 which discusses flood response and recovery plans.

7.3 ASSET REGISTER

In his review of the summer 2007 floods, Sir Michael Pitt recommended that local authorities should collate and map the main flood risk management and drainage assets (over and underground) including a record of their ownership and condition. Pitt explained that by collating information and mapping these assets, local authorities would be able to:

- → Develop more informed maintenance regimes which can take account of assets important for managing flood risk, particularly in high risk areas;

- Establish where all local drainage and watercourse systems are, allowing for quicker identification of the responsible authority in incidences of flooding;
- Produce and publish a maintenance schedule for their own assets as well as providing guidance to riparian owners as to how they should maintain their assets.

It is important to realise the full potential of a maintaining a robust asset register. The asset register is not simply a system for recording assets that are likely to have a significant effect on a flood risk. The asset register presents an opportunity to:

- Inform the public of key flooding assets in their area;
- Understand how assets contribute to flood risk;
- Understand how assets assist in the management of flood risk;
- Assist investigations of significant flood events by linking flood events to assets within the area that could contribute to and/or alleviate flooding;
- Inform and influence the proactive inspection and maintenance of assets to reduce and manage flood risk;
- Inform, influence and prioritise funding requirements to reduce and manage flood risk;
- Identify multiple benefits, such as assets important for effective operation of highways as well as for flood risk management.

The Flood and Water Management Act implements those recommendations made by Sir Michael Pitt including the recommendation for local authorities to establish and maintain a record of assets. Specifically, Section 21 of the Act states:

21. Lead local authorities: duty to maintain a register

(1) A lead local flood authority must establish and maintain –
  (a) a register of structures or features which, in the opinion of the authority, are likely to have a significant effect on a flood risk in its area, and
  (b) a record of information about each of those structures or features, including information about ownership and state of repair.

(2) The Minister may by regulations make provision about the content of the register and record.

(3) The lead local flood authority must arrange for the register to be available for inspection at all reasonable times.

(4) The Minister may by regulations provide for information of a specified description to be excluded from the register or record.

(5) In this section, "the Minister" means -
  (a) the Secretary of State in relation to authorities in England, and
  (b) the Welsh Ministers in relation to authorities in Wales.

The legal characteristics of the asset register and record are outlined in Table 7.

Table 7 Asset register requirements

	Register	Record
a.	Must be made available for inspection at all reasonable times.	Up to the LLFA to decide if they wish to make it available for inspection.
b.	Must contain a list of structures or features which in the opinion of the authority, are likely to have a significant effect on a local flood risk.	For each structure or feature listed on the register, the record must contain information about its ownership and state of repair.
c.	s.21 (2) of the Act allows for further regulations to be made about the content of the register and record. There is currently no plan to provide such regulations therefore their content should be decided on by the LLFA depending on what information will be useful to them.	
d.	There is no legal requirement to have a separate register and record although as indicated above, only the register needs to be made available for public inspection.	

The Council currently record assets in a number of ways, most commonly associated with the recording of highways assets including gullies. It is acknowledged, however, that a more comprehensive and consistent method for recording assets, most notably assets that are important for flood management, is required to meet the requirements of the Act.

The Council will therefore undertake a review of the current methods of recording assets to understand the most appropriate way to record flood management assets. Where appropriate, the Council are committed to recording assets that are important for flood management using FloodStation. This will enable the Council to link assets with flooding events that are also recorded in FloodStation. However, it may not be appropriate to record all flood management assets in FloodStation and existing or alternative systems, such as systems to record road gullies and other highway assets within the Borough, will be maintained. A clear method of working will be developed that clarifies the procedures for recording flood management assets depending on the nature and location of the asset.

As discussed in Section 6.2, assets will be linked to flood events where possible and, as discussed in Section 7.4, will inform the need for a proactive inspection and maintenance regime. Assets will be geo-referenced to enable the mapping of assets – this will help understand the location of key assets throughout the Borough and link assets with geo-referenced historic flood records.

Populating the asset register and adding data such as location coordinates will be an on-going process as existing assets are added and opportunities to improve existing information are identified. The Council therefore propose to utilise the following approach to enhance their asset register and to meet the requirements of the Flood and Water Management Act:

1. Quick wins – add data that is easily available that may be held on existing records;
2. High risk – add assets that are located in known high risk areas or that could result in a high risk scenario should the asset fail;
3. Flood incidents – add assets that are identified through undertaking flood investigations;
4. Inspection and maintenance activities – add assets identified through planned or reactive inspection and maintenance works;
5. All other assets – add all other known assets not identified through the means listed above.

Assets that are typically included within the asset register (in this case within FloodStation) comprise both natural and manmade structures and features such as:

- Flood defences and flood storage areas
- Pumping stations
- Flap valves, sluice gates, penstocks and other outfall structures
- Open channels and watercourses
- Culverts and culverted watercourses
- Piped drainage systems
- Grills and trash screens
- Highways gullies
- Bridges over watercourses and open drains
- SUDS features, ponds and flood attenuation features

The Council also intend to collate information on important assets that are in private ownership or fall under riparian ownership responsibilities that could have significant consequences if they were to fail, for example, assets such as large private drainage systems.

The Council can designate a feature that is located on private land or that is in private ownership as a 'flood risk management asset'. Features that have been designated as a flood risk management asset cannot be altered, removed or replaced without the consent of the Council.

Comprehensive asset registers are also held by the other key risk management authorities, namely the Environmental Agency and Thames Water Utilities. Given the extensive area that is under the responsibility of these organisations and the number of assets that will be important for flood risk management, the Council do not intend to combine all assets into a single register. However, the Council will maintain information regarding assets that are considered crucial for flood management, such as the Thames Tidal Defences and the Barking Barrier, and any assets that are maintained by the Council on behalf of other risk management authorities.

In summary, to meet the aims of Objective 2:

The Council will maintain a register of assets important for flood management that are within the Council's ownership and/or for which the Council are responsible, and strive to include assets that are within private or third party ownership that are considered likely to have a significant effect on a flood risk.

7.4 MAINTENANCE

Many of the local flooding incidents within Barking and Dagenham are a result of temporary blockages that reduce the capacity of a feature or prevent the feature from operating as it should. Regular maintenance of these assets is therefore essential for flood risk management. Unfortunately the funding currently available for undertaking proactive and routine maintenance is limited and therefore the Council are relying more on the reactive maintenance of reported problem areas.

However, using FloodStation to record the location and condition of flood management assets as well as record the location of flooding incidents will help the Council apply a risk-based priority system to prioritise which assets would benefit the most from a proactive maintenance regime.

This approach will enable those assets that are either in poor condition and/or that can be attributed to flooding within the Borough to be prioritised above those that are in good condition and/or have no known flood-related risks.

It is important for the Council, other risk management authorities and the public to recognise the importance of both proactive and reactive maintenance activities. Implementing a proactive inspection and maintenance regime will not eliminate the need for reactive maintenance, but it should reduce the volume of reactive maintenance activities and reduce the impacts caused by defective assets.

In summary, to meet the aims of Objective 2:

> The Council will continue to undertake reactive maintenance of assets to address local flood risk issues.
>
> The Council will also aim to develop a proactive maintenance regime for those assets that are considered to pose the greatest flood risk, as informed by data collected in Flood Station regarding the condition of the asset and recorded flooding events.

7.5 PRIORITISATION

Section 5 of this Strategy has highlighted that large areas of Barking and Dagenham are considered to be at risk of flooding from one or more sources. The greatest risks are typically associated with a breach in the Thames Tidal Defences, although the risk from surface water runoff and malfunctioning of assets is also quite considerable. The more 'strategic' measures discussed above (i.e. the recording of flooding events, creation of the asset register and prioritisation of maintenance activities) will offer a significant improvement to the management of flood risks within these areas, however, a clear and transparent method is required to prioritise those areas that are considered to be in greatest need.

Financial and resource constraints limit the actions that can be taken by the relevant flood risk management authorities, including the Council, in addressing and reducing flood risk throughout Barking and Dagenham. It is simply not possible or practical for the Council to address all flood risk issues in the Borough. It is therefore necessary for the Council to implement a clear and transparent system for the prioritisation of communities and other infrastructure that are considered to be at greatest risk of flooding or that may experience the greatest consequences should a flood event occur.

