Hull City Council

Local flood risk management strategy

Hull

City Council

1. Executive Summary

Flooding and coastal erosion risk in England is expected to increase due to climate change and this has consequences on development in areas at risk. It is not possible to prevent all flooding or coastal erosion, but there are actions which can be taken to manage these risks and reduce their impact on communities.

The purpose of this Local Flood Risk Management Strategy is to pull together and publish the information on flood risk in the city of Kingston upon Hull and identify ways of managing the risk in partnership with all relevant Risk Management Authorities.

The Strategy considers and looks at all sources of flood risk. It provides the evidence of previous flood incidents such as the tidal surge in December 2013 and the devastating flood in the summer of 2007, which was recorded as the wettest in May–July since records began in 1776. Figures released by Hull City Council indicate that 7,800 houses flooded and 1,300 businesses were affected. Estimated repair costs were £200 million.

Following the floods of 2007 an independent review of national flood risk management practices was completed by Sir Michael Pitt. The Pitt Review was published in 2008. The report called for urgent and fundamental changes and contained 92 recommendations. Following the Pitt Review the Flood and Water Management Act 2010 was introduced and this led to the introduction of Lead Local Flood Authorities.

There are significant challenges ahead for all Risk Management Authorities. We have to start building homes and critical infrastructure for the 2100 generation and beyond, as well as protecting and enhancing what we have from generations before us. With climate change, projections suggest sea levels are rising and weather patterns will alter with increased intensity of rainfall events and frequency of heavy thunderstorms leading to more flash flooding and surface water inundation. This is along with reduced budgets and funding cuts. Future ways of managing flood risk must be done in close partnership with the communities and all stakeholders to ensure success.

This strategy provides an excellent opportunity for integrating and delivering the aspiration for the city of Kingston upon Hull. The Local Strategy will be an invaluable tool to help understand and manage the various sources of flood risk.

2. Glossary and Terminology

Term	Definition
Assets	Structures, either formal or informal which are used to manage flood risk.
Areas Susceptible to Surface Water Flooding (AStSWF)	A method of surface water flood modelling carried out by the Environment Agency to indicate the broad areas likely to be at risk of surface water flooding. See also FMfSW.
Annual Exceedance Probability (AEP)	The chance of a flood of a given size happening in any one year e.g. 1 flood with a 1% AEP will happen, on average once every 100 years.
Catchments	An area of land drained by a watercourse or water body. Every part of land where the rainfall drains to a single watercourse is in the same catchment.
Climate Change	A long term change in weather patterns. In the context of flood risk, climate change will produce more frequent occurances of severe rainfall.
Catchment Flood Management Plan (CFMP)	A strategic planning tool through which the Environment Agency works with other key decision-makers on the large scale of a River Basin District to identify and agree overarching policies for sustainable flood risk management.
Critical Infrastructure	Infrastructure which is considered vital or indispensable to society, the economy, public health or the environment, and where the failure or destruction would have large impact. This would include emergency services such as hospitals, schools, communications, electricity sub-stations, water and waste water treatment works, transport infrastructure and reservoirs.
Defences	A structure that is used to reduce the probability of floodwater affecting a particular area.
Defra	Department for Environment, Food and Rural Affairs. The government department with overall responsibility for flood risk management.
DG5 Register	A Water Sewerage Company (WaSC) register of properties which have experienced internal or external sewer flooding due to hydraulic overload, or properties which are at risk of sewer flooding more than once in a twenty year period.
Environment Agency	A non-Departmental Public Body of Defra with a strategic overview on all types of flooding/risk
Exceedance Flow	Excess flow that appears on the surface once the capacity of the underground drainage system design standard is compromised.
FRM	Flood Risk Management.
FCERM	Flood and Coastal Erosion Risk Management.
Flood	The temporary covering by water of land not normally covered with water.
Flood Map for Surface Water (FMfSW)	A method of surface water flood modelling carried out by the Environment Agency to indicate the broad areas likely to be at risk of surface water flooding.
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra.
Fluvial flooding	Fluvial flooding is flooding caused rivers. Often thought of as rivers “bursting their banks”

Flood Risk Regulations 2009	Legislation that transposed the European Floods Directive into UK law in 2009
Floods Directive	Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks, known as the EU Floods Directive, came into force in November 2007 and is designed to help Member States prevent and limit the impact of floods on people, property and the environment. It was transposed into English law in December 2009 by the Flood Risk Regulations.
Groundwater	Water which is below the surface of the ground and in direct contact with the ground or subsoil.
Hazard	A potential source of harm.
Hydrology	The study of the effects of water on and below the earth's surface.
Internal Drainage Board (IDB)	Drainage Board who are legally responsible to ensure that flows are maintained in ordinary watercourses within their domain.
Local Development Framework (LDF)	Local Planning Authority documents which comprise of a Statement of Community Involvement, Local Development Scheme and the Annual Monitoring Report.
Lead Local Flood Authority (LLFA)	Local Authority with Flood Risk Management Functions as defined in the Flood and Water Management Act 2010.
Local flood risk	Flood risk from sources other than main rivers, the sea and reservoirs. Principally meaning surface runoff, groundwater and ordinary watercourses.
Main River	A watercourse shown as such on the Main River Map flood risk management and for which the Environment Agency has responsibilities and powers.
Ordinary watercourses	A river, stream, ditch, cut, sluice, dyke or non-public sewer that is not a designated Main River, and for which the local authority has flood risk management responsibilities and powers.
Pluvial flooding	Pluvial flooding (or surface runoff flooding) is caused by rainfall and is that flooding which occurs due to water ponding on, or flowing over, the surface before it reaches a drain or watercourse.
Pitt Review	An independent review of the 2007 summer floods by Sir Michael Pitt which provided recommendations to improve flood risk management in England
Preliminary Flood Risk Assessment (PFRA)	Assessment of surface water flood risk in the area covered by a Lead Local Flood Authority describing both the probability and harmful consequences of past and predicted future flooding.
Resistance Measures	Resistance measures are designed to keep flood water out of properties and businesses.
Resilience Measures	Resilience measures are designed to reduce the impact of water that enters the property or businesses.
Riparian Owners	Someone who owns land or property adjacent to a watercourse, with a duty to maintain and allow water to flow downstream freely.
Strategic Flood Risk Assessment (SFRA)	A SFRA provides information on areas at risk from all sources of flooding.
Surface Water Management Plan (SWMP)	A tool to understand, manage and coordinate surface water flood risk between relevant stakeholders.
Sustainable Drainage Systems	A sequence of management practices and control measures designed to mimic natural drainage processes by allowing rainfall to

(SuDS)	infiltrate, and by attenuating and conveying surface water runoff slowly at peak times.

Acronym	Definition
CFMP	Catchment Flood Management Plan
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
FMfSW	Flood Map for Surface Water
FWMA	Flood & Water Management Act 2010
IDB	Internal Drainage Board
LDF	Local Development Framework
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LRF	Local Resilience Forum
NPPF	National Planning Policy Framework
PFRA	Preliminary Flood Risk Assessment
RBD	River Basin District
RMAs	Risk Management Authorities
SAB	SuDS Approving Body
SEA	Strategic Environment Assessment
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
YWS	Yorkshire Water Services
YRFCC	Yorkshire Regional Flood and Coastal Committee

3. Introduction

3.1 Hull's Local Flood Risk Management Strategy (LFRMS)

This LFRMS aims to identify the existing and future risks of flooding to Kingston upon Hull and builds on existing approaches to manage that risk. It will set out a local framework for understanding the roles of the risk management authorities and the communities in managing flood risk. To do this it will:

- Consider the risks in Hull from all sources of flooding, including looking at past incidents, the future implications with climate change and assess the consequences
- Look at the area designated as the significant area of flood risk as defined in the PFRA under the Flood Risk Regulations
- List the key players in managing flood risk, their roles and responsibilities
- Provides the background on the existing flood management legislation
- Managing the risk considers options, the sources of funding, maintaining existing and new assets into the future and looks for multi benefit solutions
- Provides useful information for residents who are living with the threat of flood risk
- The Strategy will be formally approved by the Council's Cabinet and adopted as Hull City Council's Local Flood Risk Management Strategy. It is a living document which will develop and be reviewed by the Flood Risk Team as new information and advanced expert modelling are harnessed to provide us with a greater understanding of the risk from flooding from all sources.

The local strategy will harmonize and support the national strategy published by the Environment Agency.

Link to the National Strategy: http://www.environmentagency.gov.uk/research/policy/130073.aspx

The National Strategy outlines a national framework for flood and coastal risk management, balancing the requirements of communities, economy and the environment.

Hull City Council has certain duties under the Flood and Water Management Act 2010 (FWMA) and the Flood Risk Regulations (FRR) to provide key documents for all stakeholders.

3.2 Links to Other Local Documents and Strategies

The Preliminary Flood Risk Assessment (PFRA), a high level screening exercise that brings together information on significant local surface water risk areas taken from readily available information
http://www.hullcc.gov.uk/portal/page?_pageid=221,638936&_dad=portal&_schema=PORTAL

Strategic Flood Risk Assessment (SFRA). A planning tool that provides information on areas at risk from all sources of flooding.
http://www.hullcc.gov.uk/portal/page?_pageid=221,638936&_dad=portal&_schema=PORTAL

Surface Water Management Plan (SWMP). A tool to understand, manage and coordinate surface water flood risk between relevant stakeholders.
http://www.hullcc.gov.uk/portal/page?_pageid=221,638936&_dad=portal&_schema=PORTAL

The River Hull Integrated Catchment Strategy (RHICS). The draft River Hull Integrated Catchment Strategy is a combination of assessing all sources of flood risk in the Hull catchment. RHICS provides us with a clear understanding of the impacts and cost of

flooding to all.
http://www.eastriding.gov.uk/riverhull

The Humber Flood Risk Management Strategy. The assessment of risk and how it can be managed in the Humber estuary.
https://www.gov.uk/government/publications/humber-flood-risk-management-strategy

These essential documents and Strategies were produced to help Hull City Council meets its duties as a Lead Local Flood Authority (LLFA). They ensure developments in the city can be delivered with resilient and resistant approaches to reduce the impact of flood risk for future generations and the city's built environment. They also indicate areas of significant levels of potential flood risk. The documents deliver essential data required to support a city-wide Strategic Plan on how to manage and satisfy the needs of the National Planning Policy Framework, such as by reducing inappropriate development within a flood risk area and controlling the drainage from new developments using measures like sustainable drainage systems (SuDS). They are a key tool to support developers, architects and planners in their further assessment of flood risk measures which they will need to incorporate into their designs.

3.3 Lead Local Flood Authority Responsibilities

One of the key issues with flooding in this country is the number of authorities who have a role to play and who actually does what. The Flood and Water Management Act, http://www.legislation.gov.uk/ukpga/2010/29/contents which came into UK law in 2010, aimed to address this by looking at the organisations involved and specifying their roles. It is important to state that there is no actual legal responsibility for any authority to prevent flooding. This is because in many instances it is practically impossible to completely stop flooding and fight against nature. Risk Management Authorities (RMAs) are therefore given duties to assess and mitigate where possible. The purpose of the Act is to improve flood risk management and support continuity of water supply. The key feature of the Act is the implementation of recommendations from the Pitt Review into the summer 2007 flooding, thus increasing the emphasis on sources of flooding other than fluvial and tidal, in particular surface water. The Act gives a number of responsibilities and powers to both the Environment Agency and the Lead Local Flood Authorities (LLFA). The LLFA was made responsible for local flood risk; local flood risk is defined as flooding from ordinary watercourses, surface water and groundwater. Main rivers, the sea and large reservoirs are the responsibility of the Environment Agency.

The Environment Agency will also be responsible for producing a National Strategy for Flood and Coastal Erosion Risk Management (FCERM) for England.
https://www.gov.uk/government/publications/national-flood-and-coastal-erosion-risk-management-strategy-for-england.

As Lead Local Flood Authority, it is one of Hull City Council's roles to forge effective partnerships with the adjacent LLFA - East Riding of Yorkshire Council, Yorkshire Water and the Environment Agency as well as other key stakeholders such as the Highways Agency.

A pro-active flood risk multi–agency partnership is already in place between key organisations, with protocols for data sharing and best practice already established.

The flood risk management partnership and main stakeholders are listed below:

- Hull City Council, Regional Development Service;
- Environment Agency;
- Yorkshire Water; and
- East Riding of Yorkshire Council,

Beverley and Holderness Internal Drainage Board provide drainage to rural areas to the immediate north of the Hull City Council area. South Holderness Internal Drainage Board also provides land drainage functions to rural areas to the east of Hull City Council around Bilton and Salt End.

Flooded Hull Roads, June 2007

Aside from forming partnerships, coordinating and leading on local flood management, there are a number of other key responsibilities that have arisen for Lead Local Flood Authorities from the Flood and Water (FWMA) Management Act and the Flood Risk Regulations (FRR). These responsibilities include:

- **Investigating flood incidents** – LLFAs have a duty to investigate and record details of significant flood events within their area.

- **Asset Register** – LLFAs also have a duty to maintain a register of structures or features which are considered to have an effect on flood risk, including details on ownership and condition as a minimum. The register must be available for inspection and the Secretary of State will be able to make regulations about the content of the register and records.

- **SuDS Approving Body*** – Establish a SUDS Approval Body to ensure national standards of sustainable drainage are enforced. Developers will be required to gain approval of their proposed drainage systems before they can begin construction, and the SUDS Approving Body will then be responsible for adopting and maintaining SuDs which serve more than one property.

  *The secondary legislation necessary to implement this function has not been progressed and the Government has recently stated an intention to address SuDS through amendments to the land use planning process.

- **Works powers** – LLFAs have powers to undertake works to manage local flood risk, consistent with the local flood risk management strategy for the area.

- **Designation powers** – LLFAs, as well as the Environment Agency have powers to designate structures and features that affect flooding or coastal erosion in order to safeguard assets that are relied upon for flood or coastal erosion risk management.

- **Power to Request Information** – Request a person to provide information in connection with the authority's risk management functions.

4. Hull's Flood History

4.1 What Is the Risk in Hull

The issue of flooding in the city of Hull is not new or recent. As with many cities around the world the location was chosen due to the close proximity of the water to provide the transportation, power and the required work opportunities. With the benefits that this location gave it also brought problems of living with water and having to control nature. There was a an element of acceptance of flood risk due to the fact that it was a consequence of living near employment and that the properties were resilient in the fact that there was less to damage. The main challenge between 1854 and 1953 was to prevent tidal ingress whilst still allowing fresh water to drain. Improvements began from 1700 and continued with the use of windmills (engines) built to pump the land. Much of the area around the River Hull area is very low lying and the relationship between the rivers and drains, the Humber Estuary, groundwater and surface water is complex. The construction of the River Hull Tidal Surge Barrier in 1980 effectively sealed the river from the Humber, and preventing high tides and tidal surges from moving up the river and flooding parts of the city and the low-lying areas beyond.

4.2 Recent Flooding Hull

In November 2000

Flooding occurred due to a long duration rainfall event, following one of the wettest autumns on record with twice the expected monthly rainfall in September resulting in ground saturation. An average rainfall of 250 mm fell. Flooding occurred on the River Hull when the raised high level system was full of water and could not drain fast enough into the Humber Estuary. When this happened, the pumps draining the low level system into the River Hull had to be turned down as the high level system was full. This meant that the low level system (Beverley and Barmston Drain, Holderness Drain etc.) filled up until the low lying areas alongside these drains started to flood. The flood water was stationary and mostly of shallow depth but the duration of flooding was in excess of 10 days at some locations. Flooding also took place in Hull at Setting Dyke, at Coronation Road and Western Drain, and at Astral Close. The flooding seen during this period was the most recent fluvial event of a significant magnitude.

June 2007

The Hull and Haltemprice catchment area was affected by a period of heavy and sustained rainfall causing some of Hull's worst ever flooding with 8,657 houses and 1,300 businesses being inundated and 600 roads affected. Only 8 of Hull's 99 schools escaped flooding, affecting over three quarters of the city's 36,000 school children. As floodwaters rose, the fire service received over 1,500 calls from distressed residents, and evacuations were organised in many areas. Over 70 mm of rain fell in parts of the Hull area on the 15th June and over 100 mm of rain fell in parts of the Hull area on the 25th June. The intensity of the rainfall overwhelmed ditches, drains and sewers and the low lying nature of the catchment exacerbated the problem. As a result a major incident plan was put into force. River levels on the River Hull reached 0.4 metres higher than previously recorded which would have led to some localised flooding, however, the severity of the surface water flooding caused the majority of problems within the Hull catchment. The estimated event was recorded as a 150-year event.



