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## Introduction

### *Newcastle upon Tyne - Geographical setting*

#### Location

The City is located on high ground on the north side of the River Tyne with steep banks down to a narrow floodplain. The highest ground is to the west of the City Centre in Fenham. It was a compact City up to 1800's but since then sporadic periods of expansion have taken place to support industrial development and to provide housing.

#### Climate

In the UK the prevailing winds are predominantly from the south-west so the City is protected from many heavy rainstorms by being in the rain shadow of the Pennines. This means that the area is amongst the driest in the UK, with annual totals at least 650mm.

Rainfall tends to be fairly evenly distributed through the year, especially towards the coast, with slightly drier spring months and slightly wetter autumn months compared to the annual average. There is a predominance of convective storms in the summer and cyclonic frontal rainfall in the winter; the former can be unpredictable and the latter more predictable

#### Geology

The area is underlain by carboniferous rocks, mostly middle coal measures generally dipping towards the east, with some areas of lower coal measures outcropping towards the west of the city.

The superficial geology is generally influenced by the region's glacial history, with a variable thickness and character of deposits mostly from later glaciations with ice-sheets generally moving southwards from the Cheviot ice cap. The thinnest cover is in the areas of higher ground to the west of the City. The deepest deposits tend to be in buried river channels which generally follow the lines of the present-day rivers such as the Tyne.

The material is predominantly relatively impermeable glacial tills and deposits from the ice-sheet retreat phase, more generally called boulder clay. Localised areas of more permeable sandy deposits are known to exist from borehole records, although these are difficult to map. More recent alluvial deposits lie along the main river floodplain areas, particularly along the Tyne valley.

There are areas of made ground distributed across the whole area, mostly along the lower reaches of valleys leading into the Tyne. The material used for infilling these areas is generally uncertain and its influence on groundwater movement is difficult to predict.

### *Hydrogeology*

The overall hydrogeology (distribution and movement of groundwater in soils and rocks) of the area is dominated by the history of coal mines. They have significantly altered the natural patterns of groundwater movement through connections between worked seams. In areas not affected by mine workings natural groundwater flows are likely to be dominated by water movement through fissures in the rock.

The water table is generally significantly lowered due to the continuing pumping by the Coal Authority to prevent rebound of groundwater levels and subsequent potential problems with water quality discharges to surface watercourses.

Localised perched water tables are likely to occur in areas of sands and gravels embedded in the wider drift deposits, and may influence localised discharges to the ground surface under wet conditions.

### *Surface water catchments and drainage*

The River Tyne is the primary watercourse through the city and it has been highly managed in its lower reaches by the construction of river walls and being dredged to accommodate ocean going ships.

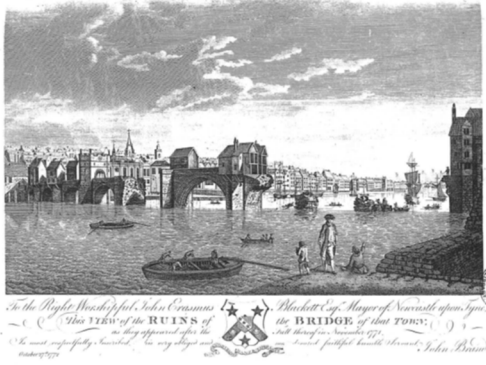
The Ouseburn is a significant tributary on the north side of the Tyne and its catchment drains a large part of the City in an arc from the west of the City near Callerton, through the Newcastle Great Park and Jesmond Dene. It flows through a major culvert under Warwick Street and on down to the Tyne past Byker Farm. After passing the Tyne Barrage it reaches its confluence with the Tyne.