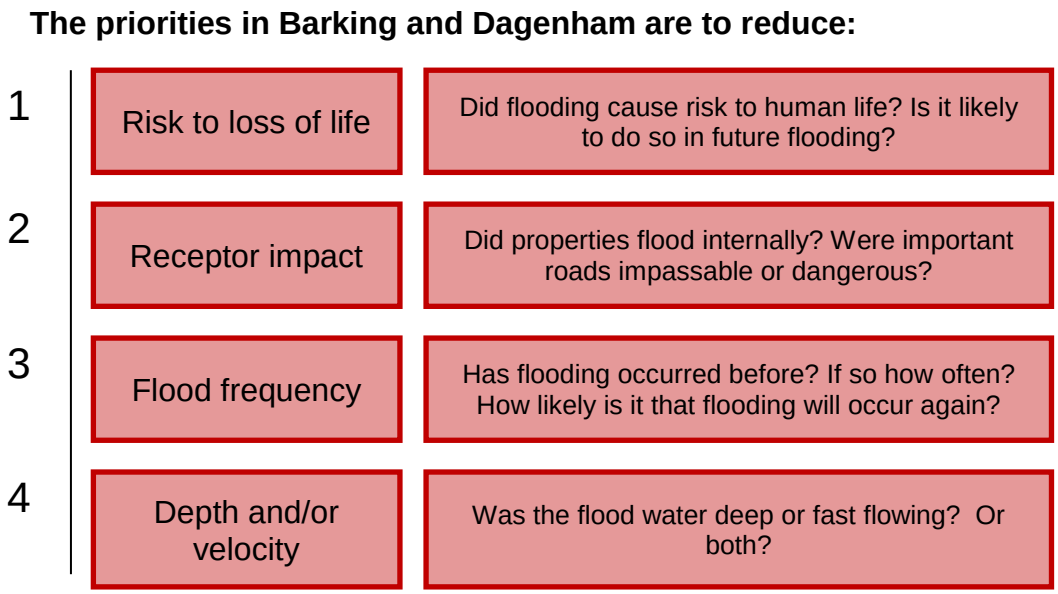
PRINCIPLES OF PRIORITISATION

The principles of prioritisation outline what is considered 'significant' when considering the impacts of a flood event and the characteristics of that event. All flood events and the impacts of those flood events will be assessed against these principles to create a priority 'shortlist'.

Whilst we appreciate that flood events that are not deemed significant (in terms of the criteria below) may still cause considerable stress, damage and inconvenience, the restrictions posed by financial and resource limitations unfortunately dictate that priority must be given to those people considered to be in greatest need.

The principles outlined in Figure 4 are the principles that will be adopted by the Council to guide the prioritisation process in Barking and Dagenham.

Figure 4 Principles to guide the prioritisation of areas at flood risk



These priorities are not intended to capture every important feature of every flood event but rather to highlight the most significant events that pose greatest risk or cause greatest impact to those affected. The priorities aim to provide structure to a method which will alert decision makers to receptors and/or communities that may require the most immediate action to reduce flooding or reduce the effects of flooding.

OTHER INFLUENCING FACTORS

The final decision of where action will be taken to reduce flooding will be decided by the relevant risk management authorities and will consider other factors that must be taken into account. This will include looking in greater detail at the other characteristics of the flood event, such as:

- The number of properties that flooded or are at risk;
- The historical or cultural importance of the affected property(s);
- The ability of those affected to protect themselves;
- The severity of health or pollution risks associated with the flood event;
- The duration and extent of the flood event;
- The scale of damage caused, associated costs and disruption, and the ability to recover;
- The impact to other receptors, such as land or features with important historic, archaeological, environmental or recreational importance;
- The support given by the people that are affected by flooding, for example through local flood groups or local funding opportunities.

It is also important for the Council to consider flood risks at an individual property level scale and a community level scale. Consideration of individual properties is important to ensure that a single property is not discounted as low priority simply because of its individual susceptibility to flooding. That said, consideration of larger communities is also extremely important as this will highlight those communities where multiple properties are at risk and therefore where multiple benefits can be achieved by taking action.

The same principles will be applied to individual and multiple properties at risk of flooding, although priority may have to be first given to actions that can address multiple properties if this is where the greatest reduction in flood risk can be achieved.

METHODOLOGIES

Data used to inform the prioritisation process will be obtained from three key sources:

1. Records of historical flood events and anecdotal evidence;
2. Predictions of future flood events based on modelled outputs;
3. New records of flood events that will be collated by the Council as and when flooding occurs.

Priority will be given to those areas that are known to have experienced flooding in the past, although it is recognised that the quality of historic flood records in Barking and Dagenham is currently limited. The quality and quantity of recorded flood data will improve in the future as the Council implement the new method of flood recording (as discussed Section 6).

Modelled flood data is useful to predict areas that are at a high risk of flooding within Barking and Dagenham but which may not have flooded yet and also to supplement data on historical flood events, particularly for those areas of Barking and Dagenham that may not have recorded many historical flood events. Modelled data is also a useful validation tool to be able to better understand historical flood events and how the flooding incident may have occurred.

PRIORITISATION OF MEASURES

After consideration has been given to those areas of Barking and Dagenham that are considered to be at greatest risk, consideration must be given to the type of measures that can be implemented and the standard of protection that can be provided. It is often not possible to protect communities from all sources of flood risk or from the most extreme of flood events.

The prioritisation of measures needs to take into account a number of considerations as summarised in Table 8.

Table 8 Method of prioritisation of flood management measures

Criteria	Commentary
Committed measures	Certain measures may have already been committed as part of another scheme or plan, for example improvements to existing flood defences or cyclical maintenance works.
The time scale and timing of the measures	Measures could be quick win solutions that can be implemented quickly to provide an immediate solution to a problem. Measures may be given priority depending on available funding opportunities at the time of assessing the problem.
Strategic or non-strategic	Some measures may only address flooding in a small area (such as property level protection) whilst other measures may offer benefit to a much wider area (such as an upstream storage pond).
Cross-boundary	Some measures may require and/or benefit from input from multiple risk management authorities, either due to geographical location (e.g. to address flooding that extends beyond Barking and Dagenham) or due to the nature of the flood risk (e.g. combined fluvial and surface water flooding) which can bring benefit (e.g. additional funding) or cause delay (e.g. due to additional coordination requirements).

Criteria	Commentary
Multiple benefits	Measures may offer multiple benefits beyond the management of flood risk, such as improvements in water quality, air quality, biodiversity or open space. These measures may also meet the objectives of other Council departments and legislation, such as the Water Framework Directive. Measures may also offer protection to important historic assets or sites of archaeological importance.
Cost and funding	This not only applies to the capital cost of the proposed measures, but also on-going maintenance requirements and deciding who would be best placed to take responsibility for this. Consideration must also be given to available funding opportunities and the criteria that need to be met to secure finding from the identified source(s).
Legislation	Certain measures may be required to meet legislative requirements, such as completing an asset register or reducing pollution risks to river catchment.

At this stage it is difficult to define the prioritisation process for specific measures as these will be heavily dependent on the flood risk characteristics within the area identified to be at risk of flooding. However, Barking and Dagenham has identified a number of critical strategic measures that are required to be implemented immediately. These include:

- The need to prepare this Flood Risk Management Strategy;
- The need to record details of flooding events;
- The need to investigate significant flood events;
- The need to create a register of assets that are likely to have a significant effect on flood risk; and
- The need to undertake periodic inspections and maintenance of 'high risk' assets using a risk based priority system.

OTHER RISK MANAGEMENT AUTHORITIES

The other key risk management authorities, most notably the Environment Agency and Thames Water Utilities, also have their own methods of prioritisation. These will vary from the criteria used by the Council, but the overall principles will be similar – most notably that priority will nearly always be given to those properties that are at greatest risk in terms of flood damages, hazard, frequency and past flood history.