August 2012

Heavy showers and severe thunderstorms brought flash flooding to much of Hull. The area worse hit was East Hull. A a slow moving low pressure system combined with a rapid upward movement of warm air, which provided local atmospheric instability conditions allowing single cell thunderstorms to develop, with frequent lightning, large hail stones and torrential rain leading to flash flooding. The worst areas hit were Bransholme, Sutton, Tweendykes, and parts of Bilton Grange. North Point Shopping Centre was evacuated after torrential rain and hail caused the roof to give way; much of Bransholme, Bodmin Road and surrounding areas had significant amounts surface water flooding. Tweendykes, and Sutton had water rising through the manholes and road gullies as the large volume of water exceeded the design standard of the current drainage system.

5th December 2013

The 5th December tidal surge was at a level not experienced for at least 60 years; a storm surge moved around the UK coastline affecting coastal locations before moving down the East coast and into the Humber Estuary. The highest ever tide was recorded at the Hull Barrier.

The positive surge of 1.9m adding to an already high astronomic high spring tide, resulting in record water levels along our coast and tidal rivers, causing flooding to more than 400 properties and main roads in the East Riding (north bank of the Humber) and in Hull. There was also significant flooding on the south bank of the Humber.

The forecasting and warning for the tidal surge is very complex. The surge was difficult to predict resulting in flood warnings and severe flood warnings being issued in the city with

very little lead time to allow effective emergency planning arrangements to be commenced.

The tidal flood defences in the city, which are managed by the Environment Agency, protected 19,000 properties from significant flooding, and the role of the Hull Tidal Surge Barrier was recognised and rightly celebrated by many in the city. The barrier was, however, within 400mm of being overwhelmed by the tidal levels and other defences in Victoria Dock Village and St Andrews Quay were similarly at their design limits and only narrowly avoided overtopping. Significant ingress of flood waters occurred into the English Street area and flows spread into the city centre and as far as Hessle Road to the west, flood damage to 157 businesses and 135 residential properties has been recorded.

Tidal levels in Hull peaked at 5.8mAOD (as recorded at the Hull Tidal Surge Barrier). The lowest levels of defence in the city are adjacent to Albert Dock at Riverside Quay with levels of 5.04mAOD and, at the height of the tidal flood event, sea water entered into the dock and, once this was quickly filled, it flowed onwards into the city.

The tidal surge peak arrived at Hull approximately 30 minutes (19:15hrs) before the expected peak of the astronomical tide (19:47hrs). As the surge reached its peak, sea water started to flow into Albert Dock over the flood defences at Riverside Quay as well as through the lock gates to the dock.

Once the tidal peak had been reached and the Humber retreated the resulting flood waters were quickly drawn down by Yorkshire Waters sewerage infrastructure and discharged at Salt End Treatment Works. This was possible due to the limited amount of rainfall already in the system. A formal Section 19 report was carried out, officially published by HCC and containing a number of recommendations. Following these recommendations, work on the flood defences alongside Albert Dock's riverside quay was progressed and work started in November 2014 to provide a new wall at a design level of 6M. This work is now complete.

10th August 2014

The main cause of flooding during the 10th August weekend was the extreme heavy rainfall and strong winds from remnants of Hurricane Bertha. The data regarding the amount of rain that fell shows that it was not particularly significant across the whole of the city but extremely localised and heavy in some areas. This put pressure on the existing systems such as the sewers and gullies. The receiving watercourses were not affected by the event and

the levels did not show a reaction to the rain.

The storm resulted in extensive road and isolated property flooding. All operating authorities responded and the infrastructure worked as designed. Issues were caused due to the storm intensity and speed, and meant that many areas were affected shortly after the onset of rainfall and before the receiving infrastructure accepted flows.

The pure intensity of rainfall and high winds is identified as the main problem on the 10th August 2014 with the existing traditional systems unable to cope due to the speed of flow rates and volumes of run off.

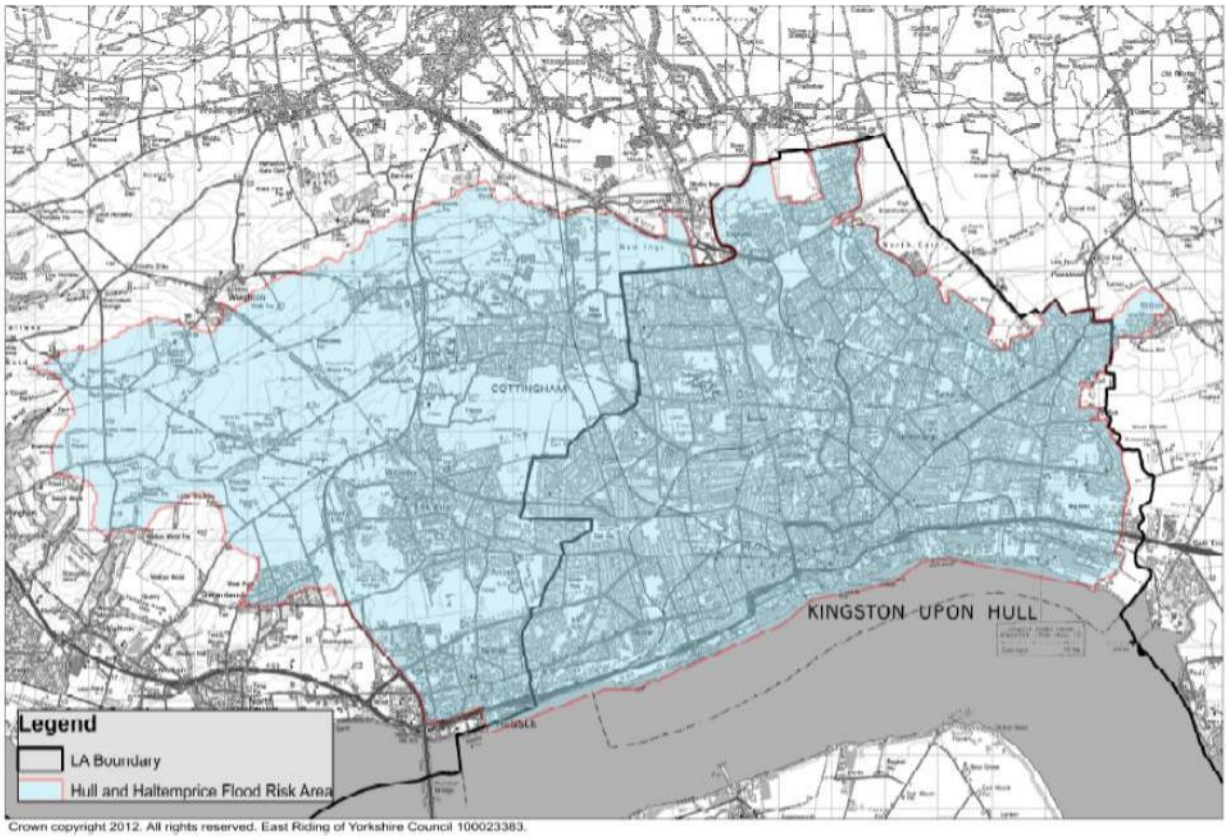
As a duty under the F&WMA a formal Section 19 report was deemed necessary following the above flooding event, and from the outcomes of the report many recommendations were made and directed to all the relevant flood risk managing authorities.

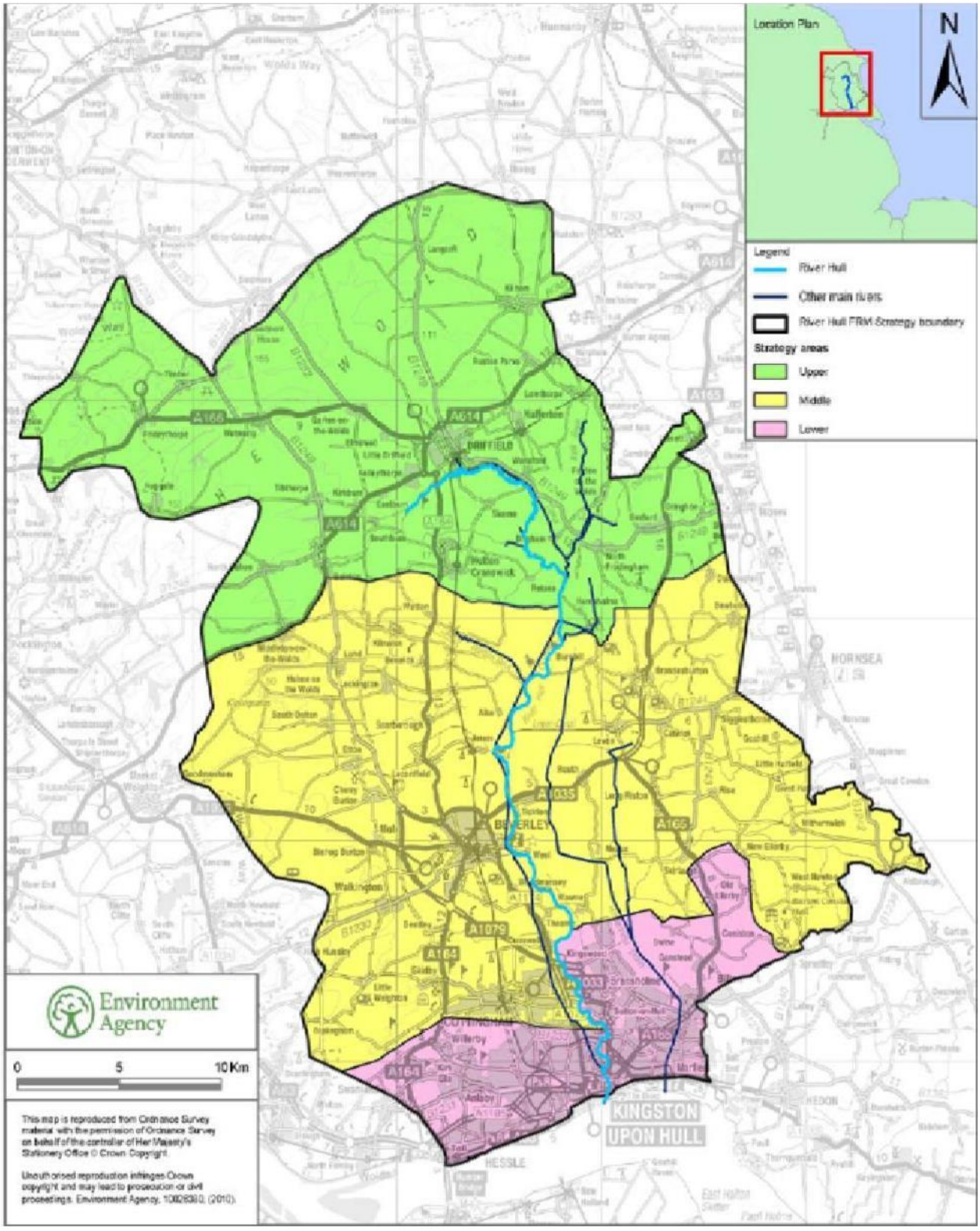
5. Flood Risk Management Area.

5.1 About the City

The City of Hull lies on the North Bank of the Humber Estuary and has a population of approximately 250,000 covering a geographical area of 7,150 hectares. The Hull City area is mainly urban and is predominantly built on reclaimed marshland. Outside the boundary of the City of Hull, and to the west of the city are the outlying settlements of Cottingham, Willerby and Kirk Ella, which are situated on higher ground. Most of the surface water runoff here which is not stored or recharged into the ground drains eastwards towards the city. The city of Hull is bounded by land administered by the East Riding of Yorkshire Council. The watercourses, drains and sewers serving the communities on the outskirts of the city flow into the city sewer system before ultimately discharging to the Humber. To assess and mitigate against flooding you need to take a catchment based approach. This means that we need to look at this area as a whole to identify cause, risk and solutions. It is for this purposed that the Hull and Haltemprice area was identified under the Flood Risk Regulations http://www.legislation.gov.uk/uksi/2009/3042/pdfs/uksi_20093042_en.pdf (section 5.10.5) as an Area of Significant Flood Risk from surface water and local sources of flooding. This forms one of the 10 flood risk areas in the country.

Hull and Haltemprice Designated Flood Risk Area





River Hull Catchment Area

5.2 Hydrology

There are two drainage systems within the city; a fluvial drainage system comprising the River Hull, the Beverley and Barmston Drain and Holderness Drain. This system brings in flows from outside the city, predominantly land to the north, which is then discharged to the Humber and ultimately the North Sea. The second system is the Hull and Haltemprice drainage system which provides the drainage infrastructure for the city and the surrounding areas of the East Riding of Yorkshire. This drainage system predominantly consists of sewers, piped systems underground with associated pumping required due to little fall in the ground levels with a number of open water courses that feed into the underground system eventually. This means flows need to be pumped to generate flow as gravity alone is not sufficient. The fluvial drainage system drains rural areas to the north of the city in the River Hull valley and includes large areas of the Yorkshire Wolds in its headwaters as well as low lying agricultural areas in its middle and lower reaches. With the general exception of the Bransholme and Kingswood area, the fluvial drainage system does not provide any surface water drainage capacity for the city. This means that Hull has a unique situation in that almost the entire storm drainage of the city is discharged through Yorkshire Water's piped drainage system and terminal pumping stations. The sewer system does not discharge to the nearest watercourse but instead is piped around the city via the West and East Hull pumping stations and the Humbercare sewage transfer system to the Waste Water Treatment Works at Saltend and is then discharged to the Humber.

5.3 Geology And Soils

The impact of geology on flood risk is determined by the permeability of rocks and overlying soils. Geological data shows that chalk underlies the city. As chalk is permeable, a greater proportion of rainfall could infiltrate into the ground depending on overlying soil or the presence of infiltration devices. Maximising infiltration would reduce the amount of surface run off which reaches rivers, which in turn reduces peak flows by delaying the transport of water from the catchment into the watercourses. The permeable chalk underlying the city should enable infiltration devices, such as soakaways and other Sustainable Drainage Systems (SUDS). Soils affect a number of factors relating to the time it takes rainfall to enter river channel. The permeability of a soil affects the amount of rainfall which will infiltrate into the soil rather than run off the surface of it. It also affects the speed at which water will percolate through the soil into the underlying geology. Within Hull City the chalk bedrock is overlain by tills composed of loam, clays, sands and gravels which are a product of glacial deposition from the ice sheets of the ice age. The predominant soil type in the city is seasonally wet deep clay, which typically has a low permeability, which naturally would cause much of the rainfall to run off the surface as opposed to infiltrate into the soil. There is also a high water table in the city due to the close proximity of the aquifers within the chalk. This factor combined with the clay soils means that little water can soak into the ground and therefore has to be routed to a discharge point.

6. Hull's Drainage System

6.1 Background to Hull's drainage system

The Hull and Haltemprice drainage system is extensive and complex in nature, comprising open watercourses which flow into culverted drains and sewers and which form part of a combined sewerage system. Sewers close to the estuary date back to Victorian times and were larger than is usual to provide storage during high tides when sewage flows could not be discharged by gravity into the Humber. Open drains used to run through the city but many of these were culverted historically because they were considered to constitute a threat to public health and to make room for development. The more recent development in the city (since the 1960's and 1970's) is served by conventional combined sewers.

The Hull and Haltemprice sewerage system which takes all the flows from West Hull and surrounding areas, is connected by gravity to the Salt End Pumping Station via a 3.6m diameter transfer sewer routed adjacent to the estuary. Salt End Pumping Station lifts flows to the city's waste water treatment works. In the event of very high rainfall, diluted sewage flows exceeding the Salt End Pumping station's capacity are screened and discharged into the estuary by means of an overflow at Salt End and two pumping stations at East and West Hull. East Hull pumping station also lifts fluvial flows from Holderness Drain in the event of high water levels in the estuary. It should be noted that the Bransholme and Kingswood area are served by their own surface water drainage system terminating at the Bransholme pumping station which discharges collected water directly into the River Hull. There is also a storage lagoon at Bransholme providing attenuation of surface water during high river flows. Sewage from Bransholme and Kingswood drains into the Hull and Haltemprice drainage system.