There are a number of smaller tributaries on the north bank of the Tyne and the New Burn, Reigh Burn and Sugeley Dene. The historic landscape contained several steeply sided valleys running down towards the Tyne. Many of these valleys were filled in during the 1700's and 1800's to facilitate development of what has become the modern day City Centre. The original watercourses were put into deep culverts below the modern road level. This leaves the City Centre with relatively gentle slopes but with the original topography reflected in the modern ground levels. For example Grey Street was the location of the Lort Burn and High Bridge falling towards it. The outline of the original High Bridge can be seen in the roof of the existing combined sewer system running down the street.

### *History of flooding events*

Flooding is nothing new to Newcastle with recorded incidents going back to at least 1339 when part of the Town Wall was undermined by the Swirle and then collapsed.

There has been a crossing over the Tyne since at least Roman times and in 1771 one of those crossings was severely damaged by high river levels.



Unbeknown to them the reporters of the day had identified the benefit of managing flood water:

“The utility of Jarrow Slake appeared, as has been observed, in this disaster; as it took in so immense a body of water, that at Shields the flood was no higher than a spring tide.”

Heavy rainstorms in 1913, 1941 are historic reminders that flash flooding isn't something new either. More recently recording breaking annual rainfall totals and the “Thunder Thursday” event in 2012 highlighted that the emphasis has moved from river flooding towards flash flooding in the modern City. The flash flood overwhelms drainage networks that aren't designed to carry extreme volumes of surface water.



Northumberland Street 1913

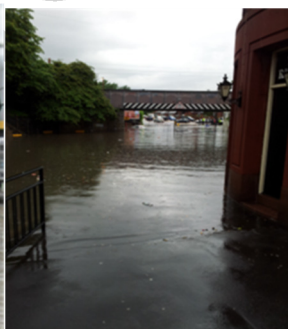


Jesmond Road, 1913



Westerhope 1941

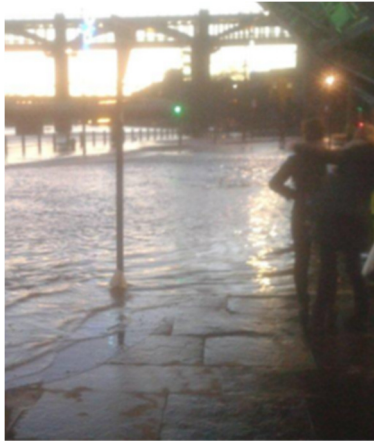
The City is now home to over 280,000 people and many more come into the area to work. Surveys carried out after the event on 28 June, 2012 – sometimes referred to as “Toon Monsoon” or “Thunder Thursday” – identified over 500 residential properties that were flooded internally and about 50 non-residential properties affected. Property is now more valuable and furnished to a higher quality relative to the past so any single flood incident can cause substantial damage in financial terms. There is always a risk to the longer term health and well-being of residents following a flooding incident.





## Flash Flooding “Thunder Thursday” 28 June 2012

We cannot forget the Tyne and in December 2013 a tidal surge affected the Quayside and flooded over 25 properties. Climate change is affecting sea levels and these may impact the Quayside area in the future.



Quayside, December 2013

Although we have lived with flooding in the past we do need to identify ways to make the City more resilient to heavy rain in the future. New developments will be expected to manage surface water without increasing flood risk for other residents and businesses.

This strategy will look at where we are now and where we need to be to provide a resilient and safe City and how we can get to that point.

## Executive Summary

### Where are we now?

Flood management is carried out within a framework of European, national, regional and local legislation, policies, strategies and guidance.

Newcastle is at risk from many different sources of flooding including the rivers, denes or burns, water flowing over the surface runoff, sewer flooding and lakes and ponds. A wide range of information has had to be reviewed to produce this Local Flood Risk Management Plan.

Flooding is nothing new to the City and there are records of river flooding incidents going back to at least 1339. More recently heavy rainstorms in 1913, 1941 and 2012 highlighted the risk of flash flooding to the modern City.