The Environment Agency operates a 'Communities at Risk' initiative. This is a tool that will help the Environment Agency prioritise schemes throughout England, focussing more on the use of proactive measures rather than just reactive measures (i.e. predicting those areas that are at greatest risk rather than addressing issues after a flooding event has occurred). The Environment Agency will work closely with the Council to look for cohesion between the prioritisation completed by the Environment Agency and the prioritisation completed by Barking and Dagenham Council.

In summary, to meet the aims of Objective 2:

> The Council will implement a clear and transparent system for the prioritisation of areas that are considered to be at greatest risk of flooding or that may experience the greatest consequences should a flood event occur. This will take into consideration the vulnerability of those at risk, multifaceted opportunities to coordinate with other risk management authorities, and the support of the local community.

7.6 DELIVERY OF SCHEMES

Wherever possible, the Council will strive to manage flood risks through the undertaking of regular maintenance, raising awareness of risks, using new development to aid in reducing flood risk elsewhere, and avoiding inappropriate development in areas identified to be risk. However, if the risk of flooding is considered significant and cannot be avoided by the above measures, the Council will investigate alternative options that may include capital works. This encompasses a wide range of measures but could be the replacement of an undersized culvert, the reinstatement of naturalised floodplains, or the provision of flood defence structures. A significant amount of work in the form of feasibilities studies and optioneering studies is required to inform the design and selection of these types of schemes. The type of scheme put forward will also be heavily dependent on the funding available, as discussed in greater detail in Section 11.

Two examples of significant schemes that have been delivered within Barking and Dagenham in recent years include the Mayes Brook Park naturalisation project and the Beam Washlands flood storage improvements.

The Mayes Brook Park project comprised the restoration of the river that flows through the park to provide multiple benefits to wildlife, the community and to flood risk – with a particular focus on adapting to the potential effects of climate change. The project was brought about by an innovative partnership of public, private and community organisations lead by the London Borough of Barking and Dagenham, the Environment Agency, Thames Rivers Restoration Trust, Natural England, London Wildlife Trust and the Mayor of London. The project is presented as a 'demonstration project' to highlight how this approach could be implemented effectively elsewhere. Central to the scheme is approximately 1.5 hectares of flood plain alongside the restored brook that safely stores floodwater and slowly releases it at a controlled rate. The floodplain itself is complex patchwork of seasonal ponds, reed beds, acid grassland and scrub vegetation. The improved park provides a home for a range of wildlife, some of which are rare in London such as freshwater fish, water birds, amphibians and bats.

The Beam Washlands is another multi-ward winning partnership project with Barking and Dagenham Council, the Environment Agency and the Land Restoration Trust. Further investment came from the European Regional Development Fund, Thames Gateway Parkland Fund and the Landfill Tax Credit Scheme (LFTCS). The project improved the integrity and capacity of this flood storage washland, providing better protection to over 570 homes and 90 businesses, including the Ford Dagenham plant, major infrastructure including Barking power station, and several strategic development sites. The project also provides a large, wildlife-rich, community parkland within 53 hectares of regenerated open space.

The Council are also currently in discussion with the Environment Agency regarding opportunities to address known flood risks at a number of other locations within Barking and Dagenham. The viability of these projects will require further investigation that will include a cost-benefit analysis of the protection that could be provided by a range of different schemes, the availability of funding streams and partnership funding opportunities, and the ability to offer multiple benefits such as improved biodiversity and public open space.

In summary, to meet the aims of Objective 2:

The Council will continue to pursue and support schemes to continually reduce the risk of flooding throughout Barking and Dagenham in accordance with the principals of prioritisation as set out within Section 7.5. Where possible, these will offer multiple benefits to the community and to wildlife and will be delivered in partnership with other relevant authorities and organisations.

8 OBJECTIVE 3: COMMUNICATE WITH COMMUNITIES AND WORK TOGETHER TO MANAGE RISK

8.1 OVERVIEW

The people of Barking and Dagenham play an essential role in the management of flood risk. Raising awareness of community responsibilities and opportunities is an important part of the Council's strategy for flood risk management throughout the Borough.

Local people have an opportunity to assist in achieving every objective that is proposed within the Local Flood Risk Management Strategy and community support is essential to their success. The financial pressures that are faced by local councils are well understood and the Council must therefore look to local communities for support in providing places that are safe for all to live and work.

As discussed in Section 7, the Council will implement a clear and transparent system for the prioritisation of areas that are considered to be at greatest risk of flooding or that may experience the greatest consequences should a flood event occur. One of the factors that will be taken into consideration by the Council when selecting schemes to be taken forward will be the support that is provided by the local community. In these times of austerity it is essential that all those involved in the management of flood risks join together to provide a partnership approach to flood risk management.

Some of the key responsibilities and opportunities for local communities are discussed in this section.

Local communities play an essential role in the management of flood risk. Responsibilities and opportunities that can be explored to achieve the aims of Objective 3 will include:

- → Raising awareness of riparian ownership responsibilities and taking action to enforce this within Barking and Dagenham;
- → Encouraging local communities that are at risk of flooding to form, join or support a local Community Flood Group;
- → Raising awareness of what to do in the event of a flood and how local communities should report flooding issues;
- → Raising awareness of action that can be taken by local communities to better protect their properties.

8.2 RIPARIAN OWNERSHIP RESPONSIBILITIES

If a main river, ordinary watercourse, ditch, drainage feature or other form of flood defence asset is located within or bordering privately owned land, these features are the responsibility of the

land owner unless specific arrangements have been made with another risk management authority. This responsibility is known as 'riparian ownership' and is a requirement in accordance with the Land Drainage Act as discussed in Section 3.

The Environment Agency has published a guide entitled "Living on the Edge" that provides advice regarding the rights and responsibilities of riparian owners. Key points of relevance to this Strategy include but are not limited to:

- If you own land that has a watercourse running through or underneath it (i.e. within a culvert) it is assumed that you own the stretch of watercourse that runs through your land;
- If your land boundary is next to a watercourse it is assumed that you own the land up to the centre of the watercourse, unless it is clearly stated otherwise;
- You must let water, including flood waters, flow through your land without any obstruction or diversion that may affect others.
- You are responsible for the maintenance of the watercourse and any associated features within your land, including keeping the banks and channel clear of anything that could cause obstruction and increase flood risk, and clearing debris from structures such as culverts, trash screens, weirs and mill gates.

Riparian owners have the right to protect their property from flooding or land from erosion. However, all works to a watercourse (and within c.9m of the channel edge) must be agreed with the relevant risk management authority – for example the Environment Agency for main rivers or Barking and Dagenham Council for ordinary watercourses.

As discussed in Section 7.3, the Council can designate a feature that is located on private land or that is in private ownership as a 'flood risk management asset'. **Features that have been designated as a flood risk management asset cannot be altered, removed or replaced without the consent of the Council.** However, the Council will give the riparian owner at least 28 days notice if they decide to do this and the riparian owner has a right to challenge any designation if they do not agree with what is proposed.

If a watercourse or its associated infrastructure is not adequately maintained by the riparian owner, this can cause flooding of properties, the highway and surrounding land. The relevant risk management authority, namely the Environment Agency for main rivers and Barking and Dagenham Council for ordinary watercourses, can take enforcement action against riparian owners if they do not believe that the required maintenance activities are being undertaken and/or if the riparian owner has undertaken works that has increased the risk of flooding.

In summary, to meet the aims of Objective 3:

> The Council will continue to raise awareness of riparian ownership responsibilities and, where necessary, take enforcement action to ensure riparian owners undertake the necessary maintenance of their assets and do not undertake works that may increase flood risk to properties, the highway or surrounding land.

8.3 COMMUNITY FLOOD GROUPS

Barking and Dagenham Council support the role of the **Community Flood Group** in providing an invaluable role in helping communities to be prepared for flooding, both in terms of understanding local flood risks and helping communities to respond to and recover from a flooding event should it occur.

The Community Flood Group initiative is also supported by the Environment Agency and a considerable amount of information is available via the GOV.UK website[5]. The group can be formed by anyone with the interest and enthusiasm to coordinate the group. The Council's Civil Protection Team are keen to provide further advice and support to establish these groups within those areas that are identified to be at risk of flooding from tidal, fluvial or surface water sources.