In general, Hull City Council is responsible for road gullies up to their connection into the conveyance system. Responsibility for open drains in the Hull drainage system varies depending on the watercourse and includes Hull City Council, East Riding of Yorkshire Council, and the Environment Agency and in some cases riparian owners.
Riparian owners are landowners who live alongside or on a watercourse or have a culverted watercourse underground. Unless stated in the deeds, if a property is adjacent to a ditch, river or dyke then the legal assumption is that property owns up to the middle line of that watercourse under riparian ownership. With this ownership come rights and responsibilities. These are laid out in the following publication https://www.gov.uk/government/publications/riverside-ownership-rights-and-responsibilities .

In summary, these responsibilities relate to the upkeep of watercourses and allowing water to flow unhindered and free from pollution.

Responsibility for the sewer network and operation of the pumping stations (West Hull, East Hull, Salt End and Bransholme) rests with Yorkshire Water. Yorkshire Water have an agreement with the Environment Agency to cover the operation of the fluvial section of the pumping station at East Hull which is used to pull flows from the Holderness drain in to the Humber estuary if require at high tide.

7. Flood Risk in Hull City Council

7.1 What is the risk in Hull?

The EA estimates that one in six homes in England, approximately 5.2 m properties ,are at risk from flooding. 1.4 m are at risk from rivers or the sea alone, 2, 8 m are at risk from surface water and 1 m are at risk from both. An estimated 200 homes are at risk of complete loss to coastal erosion over the next 20 years and 2,000 more could potentially become at risk over this period.

Flood risk has two components the chance (probability) of a particular flood and the impact (or consequence) that the flood would have if it happened. The probability of a flood relates to the likelihood of a flood of that size occurring within a one year period and is expressed as a percentage. The probability of flooding is obviously reduced by the presence of flood defences. For Hull there are well maintained flood defences on the Humber, the River Hull, Beverley and Barmston Drain and Holderness Drain. These reduce the chance of flooding but you cannot say that risk has completely gone. The consequences are high if defences are breached or overtopping occurs. The defences we have in place are all deigned to a very high standard and have regular maintenance checks. We need to make sure the designed levels of the defences are reviewed and are kept up to date with current acceptable standards of protection.

The area of Hull's catchment is very complex with its multi –agency partnership and the mainly flat urban area. The geography and geology of the risk area presents unique challenges in terms of existing high-level traditional positive drainage with strategically placed pumping stations positioned around the catchment with a mixture of culvert and open watercourses which have multi-agency ownership. The existing infrastructure has evolved rather than been planned and deployed, presenting complexities around combined sewer and water watercourses, drainage and pumping systems.

7.2 Flooding from Surface Water

Surface water flooding occurs in two ways. When intense rainfall, often of short duration, is unable to permeate into the ground or enter drainage systems quickly enough to prevent a build-up of water to an extent that it ponds on or flows across the hard or soft land surface. This can cause considerable problems in urban areas. Surface water flooding can also originate from rural areas where high intensity rainfall can run off fields without entering land drainage systems. Flooding from surface water is hazardous for various reasons including its depth, velocity of flow and sometimes its sudden presence in areas with little warning. It is difficult to warn and prepare for surface water flooding as it's dependant on many factors, such as how empty are the sewers, how localised is the rainfall and how saturated is the ground beforehand.

The water companies in England and Wales aim to provide new drainage systems with capacity to cope with rainfall events of up to a 3.3% annual probability of occurrence (1 in 30 years) whilst highway drainage inlets may be designed to deal with rainfall ranging from between 5% and 20% probability of occurrence (1 in 5 to 1 in 20 year events) for new systems

7.3 Flooding From Sewers

The vast majority of Hull City drains into a combined sewerage system where rainwater mixes with domestic and commercial sewage. Flooding can result when the sewer capacity is overwhelmed by high inflow, when

the sewer becomes blocked or when the sewer is of inadequate capacity for the area it drains. For example a frequent situation that occurs in West Hull is when rain falling on the areas outside of the city flows into the sewers, they rapidly fill. By the time the sewers have reached the city they are already full and therefore there is little capacity left for run off from the roads and properties within the city. To meet requirements set by the Office of Water Trading (OFWAT), water companies must record all instances of sewer flooding where flooding has resulted from rainfall events in a level of service 'DG5 register'. In such circumstances internal flooding is defined as '*flooding that enters a building or passes below a suspended floor*'. External flooding is defined as '*flooding which is not classed as internal*' for example flooding of gardens and other open spaces. Properties at risk are 'properties that have suffered or are likely to suffer internal flooding from public foul, combined or surface water sewers due to the sewerage system being overloaded'. Water and Sewerage Companies in the UK set a minimum design standard for new sewers to ensure there is no flooding during rainfall events of occurrences of 3.3% annual probability (1 in 30 event) or higher. It should be noted that the DG5 register only records flooding from sewers, not all incidents of surface water flooding.

7.4 Flooding from the Estuary

Tidal flooding in the River Hull catchment is primarily from the Humber Estuary. Flooding from the Humber can occur either because the tide level in the estuary rises above the level of the defences along the estuary shoreline including those along the various dock frontages within the city of Hull, or because water from the estuary flows up the river and causes water levels to rise above the river defences. The River Hull forms part of a complex network of rivers, drains, pumping stations and flood defence banks. Without these much of the area would revert to what was here before man's intervention, namely marsh and flooded land. The Environment Agency has extensive flood defence assets within the city along the banks of both the River Hull and the Humber Estuary, consisting of embankments, flood walls, pumping stations and the Hull tidal surge barrier. The River Hull water levels through the city are dominated by the tidal Humber levels and are not significantly affected by fluvial flooding, which is dominant in the headwaters and middle reaches of the River Hull. The installation of the Hull Tidal Surge Barrier in 1980 protects the city from tidal surges at the mouth of the River Hull.

7.5 Flooding from the River Hull

The River Hull serves as a navigation and a drainage channel. It rises from a series of springs to the west of Driffield, and enters the Humber estuary. It is classed as a high level system as it is largely raised above existing ground level.

Most of its course is through low lying land that is at or just above sea level, and flooding has been a long-standing problem. Drainage schemes to alleviate it were constructed on both sides of the river. The Holderness Drainage scheme to the east was completed in 1772, with a second phase in 1805, and the Beverley and Barmston Drain to the west was completed in 1810.

Since 1980, the mouth of the river has been protected by a tidal barrier which can be closed to prevent tidal surges entering the river system and causing flooding. The structure spans the river, and a huge steel gate, weighing 202 tonnes, can be lowered into the waterway, effectively sealing the river from the Humber. The gate is lowered between eight and twelve times a year. In 2009, a £10 million upgrade of the structure was started, to ensure it would

stay operational for a further 30 years. The upgrade included a new drive mechanism, which raises and lowers the gate, and pivots it when it is at the top of the structure, so that it lies horizontally rather than vertically. It also included a new control system.

The tidal barrier is lowered a number of hours before an estimated 4.3 m tide is likely. The barrier takes approximately 25 minutes to lower, and also has the capacity to drop under its own weight and be lifted manually.

7.6 The River Hull

Upper Catchment

The upper catchment area covers the River Hull Headwaters down to Hempholme Weir. In this area the chalk streams and becks of the headwaters combine into the 'West Beck' reach of the River Hull near Driffield and Frodingham Beck further east.

Flooding in the upper catchment area can occur when water flows in to the rivers causing water levels to rise. The upper reaches of the River Hull are not embanked because the surrounding ground is naturally higher. Water flows over the top of the defences onto the surrounding land. This occurs in places between Driffield and Hempholme Weir and on Frodingham Beck, Driffield Canal and Old Howe near Brigham, and North Frodingham.

The river in the upper catchment is non-tidally influenced beyond Hempholme Weir.

The area is largely rural in character, with large areas of farmland but relatively few properties at risk of being flooded from the river and drains.

Middle Catchment.

The middle catchment area covers the River Hull from Hempholme Weir down to the city limits of Kingston upon Hull, just downstream of Wawne on the east side of the River Hull and to the B1233 / A1165 on the west side of the River Hull.

Flooding from the middle catchment can also occur, although less frequently, at several locations further downstream, in particular at Watton Beck, Catch water Drain and Monk Dike. Flooding can occur at some places in Hull, where conditions are influenced by the tides in the estuary. The River Hull is heavily embanked through all of the middle catchment area with embankments 5m higher than surrounding ground levels in places. The tidal influence will keep the river levels high so there is little room for run off from surrounding areas as well as the flow down the river. There are several low spots in the defences that can overtop during high spring tides but any flooding is generally limited.

The middle catchment is characterised by industry and merging into properties at risk of being flooded from the river and drains.

Lower Catchment

The lower catchment area covers the River Hull from the northern city limits of Kingston upon Hull, just downstream of Wawne on the east side of the River Hull and downstream of the B1233 / A1165 on the west side of the River Hull, to the Humber Estuary.

Flooding in the lower catchment is more influenced by the tide than by fluvial flows. The tidal surge barrier is dropped into the river during high tidal or an expected surge to protect parts of the city from flooding. The barrier is raised when tide levels have dropped enough to allow the river to discharge to the estuary. However, flooding could occur if large amounts of water flow from the upper and middle catchment whilst the barrier has already been deployed to protect the city from a high tide. This is known as tide lock.

The Lower catchment is characterised by commercial and residential properties at risk of being flooded from the river and drains. The lower catchment gives the greater opportunities and links for regeneration along the river corridor.

7.7 The Drains

Holderness Drain

The construction of the Holderness Drain began in 1764 it is the main feature of a Land Drainage scheme for the area of Holderness to the east of the River Hull in the East Riding of Yorkshire it is classed as a low level system and outfalls to the Humber via the East Hull pumping station. Being near the outlet means that flows can be pumped into the Humber when the level of the tides prevented gravity discharge. Drainage ditches that feed into the Holderness Drain have been the responsibility of an Internal Drainage Board. In order to improve the efficiency of the system it has three pumping stations along its length which manage changes in level. The first is at Tickton, which was built in 1972 as part of the Holderness Drain scheme. The second is the Great Culvert pumping station, which was built at the same time. This is located close to the point of the original Great Culvert, which carried the high level drain to the River Hull over the low level drain to the Humber. The third is the East Hull Pumping Station located on Hedon Road.

Holderness Drain

Beverley and Barmston Drain

Beverley and Barmston Drain (B&B) provides flood defenses and drainage for 12,600 acres (5,100 ha) of land to the west of the river. The B&B drain includes the construction of 23 miles (37 km) of drainage cuts, and building embankments along 20 miles (32 km) of the river. An outfall sluice was constructed, and the drain passed through tunnels under eleven waterways, including the Beverley Beck. 27 bridges were built to carry roads over the drain, and the whole project was finished in 1810. The outfalls sit on the River Hull at the High Flags via two sets of pointing doors, with one being operational at all times under gravity.

Beverley and Barmston Drain

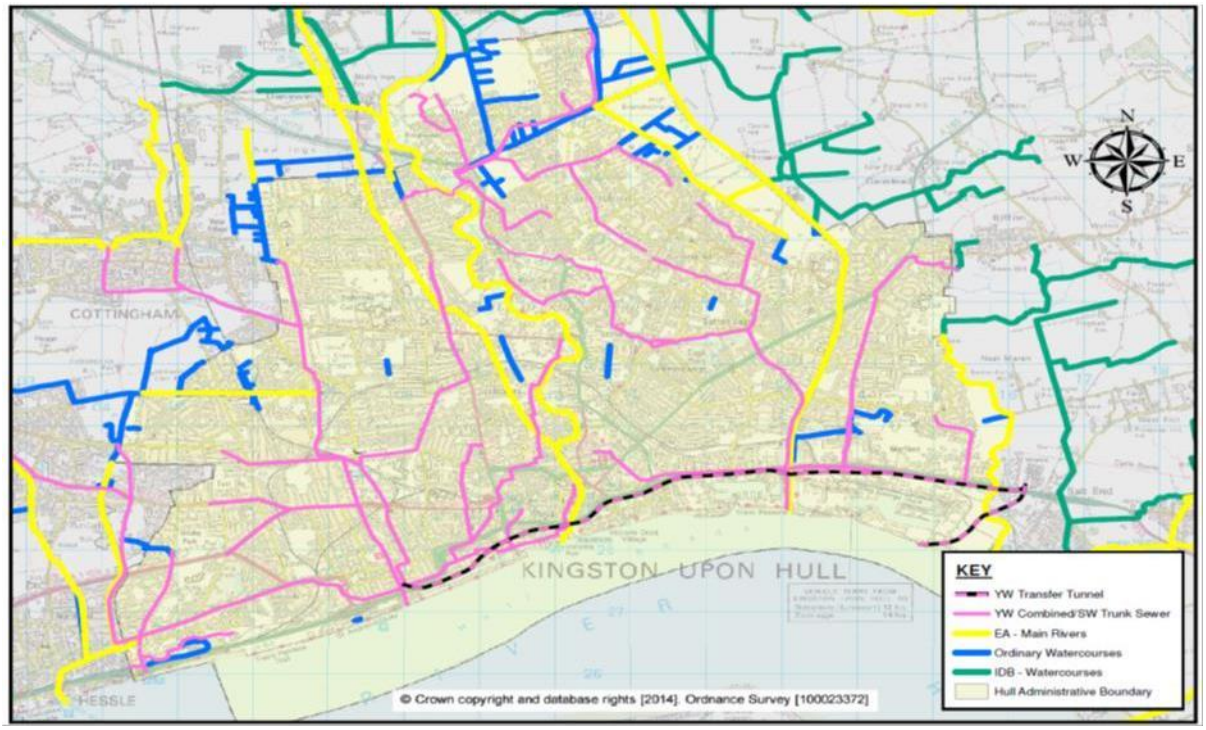
7.8 Open Watercourses

Many watercourses within the city were abandoned or culverted as part of the construction in the post war years of the city's deep level interceptor (trunk) sewers in both the East and West of the city. As a result of the above works many of the remaining watercourses now outfall into the trunk sewers leaving them susceptible to the knock-on effects of capacity exceedance in the drainage system. Historically not all culverted watercourses have been recorded; these are frequently being rediscovered and mapped.

The majority of the flooding in June 2007 in this region was due to surface water rather than fluvial flooding or open watercourse flooding i.e. rain-water was unable to enter drainage systems due to design capacity being exceeded, rather than watercourses over-topping.

Several watercourses have extensive catchment areas and water levels are quick to rise at times of heavy rainfall. Water levels in these watercourses are monitored by a telemetry system which triggers alarms when the water levels approach critical levels.

Maintenance staff are on call-out 24/7 to respond to any blockages or raising of levels and Hull CC Streetscene department operate the Flood and Severe Weather Response Plan, a procedure which is initiated in the event that a Flood Alert is issued by the Environment Agency, a Severe Weather Warning is issued by the Met office, or reports of flooding are received by the Call Centre or Civic One.



The complex nature and responsibilities of draining the City of Hull

7.9 Flooding from Groundwater

Groundwater flooding occurs as a result of water rising up from the underlying rocks or from water flowing from abnormal springs. This tends to occur after much longer periods of sustained high rainfall. Generally groundwater flooding occurs during the winter and spring when groundwater levels reach their peak and start to come above ground in low lying areas. Groundwater flooding takes longer to dissipate because groundwater moves much more slowly than surface water and will take time to flow away underground. Groundwater flooding most commonly occurs in the areas which lie on the edge of the Wolds to the west of Hull, as these are the locations where the major aquifers come to the surface. Occasional and sporadic elevated groundwater levels in the Cottingham area have caused flooding in the past, and this will contribute to surface water flooding as the water has nowhere to go. Therefore it flows into low spots within the city which frequently means flooding of properties, roads and infrastructure.

Flooding and probability

Historically, the likelihood of a flood event was described in terms of its 'return period'. For example, a '1 in 100-year event' could be expected to be equalled, on average, once every 100 years. However, there is a tendency for this definition to be misunderstood. There is a perception that if a '1 in 100- year flood' occurs; a repeat of the event will not be experienced for another 100 years. This is not the case; the key words in this example are 'on average'.

To try to avoid this misunderstanding, we now express flood events as the chance of them occurring in any one year at a given location. This can be stated in two ways, either as a chance or as a probability. Taking the above example, we would say that this event has a 1 in 100 chance or a 1% probability of being equalled in any year. We refer to this as the 1 in 100 (1%) annual exceedence probability (AEP) flood.

8. The Consequences of floods

8.1 What are the consequences of floods?

Flooding is now the most frequent type of major disaster. Over the last 10 years, floods in Europe have killed more than 1,000 people and affected over 3.4 million others *(Health impacts of, Centre for Research on the Epidemiology of Disasters (CRED, 2010)).* Furthermore, the impacts of climate change are likely to increase the occurrences of flooding. Projected climate-related increases in precipitation are likely to make floods more frequent and severe.