Surveys carried out after that event on 28 June, 2012 – sometimes referred to as “Toon Monsoon” or “Thunder Thursday” – identified around 500 residential properties that were flooded internally and over 50 non-residential properties affected (Summer 2012 Flooding Report).

In December 2013 we were reminded of the risk of tidal flooding when a tidal surge from the North Sea affected the Quayside and flooded over 25 properties.

Relative to the past, today's homes are furnished to a higher quality so any single flood incident can cause substantial damage in financial terms.

Whatever happens there is always a risk to the longer term health and well-being of residents following a flooding event.

### Where are we going?

The national approach to flood management has been influenced by the Pitt Review that was carried out following severe widespread flooding in 2007. It identified a need to change the way the country responded to an increase in flood risk.

The Flood Risk Regulations 2009 included a requirement for developing, maintaining and applying a Local Flood Risk Management Strategy (LFRMS) that would be shaped by the types of local flood risk we have experienced or expect to experience and requires a balance between local and national priorities as they affect our at risk local communities.

This was complemented by the Flood and Water Management Act 2010 which created a more integrated, comprehensive and risk-based collaborative approach for managing flood risk and identified clear responsibilities. The Act gave the City Council a leadership role in local flood risk management and the statutory responsibility as Lead Local Flood Authority (LLFA).

This legislation will influence the way the City Council approaches flood risk management in our communities as we apply our own strategic visions, values and priorities.

This draft plan explains our objectives for managing flood risk in the City and the activities that need to take place to allow that to happen in a sustainable way.

## How will we get there?

### A collaborative approach

The City Council cannot reach its objectives alone and we need local residents and businesses to work with our main partners the Environment Agency and Northumbrian Water to find sustainable ways to manage localised flood risk.

We need to make sure that everyone understands their rights and responsibilities about flooding and how to manage assets that reduce flood risk. Property owners can protect their own assets as long as they don't increase the risk of flooding elsewhere. The Council has a responsibility to keep roads open.

Flood risk in England is projected to increase due to development and climate change. Research by the Environment Agency suggests that total investment in flood and coastal erosion risk management will need to rise significantly in future years to prevent increasing flood and climate change damages to existing households, commercial property, and the infrastructure that underpins existing local economies.

### A long-term financed programme

Funding is vital and can be obtained from many organisations such as the European Commission, Local Enterprise Partnership, Central Government through the Environment Agency's Flood Defence Grant in Aid or the Local Levy managed by the Northumbria Regional Flood and Coastal Committee. The City Council will endeavour to provide contributions where it will secure external funding. But we can't find funds to do everything we would like to.

Where we can work collaboratively with partners to obtain multiple benefits and additional sources of funding we will. We already have effective links with the Environment Agency and Northumbrian Water. This helps complete schemes efficiently and with the best benefits using the limited amount of funding we have available.

Our approach to flood management must remain flexible for many years to come so we can always take advantage of opportunities to work with our partners or as legislation is updated or as funding opportunities occur. With limited funding expected to be available we may have to divert money from one project to another because we have an opportunity to gain greater benefits for the wider community.

Recent changes in legislation now require Local Planning Authorities to consult the relevant Lead Local Flood Authority about planning applications on major developments where there is a water management factor to consider. This begins to formally manage new developments to make sure the flood risk for the new houses

and their existing neighbours has been considered. It won't necessarily help manage flood risk from the existing environment and those difficulties will remain.

CONSULTATION

## WHERE ARE WE NOW

This section will look at the existing legislation, plans, policies and strategies that control the way we manage surface water flooding in the City.

CONSULTATION

## Legal Context

Managing surface water flood risk and the water environment is influenced by legislation, regulation and strategies at European, national, regional and local level, see Appendix 1 and Appendix 2.

The management of rivers and watercourses is also influenced by **Common law** (also known as case **law** or precedent) that has been developed over centuries through decisions of courts. It identifies what are termed as the riparian rights and responsibilities for landowners either side of watercourses.