One of the key actions of the Community Flood Group is to prepare a **Community Flood Plan** that summarises where flooding is likely to occur, the 'triggers' that will indicate when the Plan should be implemented, and the actions that should be taken to implement the Plan.

It is also recommended that occupants of properties that are in an area at risk of flooding or that have flooded in the past should also have a **Personal Flood Plan** to set out their emergency actions. It should include who does what when flooding is forecast and emergency contact numbers. A Personal Flood Plan template has been prepared by the Environment Agency, and is available via the GOV.UK website[6].

It is likely that newer development in areas at risk of tidal or fluvial flooding, in particular developments located in the Barking Riverside and Dagenham Docs areas, will have a flood evacuation or flood response plan in place as part of the planning application approval requirements. Residents should make sure that they are aware of any such plans and their responsibilities within these plans.

The Barking and Dagenham Civil Protection Team can provide advice and guidance for communities and individuals wishing to prepare Community Flood Plans or Personal Flood Plans, or would like to discuss the availability of plans that may have already been prepared for their community.

In summary, to meet the aims of Objective 3:

> The Council promote communities and individuals at risk of flooding to form a Community Flood Group and, if necessary, prepare and implement a Community Flood Plan and/or Personal Flood Plan in consultation with the Council's Civil Protection Team.

8.4 ACTION TO TAKE IN THE EVENT OF A FLOOD

The action to take in the event of a flood will be dependent on the severity of the event and the source of the flooding. In an emergency situation, people at risk should always contact the emergency services.

Floodwater can be very dangerous - six inches of fast-flowing water can knock you off your feet and two feet can sweep away a car. While the Council endeavours to provide assistance wherever possible, **it is an individual responsibility to protect your person and your property**.

If you are located within a Flood Warning Area as defined by the Environment Agency, it is strongly recommended that you sign up to receive alerts from the Environment Agency. These

[5] https://www.gov.uk/government/publications/flood-plan-guidance-for-communities-and-groups
[6] https://www.gov.uk/government/publications/personal-flood-plan

are updated every 15 minutes and will provide early warning that a fluvial flooding event may occur.

There are no flood warning services available for flooding from ordinary watercourses, surface water or groundwater sources. However, Barking and Dagenham Council will endeavour to provide real-time information of significant flood events via local radio/news.

If you become aware of a flooding issue such as a blocked culvert or flooding of a highway, you are advised to contact the Council to report the issue. The action taken by the Council will depend on the nature and severity of the issue, and must also take into account other pressures that the Council may be facing at that time.

If you become aware of a flooding issue associated with a main river or the public sewerage network, you are advised to contact the Environmental Agency or Thames Water Utilities. If you are unsure of the source of flooding, contact the Council for advice.

In summary, to meet the aims of Objective 3:

The Council will continue to raise awareness of flood events and the actions to take during a flood event through information provided via the Council website and via local radio and news.

The Council will also continue to reinforce the individual's responsibility to protect themselves and their property during a flood event.

The Council's Civil Protection Team can provide further advice and guidance on what action to take in the event of a flood.

If you or your community experience flooding, details of this flood event should be reported to the Council in order to inform the Council's record of flooding and meet the aims of Objective 1. The information that is required will include details such as the date, location, duration, source of flooding, if internal property flooding was experienced, how many properties were affected, and if there were any other hazards such as impassable roads.

8.5 COMMUNITY-LED INITIATIVES

Barking and Dagenham Council are keen to promote individual and community responsibility for managing local flood risks, thereby promoting ownership of the actions that are taken and the measures that may be implemented.

Community-led initiatives could include:

- Creating or joining a Community Flood Group, as discussed above.
- Preparing and implementing a Community Flood Plan or Personal Flood Plan, as discussed above;
- Installing Property Level Protection measures;

- Undertaking maintenance of assets, such as ordinary watercourses, within the community;
- Investigating options and discussing opportunities for improved flood management with the Council;
- Applying for, securing and contributing towards the funding required to deliver flood management schemes.

PROPERTY LEVEL PROTECTION

It is the responsibility of all homeowners to protect their property against flooding. Property Level Protection (PLP) measures can provide temporary or permanent protection against flood risk, depending on the nature of flood risk to the affected property. It is advised that people who live in areas at risk of flooding investigate the options that may be available to them and the benefits that they could offer.

Some PLP measures aim to keep flood waters out of a property, for example the use of flood-proof doors and flood-proof air bricks. Other PLP measures will allow flood waters to enter a property, but will minimise the risk of damage to facilitate a quick recovery.

Some PLP measures can protect more than one property and it is recommended that the need for PLP is discussed as part of a Community Flood Group.

A lot of good information about PLP is available through websites such as the Blue Pages (www.bluepages.org.uk), the Property Care Association (www.property-care.org/PCSearch.asp) and the National Flood Forum (www.nationalfloodforum.org.uk).

PLP measures are typically paid for by the property owner. However, if a community and/or individual property is considered to be at significant and/or repeated risk of flooding it will be assessed as part of the Council's prioritisation process as set out in Section 7.5. If, after undertaking an assessment of the risk, the use of PLP measures are considered to be the most appropriate then the Council may assist in the funding of these measures.

MAINTAINING ASSETS

As discussed in Section 7.4, the maintenance of assets such as watercourses and ditches can be extremely effective in managing flood risks. Whilst the Council do not promote local communities to undertake works that would put people in danger, the Council are in full support of local communities undertaking relatively minor works that could have a big impact in reducing local flood risk. This could include activities such as removing vegetation from river banks, clearing leaves from gullies or removing small branches that have fallen into a ditch. The Council should be notified of any proposed works so that they can assess the potential risks and provide advice as necessary.

The Council also promote local communities to contact the Council if they notice any other maintenance works that are required to prevent or alleviate flood risk – especially any works that would put members of the community at risk.

FLOOD MANAGEMENT SCHEMES

Local communities are often best placed to understand the causes and effects of flooding within their local area. As discussed in Section 7.5, the Council may also be able to give preference to those communities which are actively supporting a flood management scheme.

As part of a Community Flood Group, the Council encourage local communities to investigate and present opportunities for managing flood risks within their area. Wherever possible, the Council will look to assist with the funding of these schemes if they are in-line with the Council's

prioritisation hierarchy, or if the schemes can offer multiple benefits or partnership funding opportunities (i.e. if the scheme can offer other benefits such as improved biodiversity, or if the scheme can be part funded by another organisation or the community itself).

FUNDING OPPORTUNITIES

The Council's budget for implementing flood management schemes or undertaking other activities such as maintenance of flood assets is extremely limited and must be carefully planned for each year. It is often very difficult for the Council to fully fund flood management schemes, especially those that might not be within the top priority list.

The Council encourages local communities to research and apply for other sources of funding that may be available for flood risk management initiatives. Government grants are often available after significant flooding events, for example the Repair and Renew Grant that was made available to homeowners and business owners following the Spring 2014 floods.

Further information regarding potential sources of funding is provided within Section 11.

In summary, to meet the aims of Objective 3:

> The Council encourages local communities to propose and implement local initiatives for managing local flood risk, and where appropriate will support these initiatives in the Council's role as Lead Local Flood Authority.

9 OBJECTIVE 4: DEVELOP, MAINTAIN AND IMPLEMENT EMERGENCY RESPONSE AND RECOVERY PLANS

9.1 OVERVIEW

Within Barking and Dagenham, flood warning, response and recovery is managed by the Council's Civil Protection Team as part of the Civil Protection Service. The Civil Protection Service is a shared service with the London Borough of Waltham Forest. This helps to keep costs low, while developing knowledge that can be shared across both Boroughs.

The Council's Civil Protection Service is part of a Borough Resilience Forum that is chaired by the Police and contributed to by the Council's Civil Protection Team. This is a multi-Borough forum that feeds into Multi-Agency Flood Plan which sets out the approach to managing a major flooding incident, such as a breach of the Thames Tidal Defences, should one occur. The Borough Resilience Forum meet on a quarterly basis to discuss topical issues, such as a recent flooding event, and ensure the appropriateness and robustness of the relevant emergency response plans, including the Multi-Agency Flood Plan.