The Floods Directive defines "a *flood as a covering by water of land not normally covered by water"*. Flooding impacts on both individuals and communities, and has huge social, economic, and environmental consequences.

As most people are well aware, the immediate impacts of flooding may include loss of human life, damage to property, loss of historic and habitat environments, devastation of crops, loss of livestock, and deterioration of health conditions due to waterborne diseases such as typhoid fever, cholera, leptospirosis *(also known as Weil's syndrome)* and hepatitis. As communication links and infrastructure such as power plants, roads and bridges are damaged and disrupted, some economic activities may come to a standstill, people are forced to leave their homes and normal life is disrupted. Interruption to industry can lead to loss of livelihoods. Damage to infrastructure also causes long-term impacts, such as disruptions to supplies of clean water, wastewater treatment, electricity, transport, communication, education and health care.

Loss of livelihoods, reduced income and loss of land value and insurance concerns can leave communities economically vulnerable together with an embedded feeling of uncertainty. Living with the actual or perceived threat of further flooding has become an unpleasant fact for most of Hull's communities.

Whilst most people who are involved in flood disasters recover with the support of their families, friends and colleagues, anxiety about past or potential future floods can create a lack of certainty and confidence, and can create personal challenges which may exacerbate or provoke mental health issues such as post-traumatic stress disorder (PTSD), or lead to significant increases in depression, and psychological distress.

9. Climate Change

9.1 The implications of climate change

The global climate is changing and this has a massive impact on all Risk Management Authorities to manage flood risk. Climate change is the long-term change in average weather conditions, including higher temperature, precipitation and wind, rising sea levels, increased ocean acidity and ice melt.

Weather patterns are also likely to change, with wetter winters, drier summers and more frequent occurrences of intense rainfall, both in winter and summer this can cause flash flooding from surface water as we see drainage systems being overwhelmed by intense rainfall. This is one of the most serious challenges Hull faces due to the existing belowground infrastructure already being at capacity.

For the River Hull and the low-level drains this is likely to mean that agricultural land and adjacent road network to the river may be flooded more frequently and for longer periods of time as the standard of protection offered by the flood defences will effectively be reduced in the future.

The impact of sea level rise will be managed by more frequent operation of the Hull tidal surge barrier and the defences along the frontage requiring to be increased in height to provide adequate protection.

The Environment Agency have provided guidance on adapting to climate change "Adapting to climate change: advice for flood and coastal erosion risk management authorities"

http://www.environment-agency.gov.uk/research/planning/116707.aspx

10. The Hull City Council Local Flood Risk Management Strategy

10.1 Stakeholder Engagement

The Local Flood Risk Management Strategy (LFRMS) states how the LLFA intends to deal with flooding in its area and how it will work with its local RMA's partners to deliver duties and functions. As part of this approach the document has provided a number of objectives, actions and outcomes.

Hull City Council understands and acknowledges the fact that the catchment area is highly complex, with a number of stakeholders all having an essential part to play in making the city as flood free as possible whilst working within the constraints of the various forms of funding regimes and processes.

The objectives, actions and outcomes described below involve all RMAs and communities, and are all relevent in reducing flood risk. It is very likely that some will change and evolve. The process of setting these involved an objective & outcome workshop held on November 11th 2014 at the Hull History Centre. Invitations to the half day workshop went to the following organisations:

- Hull City Council Development Control , Highways, Streetscene, Parks and Gardens, Planning Policy and Flood Risk Team
- Yorkshire Water
- The Environment Agency
- East Riding of Yorkshire Council Asset Strategy

The half day workshop involved a short speech on flood risk in the city by the Flood Risk Planning Manger including an explanation of the need for the Strategy. The stakeholders were split into two groups to discuss the draft list of outcomes and objectives tabled by the Flood Risk Team. This was reviewed and amended in line with the stakeholders' comments. Some items were deleted and new ones added.

10.2 The Goals of the Strategy

The Strategy has two main goals:

- To reduce the impact of flooding.
- To provide knowledge and assist understanding of flood risk in Hull

The goals above underpin all the outcomes, actions and objectives.

Flooding is a natural process and it is not possible to prevent it from happening. The role of the LLFA is to manage flooding in such a way that it can occur without causing harm and disruption to lives and property. The focus of the Strategy, therefore, is very much on reducing the impact of flooding rather than eliminating it altogether.

10.3 Objectives, Actions and Outcomes

The LFRMS will support the following Objectives, Actions and Outcomes. These are the main drivers and are designed to improve Hull's residents' and businesses' greater resilience to flooding and takes the opportunity to improve our city's environment.

- **Prevention of risk**: for example, by not building homes in areas that can be flooded we can prevent risks from arising in the first instance.

- **Protection from risk**: for example, by delivery of formal flood defence schemes or property level protection.
- **Preparing for risk**: for example, by improving awareness of flood risk.
- **Recovery and Review of risk**: for example, by improving our knowledge and understanding of flood events we can design and develop works to reduce the impacts of future floods

	Timescale		
The Objectives, Actions and Outcomes below will take varying timescales to achieve and are dependent on securing funding. The above will be reviewed as funding is secured. They have initially been placed in one of the following three categories:			
	Short term – ongoing up to two years	Medium term – two to five years before start	Long term – over five years before start

Prevention of risk

	Objective	Action	Outcome
A1	Acknowledge the unique situation in Hull where the city is almost entirely within Flood Zone 3 and 2 and influenced by all sources of flooding risk. Ensure development is located to ensure that flood risk is appropriately considered and mitigated for.	1) Update and publish SFRA, deliver support & guidance to DM planners. 0) Provide detailed guidance documents to deliver SuDS through planning. 1) Promote, engrain and ensure their effective delivering of flood risk policies in the new, emerging Hull Local Plan. 2) Provide design guidance to promote flood resilience measures to high risk priority areas at risk as identified in evidence provided by YW, Environment Agency and Hull City Council.	Flood resilient buildings for future generations. Robust sustainable drainage systems which provide adequate storage for the site and which improve water quality and biodiversity. An improved awareness for communities in areas at high and/or moderate risk of flood.
A2	Understand Hull's development needs and environmental management responsibilities to better align with flood risk obligations	1) Working with the public and businesses to identify community led solutions to improve localised flooding. 2) Provide supporting evidence to Hull's Local Plan in seeking to ensure development is appropriately located and designed.	Reduced numbers and distress of affected areas for residents during and after a flood incident.

Protection from risk

	Objective	Action	Outcome
B1	Effectively manage flood risk associated with existing development and infrastructure by the provision of flood defence schemes	1) Retrofit SuDS around the city. 2) Work in partnership with EA and ERYC on flood defence schemes which deliver a high number of benefits. 3) Maintain and review a prioritised programme (6 year) of projects, to be allocated on the medium term plan (MTP) 4) Deliver in a timely manner a programme of flood risk management projects to reduce the impacts of local flooding through approved strategies and schemes.	Maintain and review a prioritised programme (6 year) of projects, to be allocated on the MTP. Confidence and reassurance to residents and businesses that flood risk in Hull is improving.
B2	To seek environmental enhancement opportunities and multi benefits wherever possible through the implementation of integrated flood risk management measures and schemes	1) Encourage innovation and communication between all RMAs and within internal departments of the council such as Parks and Highways. 2) Work closely with partners such as Natural England, the Yorkshire Wildlife Trust and Groundwork to ensure that opportunities and multiple benefits from schemes have been explored and outcomes explained. 3) Support and enhance existing funding schemes to deliver essential flood protection schemes with environmental and recreational benefits wherever possible. 4) Use Catchment Based and the Payment for Ecosystems Services (PES) approach when looking at future schemes to maximise benefits.	Creating habitat areas and improved water quality throughout the city. Community trust in future flood schemes. Involvement and ownership of local flood risk issues and schemes. Using multi-functional space for reducing flood risk.

	Objective	Action	Outcome
B3	Maximise coordination, support and partnership working with all Risk Management Authorities to deliver a sustainable way of maintaining existing and future flood defence works and watercourses which meet aspirations and requirements under the WFD	1) In partnership look to develop innovative ways to reduce flood risk by utilising existing assets differently. This could be through setting up a maintenance group and working out ways to maintain existing assets. For example through the use of Public Sector Corporation agreements.	Key organisations that manage water will play a pivotal role in advocating collaboration and integration of water management. Delivery and support from a wider range of sectors.
		2) Ensure evidence base is up to date. Hull CC asset register and data is correct from all RMAs. Work with partners to ensure that upper land catchment areas are managed responsibly and are using best practice methods to slow the flow and retain water where possible and reduce pollution and sediment deposits.	

Preparing for risk

C1	Work with, and inform the insurance industry on their understanding of flood risk in Hull and aim for affordable and realistic insurance and effective flood risk cover for all.	1) Work in partnership with all RMAs to influence and inform the insurance industry about flood defence schemes and how this has reduced flood risk. 3) Ensure that appropriate mapping products used by the insurance industry or communities are up to date. Make sure any hydraulic modelling done for schemes is of the required standard for the Environment Agency NAFRA maps.	A consistent, fair and reasonable way of assessing flood risk using the most up to date information. Communities understand their own risk and have the ability to shop around for the best insurance deals. Large take up of Flood Re within the city.
		4) Deliver approved existing and future key defence works in a timely manner and which meet with existing DEFRA funding rules and policies. 5) Insist all relevant data is available from all RMAs' groups which will be shared to achieve positive outcomes.	

	Objective	Action	Outcome
C2	Work in partnership with all RMAs & Emergency Planning to enhance community emergency plans and flood warning uptake.	1) Organise the delivery of workshops or Flood Buses with key stakeholders and communities in high risk areas. 2) Create a Hull City Council flood risk web page and signpost other key stakeholders information, programmes and strategies.	Well prepared and informed residents ready to act when flooding happens.
C3	Encourage proactive, appropriate maintenance of privately owned defences and drainage assets, such as defences along the River Hull.	1) Develop and maintain the website flood pages to provide an effective resource for residents and businesses wanting information on flood risk management. 2) Increase flood risk understanding through all forms of social media. 3) Involve communities & asset owners in future flood schemes to encourage ownership. This would be through having representatives on project boards and carrying out stakeholder group analysis.	Raising awareness and engaging people on their flood risk concerns and responsibilities.
C4	All local RMAs to understand key issues within the catchment area and continue to raise the awareness of the risk of flooding within Hull, both now and in the future.	1) Improve the capacity and efficiencies of existing drainage systems. Expand local understanding of existing drainage system network. 2) Arrange a number of information events/talks from other RMAs & specialist consultants to achieve a better understanding of catchment wide problems and options to improve systems approach.	A comprehensive understanding for all RMAs and providing a way of identifying future flood risk high priority areas, to provide clear maintenance programmes and help with effective communication strategies between key departments.
Recovery and Review of risk			
D1	Ensure co-ordinated efficient emergency response to flooding to ensure that the communities of Hull are kept safe and disruption is minimised.	1) Deliver timely investigations in accordance with Section 19 of the Flood & Water Management Act, which are supported, actioned and reported on at the Integrated Strategic Drainage Board.	Robust and resilient tested framework and polices that meet the demand of an emergency response.

		2) Communication of all RMAs' Emergency plans are clear and coordinated with RMAs	
	Objective	**Action**	**Outcome**
D2	Investigate, learn and share knowledge from flood incidents to inform future actions and investment need.	1) Produce timely proportionate Section 19 reports following flood incidents. These should include the cause of flooding and recommendations	Integrated, smart and sustainable approaches to water management and flood risk matters based on sound evidence.
		2) Strengthening preparedness for response.	

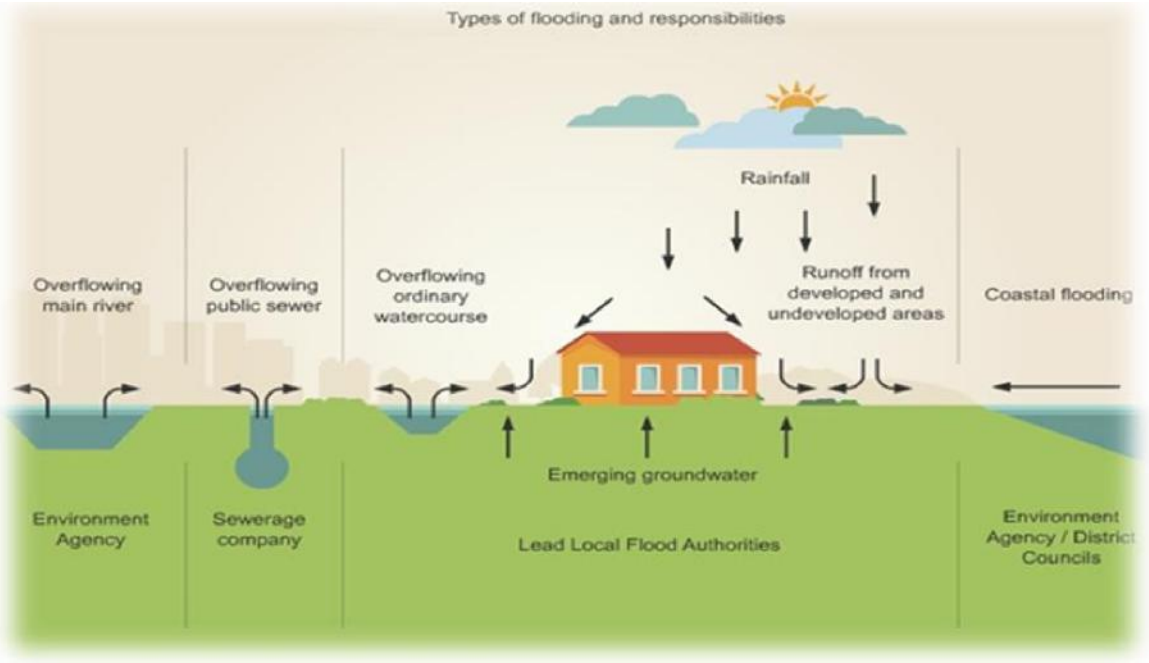
11. Risk Management Authorities

11.1 Who are the Risk Management Authorities?

Risk Management Authorities (RMAs) are defined in the Flood and Water Management Act (FWMA). In Kingston upon Hull these are:

- The Lead Local Flood Authority – Hull City Council
- The Environment Agency (EA)
- The Water and Sewerage Company (WaSC) – Yorkshire Water Services (YWS)
- The Internal Drainage Board (IDB)
- The Highway Authority – Hull City Council as Unitary Authority, but the Highways Agency has responsibility for major trunk roads

As Risk Management Authorities (RMAs), each of the above authorities has specific responsibilities in relation to the Flood and Water Management Act (FWMA) and The Flood Risk Regulations, 2009 (FRR) and must also coordinate their activities with each other. It is important to note that whilst the legislation sets out the roles, there is no legal obligation for any Risk Management Authority to totally prevent flooding. In some instances this is because it is not physically possible or that the engineering solutions required are not cost beneficial. The role of the RMAs is to do what is within their powers to reasonably reduce the risk of flooding to their communities to improve the quality of life for all.



11.2 The key specific responsibilities of each of the above authorities.

The Environment Agency (http://www.environment-agency.gov.uk/)

The Environment Agency (EA) is a non-departmental public body responsible to the Secretary of State for Department of Environment, Food and Rural Affairs (Defra). Its primary aims are to protect and improve the environment of England and Wales, and to promote sustainable development. The EA take lead responsibility for risk-based management of flooding from Main Rivers and the sea, and regulation of the safety of reservoirs. Other responsibilities include:

- Strategic overview for all forms of flooding
- Development of a National Strategy for Flood and Coastal Erosion Risk Management Strategy (FCERM) to cover all forms of flooding
- The conversion of Regional Flood Defence Committees into Regional Flood and Coastal Committees with a new remit to include coastal erosion issues
- Powers to request information from any person in connection with the Environment Agency's flood and coastal erosion risk management functions
- Power to designate structures and features that affect flooding or coastal erosion
- Powers to cause flooding and erosion for nature conservation and cultural heritage reasons, and people's enjoyment of these
- A duty to have regard to FCERM in carrying out other work which may affect FCERM
- A duty to have regard to Local Flood Risk Management Strategies (LFRMS)
- A duty to report to Ministers about FCERM including application of the national strategies for England and Wales
- Statutory consultee on proposed development on Flood Zone 3 & 2 (high and medium risk) and for sites over 1 hectare in Flood Zone 1 (low risk) for drainage issues

The Environment Agency has a large role in flood risk management. They are set up with Asset Management and Operational teams who plan, fund and carry out the maintenance on main river systems. They have a Flood Resilience team who set up flood warnings and work with communities on incident response. There's a Partnership and Strategic Overview team; this team carry out the flood mapping, do the planning and consent work and support other Risk Management Authorities to progress flood schemes. Aside from flood risk work the Environment Agency also have a pollution prevention function and a biodiversity, fisheries and conservation role. This regulatory role links with the flood risk through legislation such as Water Framework Directive, which is about water quality and improving the rivers. There is also the Habitats Directive and environmental legislation which projects must comply with. With compliance comes opportunities to seek multi benefit schemes to open up other funding sources and create a better environment in general.

E.A Main Rivers and Watercourse Permissive Responsibilities in The Hull Area

River Hull	Setting Dyke	Foredyke Stream
Holderness Drain	Beverley Bramston Drain	Sutton Cross drain
Old Fleet Drain & Fleet Drain	Engine Drain	Cottingham Drain

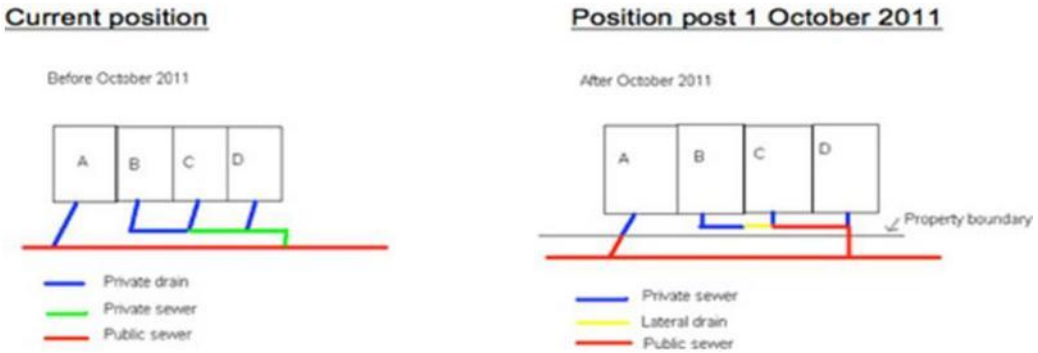
Yorkshire Water Services (http://www.yorkshirewater.com/)

Yorkshire Water Services (YWS) is the solitary water and sewer company (WaSC) operating in Hull. The water companies in England and Wales were separated off from Local Government and privatised in 1989. They therefore answer to the shareholders. The Office of Water Services (OFWAT) is the government regulator set up to monitor and regulate water companies' performance. OFWAT is a financial regulator looking at value for money rather than the technical details of how sewers operate. As a provider of water infrastructure services YWS responsibilities in relation to FWMA include:

- Where appropriate assist the Lead Local Flood Authority (LLFA's) in meeting their duties in line with the National FCERM Strategy and guidance;
- Where appropriate assist the LLFA's in meeting their duties in line with local strategies
- Where appropriate share information and data with Risk Management Authorities (RMAs), relevant to their flood risk management functions
- A duty to effectually drain their area, in accordance with Section 94 of the Water Industry Act 1991
- A duty to register all reservoirs with a capacity greater than 10,000m^3 with the Environment Agency
- An agreement with the Office of Water Services(Ofwat) to maintain a register of properties at risk from hydraulic overloading in the public sewerage system (DG5 register, DG standing for Director General)
- The appropriate management of surface water in combined systems
- Encouraging the use of SuDS
- Creating a detailed understanding of flood risk from the public sewer system
- Explore and implement multi benefit/agency schemes

Yorkshire Water (YW) is responsible for delivering appropriator arrangements for the drainage of foul water, the treatment of waste, surface water sewers and combined sewers. They have primary responsibility for floods from water and sewerage systems, which can include sewer flooding, burst pipes or water mains, or floods causes by system failures.
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 Office of Water Services (Ofwat) for a specified 5-year period. YW are currently in the AMP5 period (2010 – 2015).

Yorkshire Water is the water supply and treatment utility company servicing West Yorkshire, South Yorkshire, the East Riding of Yorkshire, part of North Lincolnshire, most of North Yorkshire and part of Derbyshire. Up to 1st October 2011 they operated approximately 30,000 km of public sewer and 2,000 sewage pumping stations and around 600 Waste Water treatment works where the sewage is treated to ensure all discharges meet strict environmental standards. On 1st October 2011 thousands more kilometres of what was previously private sewer network have been transferred into the ownership of Yorkshire Water. This includes private sewers and lateral drains. A private sewer is a pipe that carries rainwater and/or waste water away from more than one property to the public sewer. A lateral drain is a pipe that carries waste water away from a single property. The transferred asset will be the length located outside the property boundary. Sewers which connect to a private treatment works, connect to a septic tank or carry water directly to a watercourse have not been transferred. As a result of the Government's decision. Yorkshire water has taken on an additional 22,000kms of private sewers and lateral drains, which almost doubles the size of its system.



Yorkshire Water Responsibilities

To invest in the sewer system Yorkshire Water needs the justification and evidence of a flood risk problem. This is done through the DG5 register and reports such as the Hull Holistic Drainage Study.

For further advice on sewer flooding, visit the link below presented as a return period or as the probability that the event will occur within any given year.

http://www.yorkshirewater.com/your-water-services/flooding-advice.aspx

Beverley and North Holderness Internal Drainage Board
(http://www.yorkconsort.gov.uk/beverleypolicystate.html)

The Beverley and North Holderness Internal Drainage Board (IDB) works alongside all other Flood Risk Management Authorities to provide local leadership and coordination. They operate within the framework of Flood and Coastal Erosion Risk Management (FCERM) and Flood and Water Management Act (FWMA).
The Beverley and North Holderness IDB has nature conservation duties under the Land Drainage Act 1991, the Wildlife and Countryside Act 1981, and The Conservation (Natural Habitats, &c) Regulations 1994. Key responsibilities include.

- Maintenance or improvement, and consistent with the need to maintain satisfactory flood protection standards
- Avoid any unnecessary or long-term damage to all the natural habitats
- Take appropriate opportunities to enhance diverse aquatic habitats
- Power to designate structures and features which affect flooding or coastal erosion
- Powers to cause flooding and erosion for nature conservation and cultural heritage reasons
- A duty to exercise their functions in a manner consistent with local and national strategies
- A duty to be subject to scrutiny from lead local flood authorities' democratic processes
- The ability to work in consortia with other IDBs
- Consent works under the Land Drainage Act, which would have impacts on flows
- Power to do works on ordinary watercourses flooding within their boundary and, with the Environment Agency's consent, the sea

The Highways Agency (http://www.highways.gov.uk/) and Highway Authorities

The Highways Agency and Highways Authorities have the lead responsibility for providing and managing highway drainage and roadside ditches under the Highways Act 1980. The owners of land adjoining a highway also have a common-law duty to maintain ditches to prevent them causing a nuisance to road users.

The Highway Authority has a prescriptive right to drain the highway to adjoining roadside ditches; there are a couple of roadside ditch maintenance scenarios:

- If a ditch was created by the Highway Authority and owned by them solely for draining the highway the responsibility for maintenance rests with the Highway Authority.
- Where a roadside ditch was not created by the Highway Authority and it provides natural land drainage and highway drainage, common-law imposes a duty on the riparian landowner to maintain the ditch.

Clive Sullivan Way

The city's main approach road (the A63) between the Humber Bridge and the city centre was renamed Clive Sullivan Way in his honour. Clive A. Sullivan MBE (born 9 April 1943 in Cardiff, died 8 October 1985 in Hull) was a Welsh rugby union and professional Rugby League World Cup winning footballer of the 1960s, 70s and 80s. A Great Britain and Wales international winger, he played with both Hull and Hull Kingston Rovers in his career, and also played for Oldham, and Doncaster. He was the first black captain of the Great Britain Lions and for any national British sporting side.

The Highways Agency is responsible for managing road drainage and culverts under a trunk road. The trunk road network in England includes the slip roads to and from trunk roads. Within Hull, this includes the A63. Other roads in Hull are managed by Local Highway Authorities.

To manage these risks as set out in the national strategy, highways authorities will need to work effectively with the Environment Agency, Lead Local Flood Authorities (LLFAs) and Yorkshire Water to ensure their flood management activities are well coordinated.
Their responsibility in relation to flood risk management is to:

- Provide and manage highway drainage and roadside ditches under the Highways Act 1980.
- A duty to exercise their functions in a manner consistent with local and national strategies.

Other Risk Management Authorities

Other authorities and stakeholders, with no designated role under the Flood and Water Management Act (FWMA), also have key responsibility for flood risk management in their own areas of discipline.

These include:

- Network Rail
- Met Office
- Natural England
- English Heritage
- Association of British Insurers
- Local flood partnerships, forums and community groups
- Associated British Ports (ABP)

It is expected that these authorities will undertake their activities in a manner which is consistent with this strategy.

Riparian Land Owners

Riparian landowners own land adjoining an open watercourse or culvert. They are presumed to own the land up to the centre of the watercourse unless it is known to be owned by someone else. Riparian landowners have certain rights and responsibilities as discussed in section 4 including the following:

- They must maintain the bed and banks of the watercourse, and also the trees and shrubs growing on the banks
- The right to abstract water
- Fishing rights, subject to Environment Agency rod licences
- They must clear away any debris, even if it did not originate from their land. This debris may be natural or man-made
- They must keep any structures that they own clear of debris. These structures include culverts, trash screens, weirs and mill gates

If they do not carry out their responsibilities, they could face legal action

12. Infrastructure

12.1 Types of Flood Risk Management Infrastructure

Ownership and operation of flood risk management infrastructure within the Hull catchment area is the reasonability of a number of operating risk management authorities - Hull CC as local lead flood Authority, the Environmental Agency, and Yorkshire Water.

Many assets in the city are under riparian ownership, however, in most instances the operating authority will carry out operation and maintenance on their behalf.

Each risk management authority delivers asset management inspection and maintenance controls. The approach taken is of a risk-based type with regular inspections of critical and reactive inspection programmes in place.

13. Operating Risk Management Authorities Infrastructure Reasonability

13.1 Hull CC as Local Lead Flood Authority

- Flood Defences
- Ordinary Watercourse
- Debris Screens
- Culverts
- Road Drainage Gulleys
- Sustainable drainage system installed by Hull CC

13.2 Environment Agency

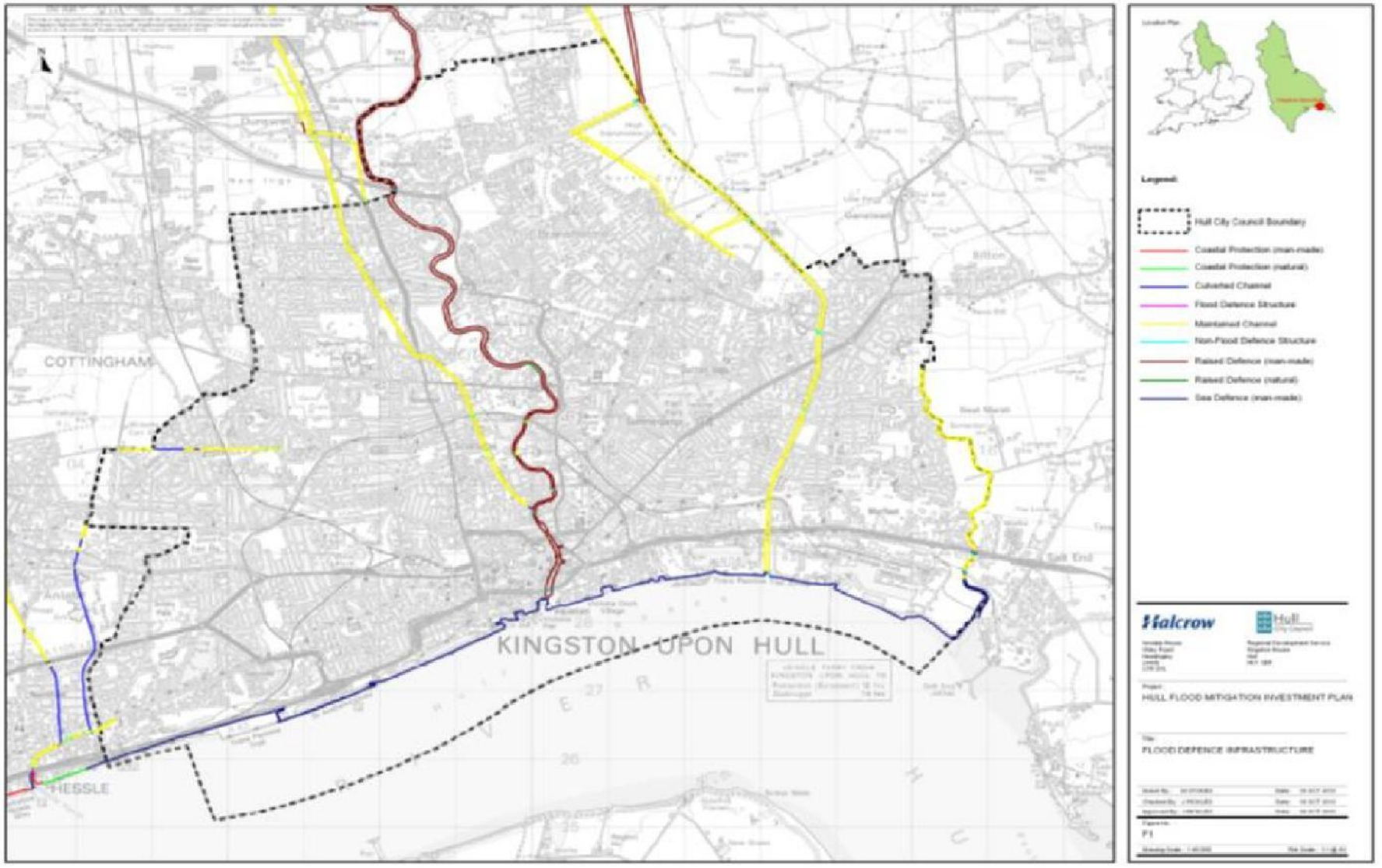
- Main Rivers
- Critical Ordinary Watercourse
- Debris Screens
- Flood Defences – tidal & fluvial
- Flood Defences Embankments – tidal & fluvial
- Pumping Stations
- Hull Tidal Surge Barrier
- Flood –tidal & fluvial warnings

13.3 Yorkshire Water

- Sewage Pumping Stations
- Combined Sewer System

Flooding from Sewers

The water companies, who operate the sewerage systems in England and Wales, are regulated by the Water Services Regulation Authority (OFWAT). Prior to 2006 this function was undertaken by the Director General of Water Services who's staff were known as the Office of Water Services, hence the use of the term 'OFWAT'.
The current and fifth plan (AMP5) runs from April 2010 to March 2015. As part of the regulation process, the companies report on specific aspects of their performance. One of these is the DG5 (DG standing for Director General) which records instances of internal and external flooding of property.
Water companies are required to record all instances of internal flooding of properties. These are categorised on their cause, either hydraulic overloading of the sewers (the sewer pipe is too small or at too shallow a gradient) or other causes (blocked or collapsed sewers, pumping station failure. The DG5 at risk register, this register further categorises properties into the likely frequency of the flooding, the categories being 1 in 20 years, 1 in 10 years and 2 in 10 years return periods. (A 1 in 10 year return period means that the property is likely, on average, to be flooded once every ten years). To put these figures into context, new sewers are currently designed not to flood for a 1 in 30 years return period storm. OFWAT consider that flooding resulting from rainfall more severe than 1 in 20 years are 'exceptional' and are not sufficient to warrant a property being put on the DG5 at risk register.



Current Flood Defence Infrastructure

13.4 Maintenance of Watercourses

Hull City Council is a major land owner in the city, being responsible for council housing estates, schools, parks, sports grounds and open green spaces.

The Council is responsible for the maintenance of a number of watercourses within the city by virtue of:

- Being an abutting landowner (riparian owner) of an ordinary watercourse
- Having entered into an agreement
- Having culverted a section of a Main River

Obstructions in an open ordinary watercourse which affect the flow of water in the channel are managed by the council; such obstructions include excessive vegetation, artificial obstructions and heavy siltation. The council inspects critical ordinary watercourses to ensure that they operate efficiently; this is achieved by inspecting them on a regular cycle and clearing obstructions as necessary. Dredging and vegetation removal is usually carried out on a 1 to 3 year cycle, depending on the watercourse. Works are normally programmed to avoid the bird-nesting season and one bank is usually left untouched so that it can act as a refuge area for wild animals.