Barking and Dagenham Council is designated as a Category 1 Responder under the Civil Contingencies Act 2004 and therefore has defined responsibilities to assess risk and respond appropriately in case of an emergency, including (for example) a major flooding event. Under the Civil Contingencies Act, the Council's primary responsibilities are:

- Assess the risk of an emergency occurring;
- Assess the risk of an emergency making it necessary or expedient for the person or body to perform any of his or its functions;
- Maintain plans for the purpose of ensuring, so far as is reasonably practicable, that if an emergency occurs the person or body is able to continue to perform his or its functions;
- Maintain plans for the purpose of ensuring that if an emergency occurs or is likely to occur the person or body is able to perform his or its functions so far as necessary or desirable for the purpose of:
  - preventing the emergency,
  - reducing, controlling or mitigating its effects, or
  - taking other action in connection with it.

The Flood Forecasting Centre is run by the Environment Agency and Met Office and provides forecasts for all natural forms of flooding, i.e. from rivers, surface water, tidal/coastal and groundwater. The Flood Forecasting Centre provides Category 1 and 2 Responders with a daily Flood Guidance Statement to aid with emergency planning and resourcing decisions. The statement provides an overview of flood risks across five days and identifies possible severe weather, which could cause flooding and significant disruption. A version of the Flood Guidance

Statement is published for the general public on the Environment Agency website called the Three Day Flood Risk Forecast[7].

The Environment Agency also constantly monitors rainfall, river levels and sea conditions to forecast the possibility of flooding[8], and if flooding is forecast the Environment Agency will issue Flood Warnings and Alerts. Flood Warnings are issued to specific areas where flooding is expected. Flood Alerts cover larger areas and are issued more frequently to areas when flooding is possible.

9.2 EXISTING AND PROPOSED ACTIVITIES

MULTI-AGENCY FLOOD PLAN

The aim of the Multi-Agency Flood Plan is to provide a coordinated multi-agency response framework to mitigate the impact of a large-scale flood event in the London Borough of Barking and Dagenham. It provides guidance on a strategic multi-agency response to deliver the following objectives:

- Prepare key parts of the community susceptible to flooding through the provision of advice and information;
- To prioritise the identification and required responses to protect the vulnerable within the community;
- To support the Environment Agency in the provision of warnings to communities at flood risk, where technically feasible;
- Manage precautionary actions to preserve life for the highest impact flood risks;
- Provide accurate and timely information to public and local business on flood response;
- Manage the wider impact of Borough flooding events to reduce disruption to the utilities, communities and environment;
- Lead recovery activity to support the recovery of communities and business;
- Maintain critical services within each organisation as part of business continuity arrangements.

In summary, the Multi-Agency Flood Plan sets out the procedures to warn communities of severe flood events, help the most vulnerable of communities and infrastructure during a flood event, and assist with the post-event recovery. A copy of the Multi-Agency Flood Plan for Barking and Dagenham can be requested from the Council's Civil Protection Team.

FLOOD WARNINGS

As discussed in Section 8.4, the Environment Agency operates a flood warning service for properties that are located within their Flood Warning Areas. These are updated every 15 minutes and will provide early warning that a fluvial or tidal flooding event may occur. If you are located within a Flood Warning Area, it is strongly recommended that you sign up to receive these alerts from the Environment Agency[9].

The majority of land to the south of the A13 Alfreds Way / Ripple Road can register to receive Environment Agency's Flood Warnings. A detailed map of the areas that receive this service is

[7] http://apps.environment-agency.gov.uk/flood/3days/125305.aspx
[8] https://flood-warning-information.service.gov.uk/river-and-sea-levels
[9] http://apps.environment-agency.gov.uk/flood/

available on the Environment Agency's website[10] and within the Barking and Dagenham Strategic Flood Risk Assessment.

The Environment Agency also publishes flood forecasts and real-time information on their website, including regular updates of the Environment Agency's Live Flood Warning Map[11].

In the build-up to a flooding incident, the media are also routinely sent all warning messages issued by the Environment Agency, Met Office and Flood Forecasting Centre.

There are currently no flood warning services available for flooding from ordinary watercourses, surface water or groundwater sources. However, the Council will endeavour to provide real-time information of significant flood events via local radio/news. This will include sustained road closures.

If a flooding event is considered likely, local communities should implement their Community Flood Plan or Personal Flood Plan as recommended in Section 8.3, and provide assistance to the most vulnerable people within the community.

FLOOD RESPONSE

The type of response will be heavily dependent on the nature and scale of the flood event. Smaller flooding events commonly associated with surface water runoff or blocked highway gullies will be managed by the Barking and Dagenham Council Highways Authority and should be reported to the Council directly. In the most extreme of events, the Multi-Agency Flood Plan will come into effect and the Emergency Services will be deployed to provide assistance.

During a flooding event, the Council's Civil Protection Team in conjunction with the wider Borough Resilience Forum will aim to provide assistance to those at greatest risk, such as the elderly or infirm. The Council are committed to housing people that are displaced during a flood event and who are unable to stay with nearby friends and family. Emergency evacuation centres and short term shelters will be established when necessary in accordance with the Barking and Dagenham Short Term Shelter Response Plan. Information will be disseminated to communities through local media and on-the-ground staff such as the Emergency Services and Environment Agency.

For those areas that are already identified to be at greatest risk of flooding, it is recommended that the actions to be taken by the local community during a flood event are included within a Community Flood Plan and issued to all members of the community that are likely to be at risk.

For any new developments that are proposed within the defended and undefended high risk flood zones (as identified within Environment Agency's indicative flood maps and within the Barking and Dagenham Strategic Flood Risk Assessment), developers are likely to be required to prepare a site-specific flood evacuation plan or flood response plan. This will be made available to all residents of these developments and will set out the procedures to be followed in the event of a flood. This plan could also form the Community Flood Plan or Personal Flood Plan as recommended in Section 8.3.

The Environment Agency provides the following advice for aspects to be considered when preparing a site-specific flood evacuation plan or flood response plan for new development:

- *before* – lack of preparedness – ensure people are aware (sign up to Environment Agency's Flood Warning service), infrastructure is protected or resilient;

[10] http://maps.environment-agency.gov.uk/wiyby
[11] www.flood-warning-information.service.gov.uk

- *during* – property and infrastructure is flood-resistant, escape and access is appropriate, refuge areas are provided;
- *after* – recovery is maximised - ensure emergency services can reach those most at risk/affected, no basement-only properties in areas if most flood risk, ensuring properties are properly flood-resilient.

For larger developments, vulnerable developments and/or developments in areas at high risk, the site-specific flood evacuation plan or flood response plan should include, but is not limited to, the following:

- Evacuation procedures or procedures for safe refuge;
- People responsible for evacuation and/or safe refuge;
- Evacuation and emergency refuge routes;
- Flood warning codes; and
- Local emergency services contact details.

MEMORANDUM OF UNDERSTANDING

Good communication and collaborative working is essential to the management of major flooding incidents. To this end, Barking and Dagenham Council hold a Memorandum of Understating with the Environment Agency to attend blockages at Mayes Brook Outlet Trash Screen and Kingsbridge Tidal Sluice Trash Screen during major flooding incidents whereby the Environment Agency operatives may be overstretched and unable to attend. The Council are obliged to provide resources within a response time of 45 minutes to clear any blockages on the respective screens.

FLOOD RECOVERY

The framework to facilitate the rebuilding, restoration and rehabilitation of communities following a flood event is set out by the Borough Resilience Forum within documents such as the Multi-Agency Flood Plan and Short Term Shelter Response Plan. These plans summarise the key roles and responsibilities of the key risk management authorities, such as the Environment Agency and Barking and Dagenham Council, and also sets out the activities that are expected of local communities.

Short term housing of displaced people may be available by the Council for the most vulnerable and who are unable to stay with nearby friends and family. The Council will provide advice to those that are likely to be displaced for a longer period of time, although it is ultimately the responsibility of individuals to arrange longer term accommodation in consultation with their insurance companies.