Some culverted watercourses have a trash screen installed at the upstream end to protect the culvert from blockages. The council inspects these screens to ensure that they operate efficiently; this is achieved by inspecting them on a regular cycle and clearing them as necessary. Screens are also inspected in response to heavy rainfall when loose debris can accumulate very quickly.

14. Legislative Framework

14.1 Historic Legislation in Hull

The responsibility for flood risk management within Kingston upon Hull has transformed significantly over the past years.
The Hull Catchment Boards were created following the passing of the Land Drainage Act 1930. They were given powers to regulate fisheries and took over the duties of flood prevention on main rivers from local authorities. The Catchment Boards were replaced by *The Hull and East Yorkshire River Boards* who controlled land drainage, fisheries and river pollution and had many other functions relating to rivers, streams and inland waters between 1950 and 1965. The boards were established by *The River Boards Act 1948*

The Yorkshire Ouse and Hull River Authority controlled land drainage, fisheries and river pollution in rivers, streams and inland waters in England and Wales between 1965 and 1973. The River Authorities were abolished in 1973, with their powers and duties passing to the water authorities established by *The Water Act 1973.*

Water supply and sewage disposal were removed from local authority control, and the Regional Water Authorities came into existence in 1975. *The Yorkshire Water Authority* became one of ten regional water authorities created taking over the water supply *Kingston upon Hull Corporation*.

The Yorkshire Water Authority was privatised in 1989 where they took the water supply, sewerage and sewage disposal activities into the privatised company. The remaining duties remained with the newly created *National Rivers Authority* who existed between 1989 and 1996. The National Rivers Authority was one of the forerunners of the Environment Agency of England and Wales.

The Environment Agency was created by *The Environment Act 1995* and came into existence on 1st April 1996. The Environment Agency is an England-only non-departmental public body of the Department for Environment, Food and Rural Affairs. The Environment Agency is the principal flood risk management operating authority. It has the power (but not the legal obligation) to manage flood risk from designated main rivers and the sea. These functions in relation to other rivers (defined as ordinary watercourses) in England are undertaken locally by Hull CC as a Lead Local Flood Authorities and the Beverley and North Holderness IDB. The Agency also has the responsibility for issuing flood warnings, a role previously held by the police.

In December 1991, a number of pieces of legislation were enacted which aimed to consolidate existing water legislation. Most relevant in terms of flood risk management were the *Water Resources act 1991*, *Land Drainage Act 1991*,and *Statutory Water Act 1991* and the *Water (Consequential Provisions) Act 1991)*. The combined purpose was to consolidate existing water legislation, which was previously spread out over 20 separate pieces of legislation. The Act governs the quality and quantity of water by outlining the functions of the Environment Agency (previously the National Rivers Authority). The WRA sets out offences relating to water, discharge consents, and possible defences to the offences. The Environment Agency has the power to bring criminal charges against people or companies responsible for crimes concerning water.

The Flood and Water Management Act was introduced on 8 April 2010 in England and Wales. It was intended to implement Sir Michael Pitt's recommendations following the widespread flooding of 2007 when more than 55,000 homes and businesses were flooded. The flooding was largely caused by surface water run off overloading drainage systems. The

Act was also a response to the need to develop better resilience to climate change. Alongside the Act, the *Flood Risk Regulations 2009* have been made to implement the Floods Directive in England and Wales. These regulations outline the roles and responsibilities of the various authorities consistent with the Flood and Water Management Act and provide for the delivery of the outputs required by the Directive.

14.2 Planning Policy

Prior to flooding in 2000, the consideration of flood risk as a material planning matter on new development and flood risk was limited. There was little, if any, technical advice to planning officers on the existing sewers or watercourses which the new development would discharge to and any mitigation measures required to ensure a new development was safe. The Environment Agency had a limited role in commenting on new development within 8 metres of a watercourse, under the Water Resources Act and Circular 30/92. http://www.environment-agency.gov.uk/static/documents/Research/110724.pdf

The 200 flood incidents led to a shift in thinking regarding development on the floodplain. Indicative flood maps were produced to guide planners and there was the release of *Planning Policy Guidance 25 (PPG25):* Development and Flood Risk in 2001. PPG25 aimed to strengthen development planning with regard to flood risk. It advised the submission of a Flood Risk Assessment for developments in high risk areas. This meant the developer had to justify that not only would the new development be safe but that it would not increase flooding to others as a result. Importantly, it was the first attempt to introduce sustainable surface water management into the planning process. *Planning Policy Statement 25 (PPS25)* superseded PPG25 in 2006 and strengthened the requirement for sustainable surface water management in new developments. PPS25 also introduced the concept of the sequential approach. This is about ensuring that the development is appropriate for the location and the flood risk of that site. PPS25 also strengthened flood risk as a material planning matter by adding a right by the Secretary of state to “call-in” any applications which the Local Planning Authorities approved against Environment Agency advice. This has now been replaced by the *National Planning Policy Framework,* published on 27 March 2012. It is designed to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The framework requires a Strategic Flood Risk Assessment and a sequential, risk-based approach to the location of development in order to avoid flood risk to people and property, to manage any residual risk, and to take account of the impacts of climate change.

NPPF contains the majority of the advice and guidance contained in PPS25.

14.3 Current Legislation

Following the extreme floods of 2007, *The Pitt Review (2008)* stressed the importance of implementing better legislation for the effective management of surface water, with increased responsibilities for upper tier local authorities such as Hull City Council. Many of the recommendations from the Pitt Review have been implemented through the *Flood and Water Management Act (2010).* Following Royal Assent in April 2010 the *Flood and Water Management Bill* became an Act of Parliament which places a greater responsibility on local authorities, particularly for surface water management issues, under their new role as a Lead Local Flood Authority. This addressed one of the big issues in the 2007 flooding about community’s lack of understanding as to who did what and the number of authorities involved.

14.4 The Pitt Review (2008)

Sir Michael Pitt carried out an independent review of national flood risk management practices after the extensive and devastating floods during the summer of 2007, in which many thousands of households, business, schools and essential infrastructure were affected and damages exceeded billions. The Pitt Review was published in June 2008 and asked for essential and fundamental changes to the way flood risk was being managed in England and Wales. The report contained 92 recommendations for the Government, local authorities, Local Resilience Forums and other stakeholders. The review called for local authorities to become Lead Local Flood Authorities and to play the major role in the management of local flood risk, through coordinating with all relevant stakeholders. Many Local Authorities had limited resources or knowledge available for flood risk and drainage as there was little clarity on how much of a Local Authority issue this was.
Source www.industry-forum.org

Sir M .Pitt graduated from University College London with a first class honours degree in Engineering. During the first half of his career he was involved in the planning, design and construction of transport and other infrastructure in this country and abroad, working for the private and public sectors. He has held senior posts in a variety of local authorities, including Director of Property and Director of Technical Services at Humberside. From 1990 to 2005 he was Chief Executive of Cheshire and Kent County Councils. More recently, he has worked on a wide range of consultancy assignments, including a yearlong appointment as independent Chair of the Government's review of the 2007 floods. He has been Chair of a number of other organisations including NHS South West, the General Medical Council's National Revalidation Programme Board, two companies and a charity.

http://webarchive.nationalarchives.gov.uk/20100807034701/http:/archive.cabinetoffice.gov.uk/pittreview/thepittreview/final_report.html

14.5 The Flood and Water Management Act (2010)

The Flood & Water Management Act (FWMA) gained royal assent on the 8th April 2010 and provides legislation for the management of risks associated with flooding and coastal erosion. The recommendations enclosed in the Pitt Review will be enacted through the Flood and Water Management Act. The Act necessitates flooding to be managed holistically and in a sustainable manner and places a number of roles and responsibilities on Hull City Council as a designated Lead Local Flood Authority.

http://www.legislation.gov.uk/ukpga/2010/29/contents

14.6 The Flood Risk Regulations (2009)

The Flood Risk Regulations (FRR) came into force in December 2009 and transposes the EU Floods Directive into law for England and Wales. The Flood Risk Regulations require three main pieces of high level work to be carried out by Hull City Council as a Lead local Flood Authority and the Environment Agency:

- Preliminary Flood Risk Assessment (PFRA) – This involves collecting information on past and future floods from surface water, groundwater and small watercourses, assembling the information into a PFRA report and identifying Flood Risk Areas.

- Flood Hazard and Flood Risk Maps – Following the identification of Flood Risk Areas the Environment Agency and Hull City Council are required to produce hazard and risk maps for Flood Risk Areas.

- Flood Risk Management Plans – The final stage is for Hull City Council and the Environment Agency to produce a joint Flood Risk Management Plan for the Flood Risk Areas by 22nd December 2015.

http://www.legislation.gov.uk/uksi/2009/3042/introduction/made

14.7 Other Legislation

A range of other legislation and guidance affects flood Risk Management. These include:

- The Climate Change Act (2008)
- The Conservation of Habitats and Species Regulations (2010)
- The Civil Contingencies Act (2004)
- The Strategic Environmental Assessment (SEA) Directive (2001)
- The Land Drainage Act (1991)
- The Water Framework Directive (2007)
- Wildlife and Countryside Act (1981)
- Countryside and Rights of Way Act (2000)
- Public Health Act (1936)
- Highways Act (1980)
- Reservoirs Act (1975)

www.legislation.gov.uk/

15. Reducing Flood Risk

15.1 Ways in which to reduce flood risk

There are many ways in which to reduce flood risk or the impacts of flooding, these include engineering solutions, catchment approaches such as land management and resilience. Examples of these are:

Engineering solutions

- Physical flood defences such as embankments or hard/soft walls;
- Purpose built storage areas such as lagoons or reservoirs with designed inlets and outfalls;
- Underground storage tanks to store flood water and discharge at restricted rates;

Catchment Approaches- upland management

- Tree planting- either in catchments to intercept run-off or wet woodlands to slow flows in rivers;
- Blocking of ditches, gripes, dykes in upland areas to keep water in these areas;
- Catchment sensitive farming such as techniques to reduce soil compaction, leaving buffer strips alongside ditches to reduce silt input;
- For surface water these can be aqua greens, swales, reed beds and rain gardens;

Resilience

- Property level protection measures;
- Flood warnings;
- Emergency planning and preparedness;

The type of measures selected depends on type and characteristics of flooding, frequency, community requirements and the funding available for dealing with the issue.

16. Funding

16.1 Funding Mechanisms

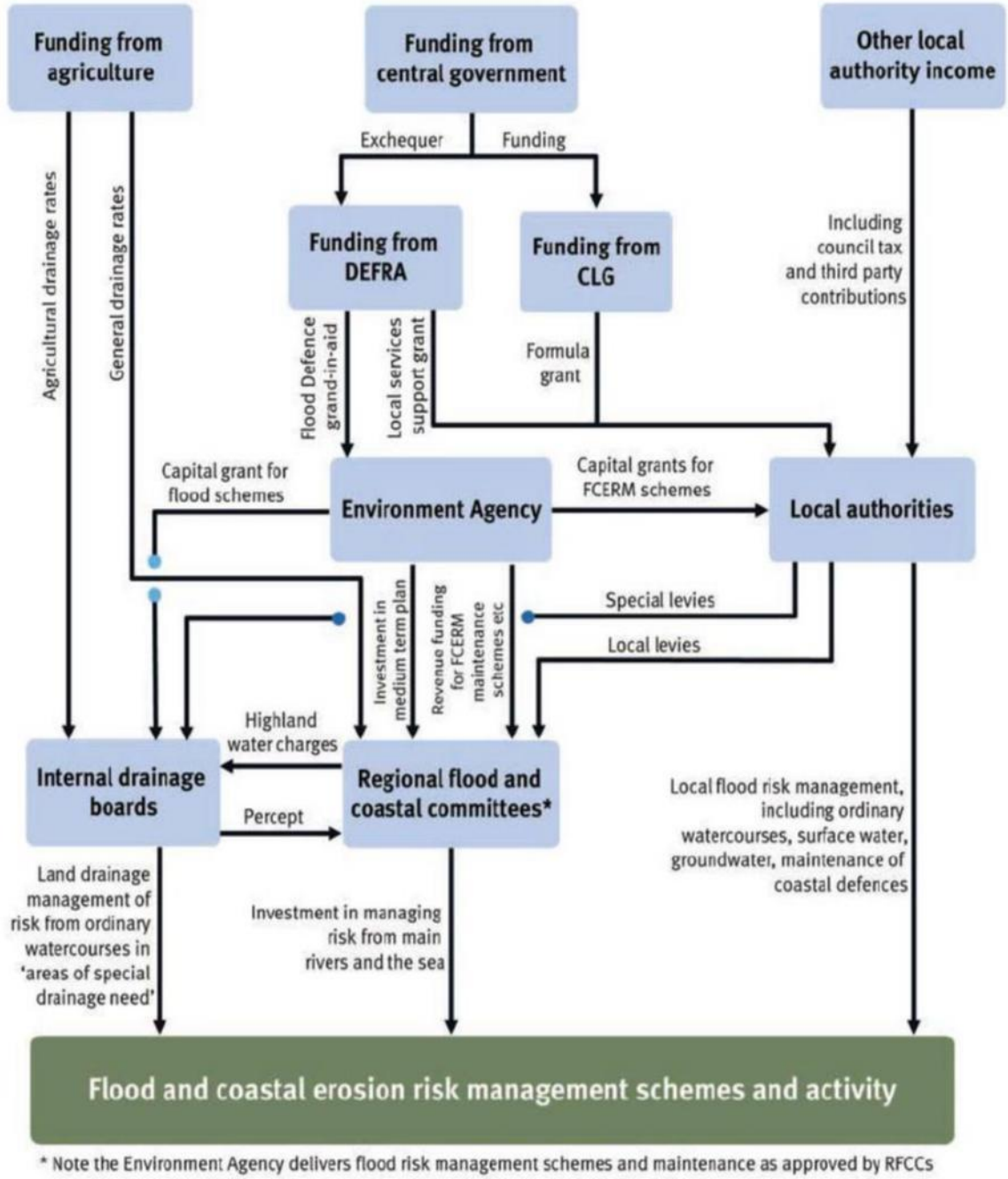
The Local Strategy sets possible funding sources and opportunities for the planned objectives, actions and outcomes. It is also important to identify what funding mechanisms are available to Hull City Council to pay for the flood risk actions that are set out in this strategy. Effective realistic implementation of the objectives, actions and outcomes requires sufficient resources. It is imperative that Lead Local Flood Authorities and other risk management authorities within the city increase their flood risk management skills and capacity in order to deliver their new responsibilities under the Flood and Water Management Act, and to understand what the future forecast of climate change may mean for our city. Our strategy will help to identify what skills will be needed to ensure that the objectives, actions and outcomes set out in this strategy can be delivered and implemented successfully.

In 2011, Hull City Council commissioned Halcrow to provide an in depth investigations report, the Flood Mitigation Investment Plan Report (FMIP) which was delivered in three strategic phases. The report identified high priority flood risk areas within the Hull CC boundary. It also provided us with an overall strategy, objectives, intended impacts and funding of flood mitigation within Hull. The FMIP confirmed to us that essential ongoing maintenance of existing flood protection assets and defences, as well as long-term investment and commitment in flood risk management schemes within Hull is required in order to deliver sustainably development and to build ongoing confidence to residents and existing and future businesses.

The ongoing challenge is that with the increasing demand for public money and the impacts of climate change there is a reduced amount of government funding for capital schemes and revenue for maintenance This means we have to compete for funds and prioritise projects with all the other Risk Management Authorities across the country. To help provide ongoing security and confidence within the city we now have to consider ways in which additional finance may be secured and maximised.

16.2 Funding Streams for Risk Management Authorities

The chart below identifies the a range of potential funding options to Risk Management Authorities



16.3 Flood Defence Grant in Aid (FDGiA) and Local Levy

FDGiA is the capital funding from central government which is administered from Defra via the Environment Agency. All RMAs can bid for FDGiA through the annual bidding process. The Environment Agency pulls together a national programme of flood schemes with indicative allocations of FDGiA. The bids have to comply with Partnership Funding (section 12.3). All the RMAs will compile their lists of schemes for their areas which then go through the Regional Flood and Coastal Committee (RFCC). The RFCC is formed of elected members from each Lead Local Flood Authority in Yorkshire. The role of the RFCC is to assess the priorities based on both value for money and local issues. The approved programme then goes back to Defra to allocate funding based on the available budget from Treasury.