Capturing data for the purpose of understanding the causes, extent, duration and damages of a flood event will also form an important part of the flood recovery process. This is closely linked to Objective 1, as understanding flooding events will assist in being better prepared for future events and, where possible, reducing the likelihood of reoccurrence. For significant events, the Council or the relevant risk management authority will undertake an investigation in accordance with Section 19 of the Flood and Water Management Act (as discussed in Section 6.3).

In summary, to meet the aims of Objective 4:

The Council will continue to implement existing processes for flood warning, response and recovery in collaboration with other relevant organisations and authorities through the Borough Resilience Forum, preparation of Community Flood Plans and Personal Flood Plans, and raising awareness of risks and procedures via local media.

10 OBJECTIVE 5: MAKE SUSTAINABLE POLICY AND PLANNING DECISIONS INFORMED BY FLOODING ISSUES

10.1 OVERVIEW

Avoiding development within areas that are identified to be at risk of flooding is often the most secure way to reduce the number of people and property at risk. This is, however, often difficult to achieve due to increased land use pressure, the redevelopment of sites that are identified to be at flood risk and many other factors that influencing site selection. This is particularly true of the Barking Riverside and Dagenham Docks areas which are undergoing significant regeneration and redevelopment.

A risk-based approach must be taken when selecting sites for development and deciding on the type of development that would be considered acceptable. This must take into account the type of flooding that is predicted, the likely consequences of flooding, and any measures that can be included to improve the resistance or resilience of the development to flooding.

All development can assist in the reduction of flood risk, either to the development itself or to people and property elsewhere. The Council encourage all new development to go beyond what is considered 'minimum requirements' and instead explore opportunities for 'best practice'.

The Council has prepared a number of documents that set out the way in which flooding will influence the selection of sites and type of development that would be considered appropriate for those sites. Key documents prepared by the Council include the Local Plan and Core Strategy; Barking Town Centre Area Action Plan; and the Barking and Dagenham Strategic Flood Risk Assessment. These documents are informed and supplemented by many other planning and guidance documents including (but by no means limited to) the NPPF and its supporting Planning Practice Guidance; Non-Statutory Technical Standards for Sustainable Drainage; The SuDS Manual; and standing advice provided by the Environment Agency via the GOV.UK website.

In summary:

The tools used by the Council that are considered key in the promotion of sustainable and appropriate development include:

- → The preparation of an appropriate Local Plan and Strategic Flood Risk Assessment;
- → Ensuring that local and national policies are taken into account within the planning application and approval process;
- → The promotion of best practice design techniques, including the use of sustainable drainage systems.

10.2 KEY COUNCIL DOCUMENTS

LOCAL PLAN AND CORE STRATEGY

The Core Strategy is the primary and strategic Development Plan Document for the Borough; it guides the content of the other Local Development Documents (including Area Action Plans and Supplementary Planning Documents). It sets out the spatial planning framework for Barking and Dagenham to deliver the Sustainable Community Strategy priorities and outcomes and sets strategic locations for delivering this vision. The Core Strategy takes account of national and regional issues, Barking and Dagenham Council's corporate aims and objectives, as well as the strategies of organisations where there are implications for the development and use of land. The Core Strategy supports the approach to flood risk management as set out within NPPF and its supporting Planning Practice Guidance 'Flood Risk and Coastal Change'.

The Council is currently preparing their updated Local Plan to guide development in the Borough up to 2030 and set out the overall strategic planning framework. The Local Plan is made up of a number of documents, one of which is the Core Strategy.

BARKING TOWN CENTRE AREA ACTION PLAN

An Area Action Plan (AAP) is a Development Plan Document (DPD) that provides specific planning policy and guidance for an area where significant regeneration or investment needs to be managed. AAPs address the specific challenges of an area and to specify the required land uses in particular locations and identify key strategic interventions. AAPs have a strong focus on delivery and implementation, and form a statutory component of the Local Development Framework.

The Barking Town Centre Area Action Plan was adopted in February 2011 and sets out the vision for how the town centre will function in the future and objectives concerning commercial, transport, housing, social infrastructure, urban design and public realm, parks and open spaces, sustainability and developer contributions to achieve the vision.

BARKING AND DAGENHAM STRATEGIC FLOOD RISK ASSESSMENT

The SFRA is a statutory document required under the NPPF that informs the Local Plan and the planning and design of development within the Borough. In regard to informing planning and policy decision, the SFRA is used in the selection and subsequent development of strategic development sites to ensure future development is considered appropriate at that location and that any identified risks can be adequately managed. The SFRA also identifies the requirements for site-specific flood risk assessments and the measures that should be embedded into development proposals to ensure that the development will remain safe over the lifetime of the development without increasing flood risk elsewhere.

10.3 EXISTING AND PROPOSED ACTIVITIES

THE PLANNING APPLICATION PROCESS

The planning application process is essential in ensuring that new development is not at unacceptable risk of flooding and that new development does not increase flood risk elsewhere. All applications for development within Barking and Dagenham must take into account the planning policies as set out within the Local Plan and NPPF. All applications for new development must also take into consideration any additional recommendations made within the SFRA and the London Plan.

The Council promotes early discussions with developers through the pre-application advice service. This aims to advise developers on the likely flood risk within their area and the measures

that may be required to adequately protect against flooding. Through consideration of the Sequential and Exception Tests in accordance with NPPF, this service may also identify that the proposed development is not considered suitable within an area identified to be at risk and is therefore likely to be refused planning permission.

The Council will expect all developers to demonstrate that a sequential approach has been taken in the selection of development sites and in the proposed layout of the development. This requires flood risks to be taken into account by directing the most vulnerable aspects of a development towards areas at lowest risk. If a development needs to be located within an area at risk of flooding, the Council will require the developer to demonstrate how the development will be made safe. This could include flood resistance measures such as raising internal floor levels, or it could include flood resilience measures such as providing a safe means of escape. For vulnerable developments within areas identified to be at risk, a site-specific flood evacuation plan or flood response plan may be required.

For all new developments, the developer will be required to demonstrate that the development will not cause any notable increase in flood risk to people, property or infrastructure elsewhere.

BEST PRACTICE DESIGN TECHNIQUES

Wherever possible, the Council will promote opportunities for new development to reduce the risk of flooding to the development site or to people, property or infrastructure elsewhere. This is most likely to be associated with opportunities for the sustainable management of surface water runoff, particularly within areas of Barking and Dagenham that are known to experience flooding from surface water runoff.

At minimum, developers should be striving to ensure that new developments do not increase the rate or volume of surface water runoff when compared to the current situation. However, for previously developed sites and for larger strategic development sites, the Council expect developers to be demonstrating betterment over current conditions, particularly if there are known local flooding issues.

Developers should also be looking for opportunities to contribute to other flood management schemes, particularly in communities that have established flooding problems. Providing betterment to local communities is also likely to gain more local support for new developments.

The development of flood management measures must also take into account the potential impacts of these schemes on other aspects of the natural and built environment to ensure that, in accordance with the NPPF, the planning system continues to contribute to the achievement of sustainable development. This must include consideration of the economic, social and environmental effects of a flood management scheme – noting that environmental aspects include natural, built and historic environments.

In summary, to meet the aims of Objective 5:

The Council will continue to promote sustainable and appropriate development through the Local Plan and planning approval process. The Council will also work closely with developers to identify opportunities for new development to improve the risk of flooding to the development site or to people, property or infrastructure elsewhere.

11 DELIVERY AND FUNDING MECHANISMS

11.1 INTRODUCTION

As the Council faces further economic uncertainty and substantial funding cuts, the need for a clear strategy to set a framework within which the Borough can operate becomes increasingly important. We will continue to work with our partner RMAs, residents and other key stakeholders to ensure that we are better able to influence flood risk management policies and investment agenda in the future, and take advantage of new and innovative funding opportunities as they emerge.

The Pitt Review undertaken in 2007 recommended that 'Government should develop a scheme that allows and encourages local communities to invest in flood risk management measures'. This recommendation has been realised through the new Government policy of Flood and Coastal Resilience Partnership Funding ('partnership funding') that came into force in April 2012.

There is a large number of National and Local funding streams available to contribute towards the funding of flood risk management schemes and activities, commonly referred to as Flood & Coastal Erosion Risk Management (FCERM) schemes and activities.

The majority of funding is provided by Central Government via Defra and passed down to the Environment Agency as Flood Defence Grant-in-Aid (FDGiA). The Environment Agency spends this funding directly on FCERM, but also passes some on as grants to local authorities, such as Barking and Dagenham Council. Other secondary sources of funding that can supplement these key sources of funding include the Local Levy, Community Infrastructure Levy and Partnership Funding schemes.

Delivery of flood risk management measures will always be dependent on sufficient funding being available. The funding available for any measure will be linked to the outcomes it will provide. Measures that deliver benefits beyond flood risk management, such as enhanced ecosystems, public amenity, economic growth or cultural heritage, are likely to attract funding from alternative sources beyond those typically used to support flood risk management. This has been evident in the delivery of the Mayes Brook Park and Beam Washlands projects that secured funding from multiple organisations.

This section of the document provides further information regarding potential funding opportunities for FCERM schemes and activities together with how these will be delivered.

11.2 SOURCES OF FUNDING

FCERM GRANT IN AID FUNDING

The majority of funds available from Defra are given to the Environment Agency as Flood Defence Grant-in-Aid (FDGiA). Local authorities, such as Barking and Dagenham Council, can apply to the Environment Agency for grants to assist with the delivery of FCERM schemes and activities.

The FDGiA financing model supports a new partnership funding approach. The amount of funding that will be provided for each scheme that the Council are requesting funding for is calculated based on the number of households protected by the scheme, the damages that will be prevented, and any other benefits to the environmental, amenity, agricultural productivity or economy.

Every worthwhile project has the potential to be supported by national FDGiA funding based on the benefits that a scheme provides. The amount of FDGiA funding available may be sufficient to fully fund schemes that have a high benefit to cost ratio. However, any outstanding costs must be met through other funding streams that are available to Barking and Dagenham Council, other stakeholders or local communities. This partnership funding approach allows Central Government to contribute to a wider range of schemes rather than meeting the full costs of a limited number of schemes.

FDGiA funding will be closely aligned to local flood risk management strategies and development plans produced by local authorities, in consultation with communities or local flood action groups. As long as minimum criteria are met, all new defences and capital maintenance projects are eligible for partnership funding, as are those protecting individual properties and managing risk from surface water and groundwater.

If a FCERM scheme or activity qualifies for partial funding of the total costs, then local partners including local authorities can decide what to do. For example, a project qualifying for 90% FDGiA funding can still go ahead if costs are reduced by 10%, or a 10% contribution is found, or a combination of the two.

The FDGiA system aims to improve the transparency of funding and to provide greater certainty to communities over the prospect of national funding for a flood management scheme.

The value of available funding that can be obtained through the FDGiA considers three aspects of a project:

- The value of benefits for householders as a result of flood risks being managed, especially in deprived areas and where risks are significant;
- The value of other benefits achieved, such as the benefits to businesses, agricultural productivity and protection for national and local infrastructure, across the whole-life of the scheme;
- The environmental benefits of the scheme, needed to maintain healthy ecosystems as well as offset any habitats lost when defences are built to protect people and property.

The maximum amount of funding for a project will be based on multiplying each of the aspects above by a set of payment rates, which are fixed amounts of national funding per unit of outcome or benefit achieved. Payment rates for protecting households will be higher in deprived areas, so that schemes in these areas are more likely to be fully funded by Government.

The share of funding for a project that can be obtained through the FDGiA is therefore equal to:

$$\text{Share of costs funded by FDGiA} = \frac{(\text{Household benefits} + \text{other whole life benefits} + \text{environmental outcomes}) \times \text{Fixed payment rates}}{\div \text{ Amount of funding required}}$$

This shows that the percentage of FDGiA funding increases in line with the benefits being delivered.

Funding is also available for the design stages of a project to develop suitable measures for flood risk management. Barking and Dagenham Council would need to bear the cost of the first stages of the business case to identify areas at greatest risk of flooding, prioritise those areas, initially assess the flood management solutions in terms of costs and benefits and identify suitable

funding partners. However, FDGiA funding can be applied for to continue the development of the scheme through detailed studies and design works. Funding for these early stages does not guarantee that the project will be funded for the remaining appraisal, design, construction and maintenance phases of the scheme.

LOCAL LEVY

Local levy funding is an additional locally-raised source of income, gathered by way of a levy on local authorities and collected via council tax. Barking and Dagenham's levy is administered by the Thames Regional Flood and Coastal Committee (TRFCC) and the TRFCC is responsible for deciding how the levy is spent within the region each year.

The TRFCC initiative aims to bring together all the LLFAs within the Thames catchment to discuss and develop appropriate catchment-wide plans for managing flood risks; encourage efficient, targeted and risk-based investment in FCERM; and provide a link between the Environment Agency, LLFAs, and other relevant bodies to build understanding of flood risks.

The levy that can be granted by the TRFCC can be used to support flood risk management projects that are not considered to be national priorities and hence do not attract national funding through FDGiA. Alternatively, local levy funding can be applied to FDGiA projects, at the discretion of the TRFCC, to meet the partnership funding requirements.

REVENUE FUNDING FOR LEAD LOCAL FLOOD AUTHORITIES

The Government is making additional funds available to Councils in the short term to fulfil their new roles and responsibilities under the Flood and Water Management Act. Once allocated, the grants are managed by the London Borough of Barking and Dagenham according to its needs and priorities. The amount allocated is based on the level of risk in each LLFA.

COUNCIL TAX AND BUSINESS RATE SUPPLEMENTS

Local Authorities may choose to invest in flood risk management from income generated through council tax levies and precepts. This approach has been successfully used in the past to promote flood risk management schemes although may require approval through a referendum. The London Borough of Barking and Dagenham is responsible for setting council tax and managing spend. Business rate supplements could be levied in a similar manner.

COMMUNITY INFRASTRUCTURE LEVY

The Community Infrastructure Levy (CiL) was introduced in April 2010 and provides Councils with an alternative source of potential funding for flood defence schemes. It enables the Council to raise funds from new development in Barking and Dagenham in order to support growth and pay for the impact that the development has on local infrastructure.

The CiL is designed to provide a fair, fast and transparent system of requesting contributions and allocating funds. It gives local authorities the freedom to set their own priorities for what the money should be spent on and makes the system more transparent for local people as local authorities have to report what they have spent the levy on each year.

In areas where a CiL is in force, land owners and developers must pay the levy to the local authority, in this case Barking and Dagenham Council. The charges are set by the Council based on the size and type of the new development and the value of the land in that location.

The money raised from the CiL can be used to fund new infrastructure that the Council, local community and neighbourhoods want, like new road schemes, park improvements, schools or

flood defence works. This can include the construction new infrastructure and increasing the capacity of existing infrastructure.

SECTION 106 AGREEMENTS

Section 106 of the Town and Country Planning Act allows a local planning authority to enter into a voluntary agreement with a landowner or developer in association with the granting of planning permission. A Section 106 agreement is used to address issues that are necessary to make a development acceptable to the local planning authority, such as supporting the provision of services and infrastructure.

One of the recommendations of Making Space for Water[12] was that local planning authorities should make more use of Section 106 agreements to ensure that there is a strong planning policy to manage flood risk. This means that any flood risk which is caused by, or increased by, new development should be resolved and funded by the developer.

Where possible, Barking and Dagenham Council will seek to use Section 106 agreements to obtain funding to deliver flood risk management schemes that are required to facilitate the new development.

NEW HOMES BONUS

The New Homes Bonus is a grant paid by central Government to local councils to reflect and incentivise housing growth in their areas. The grant funding matches the funds that will be raised by the additional council tax that will be generated by new homes and long-term empty properties brought back into use, with an additional amount given for affordable homes. Payments are made for the 6 years following the provision or rehabilitation of properties. Councils can chose how they wish to spend the grating funding, with the potential for funding to be used to fund local flood risk activities.