16.4 The 'Partnership Funding' / 'Payment for Outcomes' Approach

The approach for assessing the funding requirements is called Partnership Funding. This funding system was introduced in 2012. Prior to this the method was simply that any potential schemes had to reach a specified cost benefit ratio. Those which got over the specified cost benefit were fully funded, whilst those that didn't would go on a waiting list. The drawback of this system was that the more schemes which achieved the specified cost benefit then the higher the specified ratio would go as the amount designated for flood risk was always a set amount. It also meant you had a lot of projects which sat on a waiting list for years with no certainty for communities as to when it may be funded.

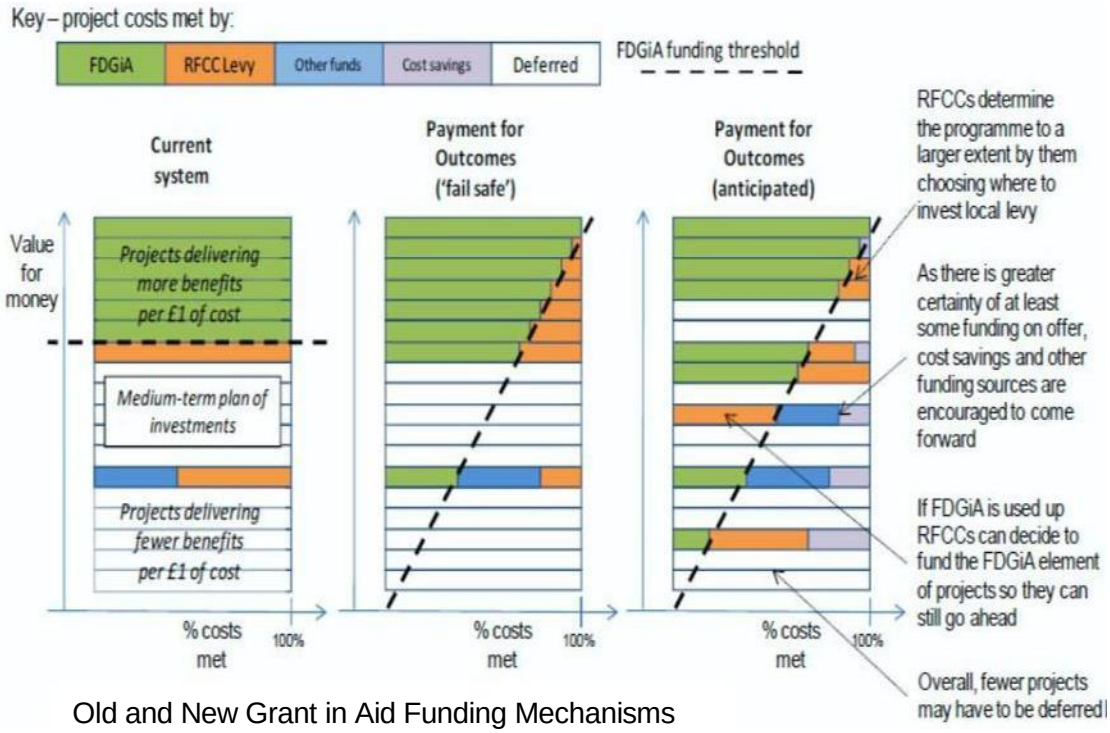
The new approach requires a calculation to be carried out to achieve a partnership funding score. The calculation is based on outcome measures. The outcome measures are based around the number of properties where the flood risk will be reduced. If a scheme does not achieve the required calculation it can be influenced by external contributions which raise the score. Therefore this allows all schemes to receive some grant in aid money with extra partnership funding required to cover the costs of the scheme. By requiring local contributions for schemes this will hopefully lead to more understanding of Hull's potential risk and additional local involvement in determining how the schemes are developed.

To assess the value for money, the 'Outcome Measure' of a scheme is used to calculate the benefits (according to specific criteria) and divided by the cost of the scheme. Any scheme with an outcome measure above 100% represents value for money. However, in the financial year 2012/13 due to the competition for grant in aid, the threshold to qualify for government assistance was set at 120%. This means that even schemes whose outcome measure score is below this threshold must secure partnership funding that gives a score above 120% in order to receive grant in aid. The lower the score, the larger the proportion of partnership funding that is required. In order to qualify for any grant in aid funds under this mechanism, any necessary partnership funding must be secured before an application can be made. The threshold score changes every year, according to the competition.

For the Flood Alleviation Schemes in Hull the Environment Agency currently have allocations of FDGiA to upgrade the defences along the Humber Frontage, the River Hull through the city and to look at reducing flood risk from the Holderness Drain through the operation of the East Hull Pumping Station. As mentioned in previous sections, the flood risk to Hull is from all sources, is complex and requires partnership working to address the issues. There are currently bids and funding allocated for schemes on the outskirts of the city which will provide flood risk reduction from surface water to many communities in Hull. These schemes are the Willerby and Derringham, Cottingham and Orchard Park and Anlaby and East Ella Flood Alleviation Schemes, some in partnership with the East Riding of Yorkshire Council. The principles behind these schemes are to store water using the natural topography and

purpose built lagoons to slow the amount of water running off the surrounding areas into the city.

To address remaining surface water flood risks there are bids for retrofitting sustainable drainage techniques onto existing housing stock.



Old and New Grant in Aid Funding Mechanisms

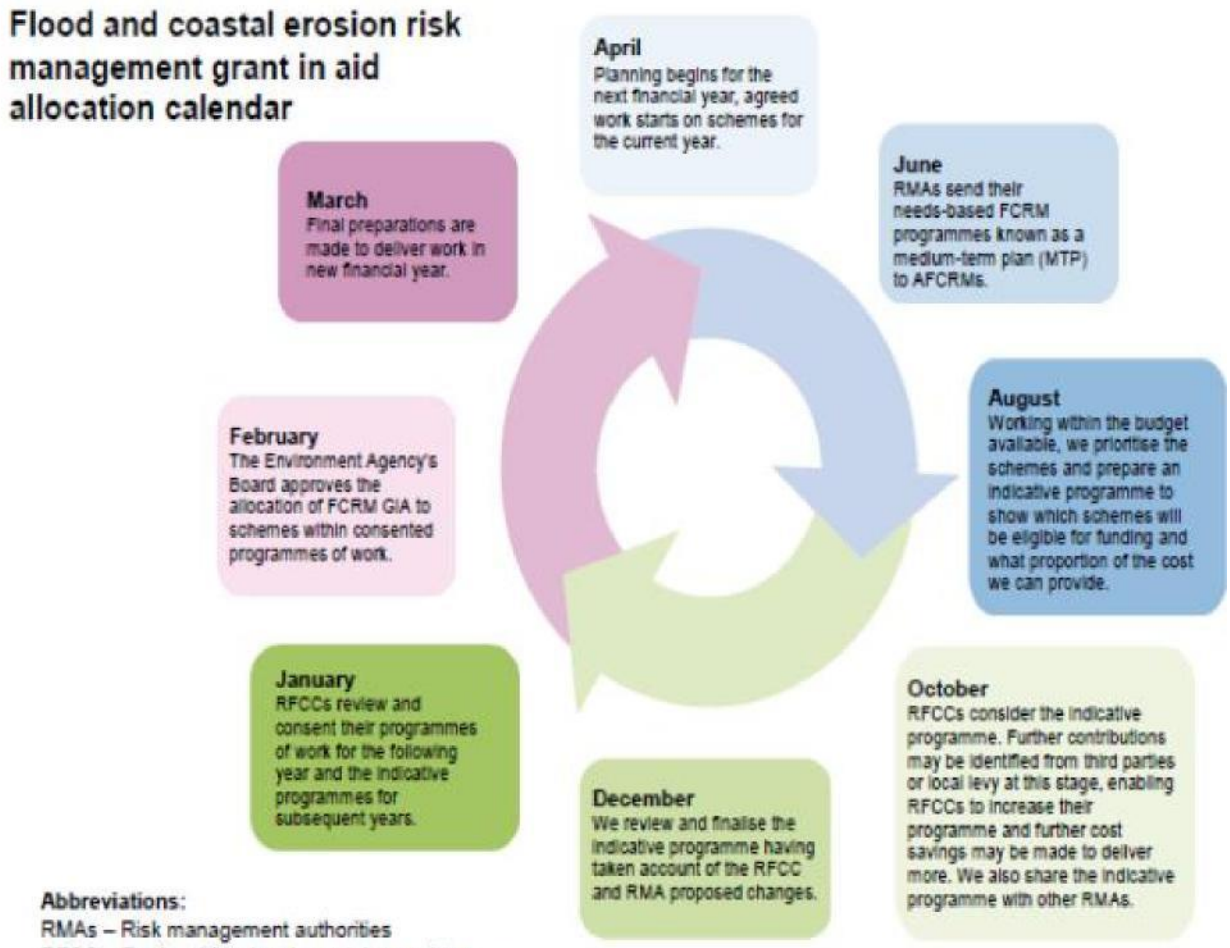
Hull City Council will take the lead role in conjunction with other key stakeholders within the city for applying for FDGiA funding and will:

- Identify projects
- Plan projects
- Establish fees required
- Outline responsibilities
- Present to Regional Flood and Coastal Committee

Hull City Council will continue partnership working with key stakeholder:

- DEFRA and the Environment Agency
- Yorkshire Water Companies and OFWAT
- European Union funding streams
- Non-governmental organizations (NGOs)
- Private sector developers
- Highways Agency
- Network Rail
- East Riding of Yorkshire Council

16.5 Flood Defence Grant in Aid (FDGiA) Allocation



Abbreviations:
RMAs – Risk management authorities
RFCC – Regional flood and coastal committee
AFCRM – Area flood and coastal erosion risk manager
FCRM GiA - Flood and coastal erosion risk management grant in aid

17. Other Sources of Funding

17.1 DEFRA Grant

To deliver and perform duties given to us under The Flood Water and Management Act 2010 and the Flood Risk Regulations 2009, DEFRA provides a funding grant to all Lead Local Flood Authorities for the current spending review period. The grant given to Hull CC is not fixed and changes with each three year review period.

17.2 Local Funding – Community Infrastructure Levy

The Community Infrastructure Levy came into force in April 2010. It is a new levy that local authorities can choose to charge on new developments in their area. The money can be used to support development by funding infrastructure which the council, local community and neighbourhoods desire. Contributions sought through the Community Infrastructure Levy have to be adopted by the Council following public consultation and examination by an independent inspector. Infrastructure gaps must be determined and a charging schedule is produced in the form of a levy (£ per square metre) required. A city wide Infrastructure study in 2010 has assessed the need for, and gaps in, a range of community infrastructure. Conclusions drawn include that CIL funding would not be able to address significant shortfalls for necessary strategic and enabling infrastructure. Flood defence projects and major road improvements are to be funded by agencies responsible for their provision and maintenance. A draft CIL charging schedule (which has been consulted on) has been derived for new housing and retail schemes.

17.3 Local Enterprise Partnership and European Union Funding – Regional Development Fund

The Local Enterprise Partnership (LEP) is a partnership of business, education and the four Humber local authorities working together to promote and develop the area surrounding the Humber Estuary and provide strategic economic leadership to create jobs and deliver growth. The key areas the LEP looks to concentrate on are; a skilled and productive workforce, thriving successful business and an infrastructure that supports growth, including building flood defences. The Local Growth Fund (LGF) is the Government's funding pot of at least £2bn a year from 2015/16 to 2020/21. Most of the funding is allocated through a competitive process. For more information on the LEP:
http://lep.ludo5.co.uk/#

The European Union is an important part of Britain's legal, economic and social structure. It supports eligible regions, such as Yorkshire and the Humber, by providing funds to help them regenerate their economies and create new jobs. These funding programmes, known collectively as 'structural funds', are distributed by the European Commission to areas in economic decline or in need of regeneration. One of these structural funds is the European Regional Development Fund (ERDF). Through a joint bid with key stakeholders, Hull CC have secured funds to provide the Willerby and Derringham Flood Alleviation Scheme (WaDFAS) which will reduce the risk of flooding for around 8,000 properties.

17.4 Private Funding -Yorkshire Water

Yorkshire Water has invested, and continues to invest into its infrastructure in Hull. Since 2007, YW has invested over £30 million into its assets. It has recently invested £2 million into the creation of a hydraulic model of the public sewer system in the Hull and Haltemprice area, and is planning a further £10 million investment into Bransholme Sewage pumping Station (SPS). They also invest and support risk management authorities on flood alleviation schemes. As part of their duties to remove properties from the DG5 register. Water companies are able to raise funds through the prices they charge their customers. However

these prices are heavily regulated by Ofwat. This is done on a five-year cycle called an Asset Management Plan (AMP). We are currently in the fifth AMP period, AMP5, which runs from 2010 to 2015. AMP6 will begin in 2016. The work that water companies undertake in each AMP period is determined by plans they submit to Ofwat prior to each AMP period, this is called the 'Periodic Review'. The next periodic review submissions will be made in 2019.

17.5 Private Funding - Developer Contributions

Planning obligations under Section 106 of the Town and Country Planning Act 1990 (as amended), commonly known as S106 agreements, are a mechanism which make a development proposal acceptable in planning terms which would not otherwise be acceptable. They are focused on site specific mitigation of the impact of development. S106 agreements are often referred to as 'developer contributions' along with 'highway contributions' and the Community Infrastructure Levy.

The common use of planning obligations in Hull is to make provision for off-site open space improvements but other forms include:

- Restricting the development or use of the land in any specified way;
- Requiring specified operations or activities to be carried out in, on, under or over the land;
- Requiring the land to be used in any specified way; or
- Requiring a sum or sums to be paid to the authority on a specified date or dates, or periodically.

This means that any offsite improvements to drainage infrastructure required, or if flood risk which is caused by, or increased by, new development should be resolved and funded by the developer.

A planning obligation can be subject to conditions, it can specify restrictions definitely or indefinitely, and in terms of payments the timing of these can be specified in the obligation. If the S106 is not complied with, it is enforceable against the person who entered into the obligation and any subsequent owner. The s106 can be enforced by injunction. In case of a breach of the obligation the authority can take direct action and recover expenses.

The planning obligation is a formal document, a deed, which states that it is an obligation for planning purposes; it identifies the relevant land, the person entering the obligation and their interest, and the relevant local authority which would enforce the obligation. The obligation can be a unitary obligation or multi-party agreement. The obligation can also become a land charge.

The legal tests for applying the S106 are that it should be:

- Necessary to make the development acceptable in planning terms
- Directly related to the development and
- Fairly and reasonably related in scale and kind to the development

As well as the legal tests, the policy tests are contained in the National Planning Policy Framework (NPPF):

"203. Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition."