FUNDING PARTNERSHIPS

As discussed above, the Environment Agency will often only allocate FDGiA to fund a project if the lead authority can secure additional contributions to help fund the project – although 100% FDGiA project funding is possible for some projects that are considered eligible (typically projects that would offer significant risk reduction as well as other amenity, biodiversity and/or economic benefits).

Implementing schemes that offer multiple benefits are therefore more likely to secure the necessary funding and therefore more likely to be implemented. For schemes that offer multiple benefits, it is expected that the key stakeholders that are associated with the scheme and/or that will benefit from the scheme will also contribute in some part towards the required funding.

Organisations that may contribute towards flood risk management projects are typically those that would benefit from the scheme and/or those with a vested interest in flood risk management. This could include organisations such as:

- Relevant departments within Barking and Dagenham Council, such as the Parks Department and Highways Department.
- The Environment Agency, especially for projects that contribute to combined flood risk management from local sources and main rivers (for example);

[12] Making Space for Water, Defra, 2004

- Thames Water Utilities;
- Network Rail and Transport for London;
- Borough Resilience Forum;
- Community Flood Groups;
- Natural England or local wildlife groups such as the Thames River Restoration Trust;
- English Heritage or local archaeological groups;
- Riparian owners;
- Developers;
- The local community and local businesses.

The partnership funding approach was demonstrated extremely well by the recent Mayes Brook Park and Beam Washlands schemes that provided consideration flood protection as well as biodiversity enhancement and amenity benefit.

THAMES WATER CONTRIBUTIONS

Thames Water Utilities maintains a database of properties at risk of flooding from incapacity of the public sewer network. Often the areas that are highlighted as having surface water problems appear on the Thames Water Utilities database. There is an opportunity for the London Borough of Barking and Dagenham and Thames Water Utilities to work together to deliver effective flood risk management collaboratively. Partnership funding where the cost is split or part funded by the key stakeholders (such as Thames Water Utilities) is another option available; this would be decided as specific schemes come forward.

OTHER SOURCES OF FUNDING

A number of other sources of funding are available to local communities and organisations. These are often released after a significant flood event, for example the Repair or Renew grants that were made available by the Government for the 2014 floods – these were one off payments for the most affected properties. Barking and Dagenham Council will endeavour to let communities know about the help that may be available following a flooding event.

Communities may also wish to explore opportunities for funding via schemes such as the National Lottery Grants and local fundraising.

For further information regarding available funding, communities are advised to consult with Barking and Dagenham Council and the Environment Agency, and review current guidance as provided on the GOV.UK website[13].

11.3 DELIVERY

The Strategy identifies the measures that the London Borough of Barking and Dagenham will adopt to achieve the local objectives. Measures are activities that will be undertaken to manage risk and achieve the stated objectives. Wherever possible, measures which achieve multiple benefits, such as water quality, biodiversity and amenity benefits will be prioritised. Both structural and non-structural measures will be considered. Structural measures may include physical options to manage flood risk such as de-culverting of rivers and drainage improvements. Non-

[13] https://www.gov.uk/government/publications/flood-and-coastal-resilience-partnership-funding

structural measures may include activities such as improved communication, spatial planning, emergency planning and improved flood awareness.

A cost benefit appraisal is completed for proposed flood risk management schemes (physical works and community initiatives) to help ensure that measures are proportionate to the level of risk presented and in some cases to help prioritise schemes and secure funding. It is recognised that specification of costs and benefits of measures is a requirement of a Local Strategy. However, it must also be acknowledged that in order to complete this process that detailed information on the specific costs and benefits of a measure is required. At this stage of the Local Strategy development, this type of information is not available in all areas to undertake a meaningful analysis.

Many of the proposed objectives relate to improving understanding of flood risk to better prepare for floods, manage the consequences of flooding and to prioritise future investment. The identified measures to implement these objectives generally relate to the London Borough of Barking and Dagenham and its partners' approach to their responsibilities for flood risk management in their everyday work. Until further investigations are completed and there is greater certainty on funding it is considered inappropriate to identify specific physical works or community initiatives and therefore the need for cost / benefit appraisal of proposals is not applicable at this time.

Future versions of the Local Flood Risk Management Strategy may include proposed measures which involve the implementation of structural or non-structural measures to reduce the consequences of flooding. A cost / benefit appraisal of these measures will then be completed as appropriate, in accordance with the guidance in place at the time. The appraisal will consider the whole life benefits of the measures (both tangible and intangible), the associated implementation costs and on-going maintenance costs.

IMPLEMENTATION

The Action Plan in Annex A sets out the proposed timescales for the delivery of measures identified to date, as well as the lead authority responsibility for the delivery of these measures and the potential sources of funding. The timescales for the measures is categorised into short (0 – 3 years), medium (3 – 10 years) and longer term with a view to managing the effects of climate change.

The Strategy is a 'live' document and is subject to revision over the plan period as circumstances and available funding streams dictate.

12 REVIEW AND UPDATE

12.1 STRATEGIC REVIEW

The Local Strategy should be reviewed and updated every six years as a minimum, although more frequent updates may be appropriate if new information is presented that amends the objectives or measures proposed within this Strategy. It is logical to align the review cycle with the requirements of the Flood Risk Regulations (2009). The Regulations require another Preliminary Flood Risk Assessment (PFRA) to be completed in 2017. The PFRA process will highlight any new flood risk information which may provide a revised baseline to inform the Strategy. In addition, the Council intends to undertake enhanced modelling of surface water flood risks which in turn may also provide a revised baseline to inform the Strategy. An update of the Strategy may therefore be appropriate in 2018 depending on the findings of the updated PFRA and enhanced modelling.

In addition, there may be circumstances which should trigger a review and/or an update of the Strategy in the interim. Examples of other triggers for review include:

- Occurrence of a significant flood event;
- Additional data or modelling becoming available, which may alter the understanding of flood risk;
- Outcome of investment decisions by partners influences available funding; and
- Development or other topographic changes which may affect flood risk.

It is in the interest of the London Borough of Barking and Dagenham and the community they represent that the Strategy remains current and up-to-date.

Review and update of the Strategy is the responsibility of the London Borough of Barking and Dagenham as a Lead Local Flood Authority. Other local risk management authorities are required to support the review and update process by supply of relevant data to inform the Strategy.

12.2 CONSULTATION

This document will be circulated for consultation to the London Borough of Barking and Dagenham Council, key stakeholders, and the general public. Feedback received from the consultation process will be reviewed by the authors and incorporated, where appropriate, into the Strategy to ensure it reflects the needs of the community.

13 REFERENCES

Defra (2005), Making space for water

Defra / Environment Agency (2011), Understanding the risks, empowering communities, building resilience, the national flood and coastal erosion risk management strategy for England.

Department for Communities and Local Government (2012) National Planning Policy Framework (NPPF)

Department for Communities and Local Government (2014) Planning Policy Guidance (PPG)

Environment Agency (2009), Thames Catchment Flood Management Plan (CFMP)

Environment Agency (2012), Thames Estuary 2100 Plan (TE2100 Plan)

Environment Agency (2014), Living on the Edge

London Borough of Barking and Dagenham (2010), Core Strategy

London Borough of Barking and Dagenham (2011), Core Strategy: Area Action Plan

London Borough of Barking and Dagenham (2008), Level 1 Strategic Flood Risk Assessment (SFRA)

London Borough of Barking and Dagenham (2008), Level 2 Strategic Flood Risk Assessment (SFRA)

London Borough of Barking and Dagenham (2017), Level 1 Strategic Flood Risk Assessment (SFRA)

London Borough of Barking and Dagenham (2017), Level 2 Strategic Flood Risk Assessment (SFRA)

London Borough of Barking and Dagenham (2012), Preliminary Flood Risk Assessment (PFRA)

London Borough of Barking and Dagenham (2011), Surface Water Management Plan (SWMP)

National Archives (2009) Flood Risk Regulations

National Archives (2010) Flood and Water Management Act