18. Ongoing and Future Projects

Source Of Flooding	Defence Scheme Details	Timescale	Lead Organisation & Support	Est Total Cost (£)	Funding Stream	Indicative Allocation	Approved
River	Albert Dock Humber defence wall	Short	EA-HCC	£6 m	Flood Defence Grant in Aid (FDGiA), Local Growth Funding (LGF)		Yes
Surface Water	Willerby & Derringham flood alleviation scheme (WADAF)	Short-Medium	ERYC-HCC	£15m	FDGiA, European Regional Development Fund (ERDF)		Yes
Surface Water	Cottingham & Orchard Park Flood Alleviation Scheme (COPFAS),	Medium-Long	ERYC-HCC	£22m	FDGiA, LGF	Yes	
Surface Water	Anlaby & East Ella Flood Alleviation Scheme (AEEFAS),	Long	ERYC-HCC	£19m	FDGiA, LGF	Yes	
Surface Water	Hull & Holderness Flood Alleviation Scheme (H&HFAS)	Long	ERYC-HCC	£30m	FDGiA, LGF	Yes	
River	River Hull Defences (1to 5 years only)	Medium-Long	EA-HCC	£37m	FDGiA	Yes	
River	Humber Frontage 1st Phase (1to 6 years)	Medium-Long	EA-HCC	£19M	FDGiA	Yes	
Surface Water	Willerby & Wymersley Flood Alleviation Scheme (WAWFAS)	Short	HCC	£10/15K	HCC	Yes	
Surface Water	Barbara Robson Playing Fields Flood Alleviation Scheme	Short	HCC	£10K	HCC, YWS	Yes	

Source Of Flooding	Defence Scheme Details	Timescale	Lead Organisation & Support	Est Total Cost (£)	Funding Stream	Indicative Allocation	Approved
Surface Water	Bund alongside Old Fleet Drain,	Medium-Long	HCC	£590K	FDGiA	Yes	
Surface Water	Newland Flood Alleviation - Sustainable Drainage retrofit	Medium-Long	HCC-YWS	£2.5M	FDGiA, YWS	Yes	
Surface Water	Sutton Ings Flood Alleviation - Sustainable Drainage retrofit	Medium-Long	HCC-YWS	£3.5m	FDGiA, YWS	Yes	
Sewer	Bransholme Pumping station		YWS	£16m	YWS		Yes
Surface Water & River	River Hull Integrated Catchment Strategy (RHICS)	Medium-Long	ERYC-HCC-EA-YWS	£40m	FDGiA, LGF		

Estimated Total Cost £235.6m

For more details on each scheme please contact the relevant lead organisation

Kingston upon Hull City Council Flood Risk Team (01482) 300300

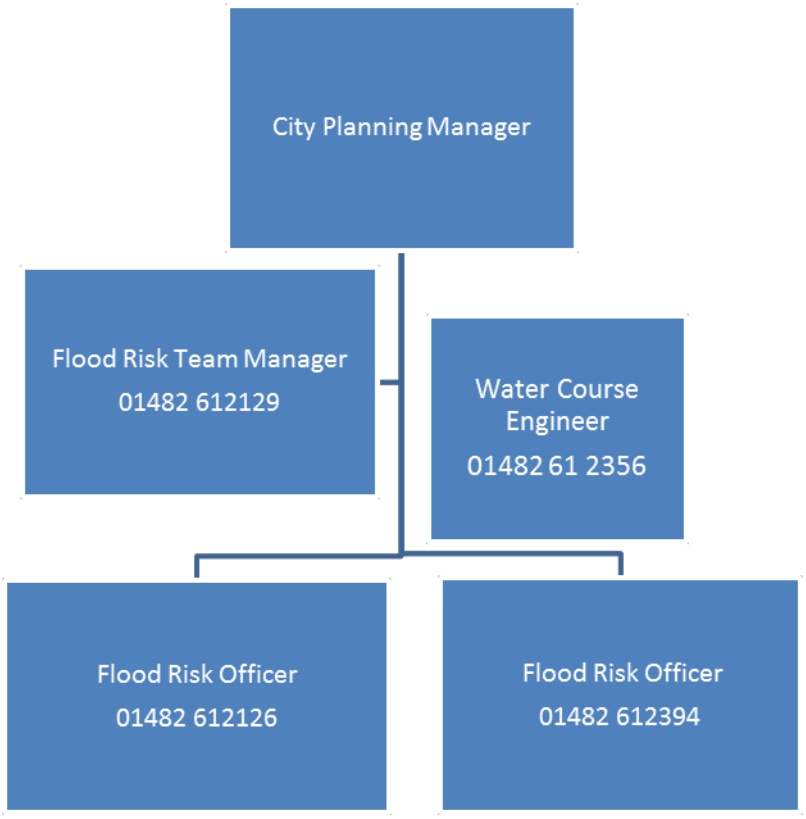
East Riding Of Yorkshire Council (01482) 393939

Environment Agency 03708 506 506

Yorkshire Water 0845 124 24 24

Appendix A

Hull City Council Flood Risk Team



Appendix B

Get Ready for the Unexpected. Life's Not Always Predictable

Some things in life we can plan for, like birthdays and weddings, but life isn't always that predictable. We just need to look back to the floods of 2007when unprecedented amounts of rain fell, to see how things can significantly disrupt our daily lives. Even though we cannot prevent emergencies happening, we can plan ahead to minimise their impact.

The guide below explains how we work alongside the emergency services and other agencies to prepare for the unexpected. Even though we are working to be prepared, there are things you can do to help keep yourself and your family safe, should an emergency happen. The guide outlines simple steps to help you prepare. A few minutes thinking about it now could make a big difference to the outcome of the emergency for you and your family. Do not wait for the unexpected to happen, prepare now!

Get ready for the unexpected life's not always predictable download guide
http://www.hullcc.gov.uk/portal/page?_pageid=221,585692&_dad=portal&_schema=PORTAL

Prepare Your Property for Flooding

It is impossible to completely flood-proof a property but there are many things you can do to reduce flood damage. If you know your property is in an area that could flood, buy protection equipment and prepare your property well in advance to reduce the risk of flood water getting inside. Remove flood protection equipment once the water has gone to help dry out your property.

- Sandbags: Contact local builders' merchants or follow the link to the National Flood Forum Blue Pages Directory
- Doors and windows: Automatic flood-proof doors and windows, or purpose-built flood boards which can be fitted when flooding is expected
- Exterior walls: check the pointing, and apply water-proofing sealant to exterior walls
- Floors: Raise damp-proof brick courses. Seal floors or replace wooden floorboards with concrete with a damp-proof membrane
- Air bricks: Automatic flood-proof air bricks or specially designed covers that are easy to fit over air bricks when flooding is expected
- Drains and pipes: fit non-return valves to drains and water inlet and outlet pipes. This will prevent wastewater from flowing back into the property through sewerage pipes for ground floor toilets and sinks
- Barriers: you could arrange free-standing temporary flood barriers, talk to your neighbours about building a single barrier around several houses to help spread the cost and the benefits
- Landscaping: landscape garden areas and driveways to help divert water away from your property

The National Flood Forum's Blue Pages Directory provides information and advice on what products are available to help protect your home or business against flooding. It can be found here:
http://www.bluepages.org.uk/BluePages/tabid/1664/Default.aspx

It is important when buying flood products that they have a recognised 'Kitemark' symbol and accreditation which shows that they have been tested properly. For more information on property level protection, please contact the flood risk team on 612126.

Appendix C

Flood Warnings

The Environment Agency provides flood warnings throughout England and Wales in areas at risk of flooding from rivers and sea.

Types of flood warning

The Environment Agency has three types of warning - Flood Alert, Flood Warning and Severe Flood Warning as shown below. These will help you prepare for flooding and take necessary actions.

- Severe Flood Warning Severe flooding Danger to life.
- Flood Warning Flooding is expected. Immediate action required
- Flood Alert Flooding is possible. Be prepared

You can register online with their Floodline Warnings Direct service if your home or business is at risk of flooding.

Follow this link to register for Floodline: https://fwd.environment-agency.gov.uk/app/olr/register

If you want to register you will have to supply a telephone number on which you can be contacted on any time of the day or night. Please ensure the number you provide has no inbound call barring as this will prevent you from receiving recorded flood warning messages. You will also need your current email address.

If you need to register both your home and a business you should register twice: once for your home address and once for your business.

If you are a landlord registering a tenant's property then you should select the business category.

If you are a tenant you can still register the property in which you are living and you should select the home category.

If you would prefer to register by telephone, or if you need help during the registration process,

Please call Floodline on 0845 988 1188.

Appendix D: Stages in the restoration of flooded buildings

Flood occurs

↓

Homeowner/property holder contacts Insurer/Local Authority

↓

Loss Adjustor / Damage Management Contractor contacts/visits Homeowner

↓

Overview report on initial survey:

- H&S assessment
- Flood damage assessment how to remove remaining water and possible strip-out
- Flooding characteristics and future flood risk

↓

Decontaminate building and sanitation certificate issued

↓

Appoint main contractor & agree schedule and methods for drying

↓

Dry building until appropriate moisture level reached

↓

Issue Drying Certificate

↓

Audit of drying

↓

Sanitation Inspection Certificate issued

↓

Agree repair/new building work strategy

↓

Apply for consents from local Building Control

↓

Repair, re-new re-fit, decoration of building

↓

Collate certificate approvals i.e. Gas, Electrical, Building Regulations

↓

Homeowner reoccupies building

Appendix E

Guidance for the Application of Sustainable Drainage Systems SuDS

The National Planning Policy Framework (NPPF) is a key part of the UK Government's planning reforms. It replaces most of the Planning Policy Guidance Notes (PPGs) and Planning Policy Statements (PPSs). The (NPPF) requires that Local Plans should manage flood risk by:

"safeguarding land from development that is required for current and future flood management
"using opportunities offered by new development to reduce the causes and impacts of flooding."

Local Plans should contain policies that require Sustainable Drainage Systems (SuDS) as the 'default' surface water drainage solution.

SUDS is a term used to describe the assorted approaches that can be used to manage surface water drainage in a way that mimics the natural environment. The management of rainfall (surface water) is considered an essential element for reducing future flood risk to both the site and its surroundings. Indeed, reducing the rate of discharge from urban sites to greenfield (undeveloped) runoff rates is one of the most effective ways of reducing and managing flood risk.

SUDS improve the sustainable management of water for a site by:

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream
- Reducing volumes of water flowing directly to watercourses or sewers from developed sites
- Improving water quality compared with conventional surface water sewers, by removing pollutants from diffuse pollutant sources
- Reducing potable water demand through rainwater harvesting
- Improving amenity through the provision of public open space and wildlife habitat and
- Replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained

Pervious surfaces / Paving	Surfaces that allow inflow of rainwater into the underlying construction or soil.
Green / Brown roofs	Vegetated roofs that reduce the volume and rate of runoff and remove pollution.
Filter drains / trenches	Linear drains consisting of trenches filled with a permeable material
Filter strips	Vegetated areas of gently sloping ground designed to drain water evenly off impermeable areas
Swales	Shallow vegetated channels that convey and retain water.
Basins	Ponds and wetlands areas that may be utilised for surface runoff storage
Infiltration devices	Sub-surface structures to promote the infiltration of surface water to ground.

Any reduction in the amount of water entering the sewer system across a catchment no matter how small applied over time will eventually be significant. The appropriate application of a SUDS scheme to a specific development is heavily dependent upon the topography and

geology of the site and the surrounding areas. Careful consideration of the site characteristics is necessary to ensure the future sustainability of the adopted drainage

SuDS Techniques

Photographs sourced from the Essex County Council SuDS: Design and Adoption Guide.

Appendix F

Insuring Property at Risk of Flooding

The likelihood of flooding may have an effect on home insurance in your area. An insurance company may ask you for more information about flood probability.

You can find out what the likelihood of flooding from rivers and the sea is in your local area on the Environment-Agency flood map. This is the same information that is available to insurance companies.

See link http://www.environment-agency.gov.uk/homeandleisure/floods/31654.aspx

Get help finding an insurer

Contact the National Flood Forum (NFF), an independent organisation offering advice and guidance on how to get insurance for properties at risk of flood and reduce your premium or excess.

See link http://nationalfloodforum.org.uk or Phone on 01299 403055

Talk to an insurance broker specialising in properties that are difficult to insure. You should be able to find these brokers in the Yellow Pages, on the British Insurance Brokers' Association website or by calling the broker helpline on 0870 950 1790.

See link http://www.biba.org.uk/

Contact the Association of British Insurers, who may be able to offer you advice.

See link https://www.abi.org.uk/ by phone on 020 7600 3333

The Department for Environment, Food & Rural Affairs (Defra's) has produced a useful insurance guide for owners of property in high flood risk areas.
See link https://www.gov.uk/government/publications/obtaining-flood-insurance-in-high-risk-areas

Individuals can also contact the Hull CC Flood Risk Team on 01482 612394 or 01482 612126 who can provide a general insurance enquiry letter which explains in detail the events of the flooding in 2007 and what work has been carried out since this event, and future projects to help alleviate flood risk in the city.

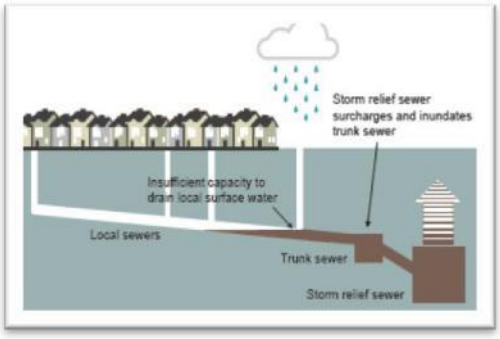
Appendix G

Retro Fitting SuDS to your Home; what can I do?

Flood risk responsibility has been given to Hull CC under The Flood and water Management Act, but flood risk should be a major a concern to everybody in the city. The people who have been victims of flooding will know only too well the heartache and stress it causes.

Urban towns and cities like Hull have, over time, become less permeable to rainwater. We have gradually paved over surfaces and built homes as the population and demand has grown. This leads to more rainwater running off urban areas, overwhelming sewers and contributing to flooding risk. We believe everybody can help to reduce flood risk in some way. The term 'nibbling' can be used when small amounts of rain water and surface water are taken out of the sewer systems and intercepted and reused, or natural evaporation occurs and it re-joins the Hydrologic cycle.

The Problem



The Solution

The above Suds features could be installed in your garden. They help to store rainwater and will be connected to the existing drainage system to release water at a slower rate. Alternatively, water could also be used for garden watering.

Water butts

Water butts intercept a downpipe to store rainwater than runs off from the roof. This water can then be used for garden watering. To help effectively manage storm water, storage systems like water butts need to be empty before the next storm.

Rain stores

Rain stores are simple rainwater storage tanks which are designed to be multi-functional. They can include planting soil, bin stores or bike racks.

Rain-gardens

Rain-gardens (free-draining planted areas) can be included by replacing ground material with sandy soils that can absorb and store rainwater, while also providing water to the plants. The majority of Hull has heavy clay soil, so it will be necessary to underdrain rain-gardens to let water seep out slowly. Gardens will require some shallow excavation to introduce suitable soils and underdrainage.

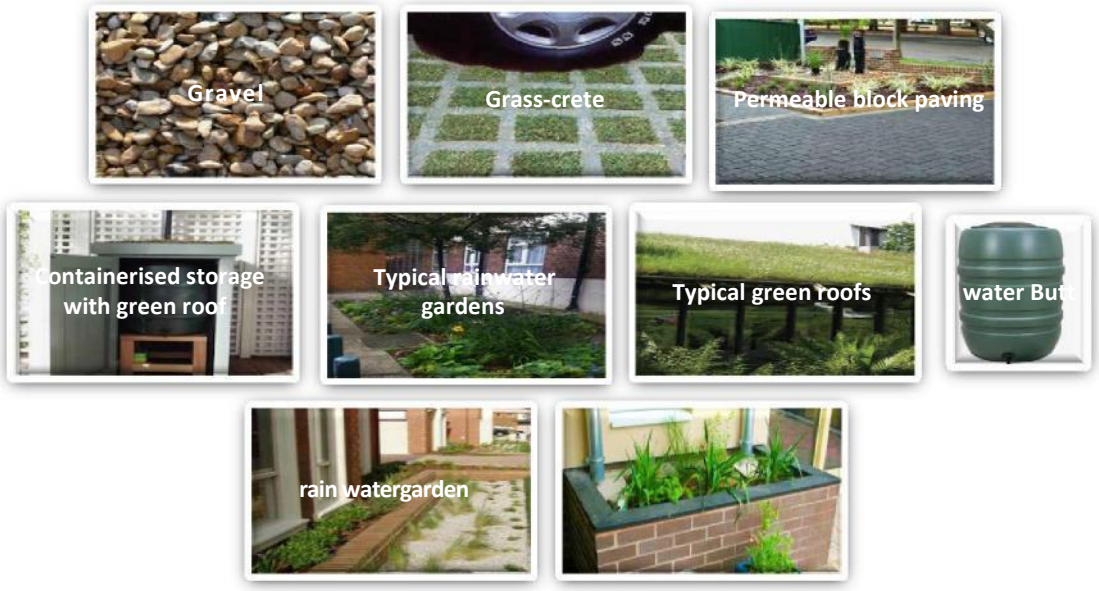
Permeable Surfaces

Paved, impermeable surfaces that do not let water soak into the ground could be replaced with grassed areas, gravels or with alternative permeable paving that will help to reduce runoff to underground pipes.

Green roofs

Green roofs involve the introduction of soil and vegetation on flat or slightly sloping roofs. The soil layer helps to absorb rainwater. Green roofs may be suitable for some buildings which can support additional imposed loads; however a site-specific structural investigation may be needed before instillation.

Domestic Retro fit SuDS Options



Appendix H

Key Contact Details

Organisation	Website	Telephone No.	Email
Hull City Council	www.hullcc.gov.uk/	01482 300300	
Hull CC Flood Risk Team			flood.risk@hullcc.gov.uk
Environment Agency	www.gov.uk/government/organisations/environment-agency	General enquiries 03708 506 506 Floodline 0845 988 1188 (24 hour service).	
Met Office	www.metoffice.gov.uk		
Yorkshire Water		0845 124 24 24	www.yorkshirewater.com