## Law and Regulations (England only)

### Flood Risk Regulations 2009

The Regulations were developed by the European Union following widespread flooding and were brought into UK law as the Flood Risk Regulations 2009.

The main requirements were to publish and review every six years:

- Preliminary Flood Risk Assessments
- Flood hazard and flood risk maps for all sources of flooding
- Flood Risk Management Plans

### Flood and Water Management Act 2010

The Act came out of the Pitt Review following widespread flooding across England in 2007. It established Risk Management Authorities (RMA's) who have a general responsibility to co-operate with each other in managing local flood risk. In general the RMA's are:

- Lead Local Flood Authority
- Environment Agency,
- Water and Sewage Company
- Highway Authority – both local and national
- Riparian owners and landowners

## Lead Local Flood Authority

The City Council is the Lead Local Flood Authority (LLFA) and takes the lead in reducing the risk of flooding from:

- Surface water
- Groundwater
- Ordinary Watercourses (including lakes and ponds attached to them)

## Environment Agency

The Environment Agency leads the risk management of flooding from:

- The sea
- Main rivers, and
- is the enforcement Authority for Regulating the safety of reservoirs

## Water and Sewerage Company

Northumbrian Water are the local water and sewage company and the Act expects them to:

- Act consistently with national and local strategies when carrying out flood risk management functions.
- Be subject to scrutiny from LLFA's democratic processes.
- Be responsible for flooding from sewers except in extreme weather

## Other RMA's

Appendix [3 lists other](#) Risk Management Authorities and Lead Local Flood Authorities who may need to be contacted.

## The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003

Link:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/307788/river-basin-planning-standards.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/307788/river-basin-planning-standards.pdf)

The Water Framework Directive (WFD) (2000/60/EC) introduced a comprehensive river basin management planning system to help protect and improve the ecological health of our rivers, lakes, estuaries, coastline and groundwater. This is underpinned by the use of standards to assess risks to the quality of the water environment and to identify the scale of improvements that would be needed to bring rivers up to good condition.

It recognises that interested groups need to work together across boundaries to design and implement improvements, taking an integrated approach to managing the water environment.

A Strategic River Basin Management Plan (SRBMP) is required for a group of smaller river catchments that neighbour each other in a relatively distinct regional area. They give a measure of certainty about the future objectives for water management in the region.

Once approved the environmental objectives are legally binding. All public bodies, including the City Council, must comply with the river basin management plans when carrying out any plans or work affecting the water environment.

### **Land Drainage Act 1991**

The Land Drainage Act 1991 gave local authorities powers to act in certain circumstances to do work to prevent or mitigate the damage of flooding.

Consents are required from the LLFA for any works in or close to a watercourse that may impede the flow and increase flood risk. The potential flood risk needs to be assessed along with compliance with WFD requirements.

### **Highways Act 1980**

The Council as Highway Authority for the City has to keep roads passable for the usual traffic at any time of the year. It is not expected to remove an unlimited volume of water falling on it in exceptional weather.

### **Public Health Act 1936**

The riparian owner may be prosecuted for nuisance.

### **Climate Change Act 2008**

Requires a UK-wide Climate Change Risk Assessment every five years accompanied by a National Adaptation Programme that is also reviewed every five years. The Act



has given the Government powers to require public bodies and statutory organisations such as water companies to report on how they are adapting to climate change.

## Common Law

### Riparian Rights and Responsibilities

Link:

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

Owners of land or property next to a river, stream or ditch are a riparian owner and their rights and responsibilities have been developed through common law over many years. They can also be responsible for walls, culverts and weirs.

The Environment Agency booklet 'Living on the Edge' is a helpful guide. It provides information on who to contact for guidance on watercourses.

### Other

There are other legislative documents that can influence how surface water management is undertaken, see Appendix 1 for a list. They are wide ranging from the need to assist in managing wildlife by the Conservation of Habitats & Species Regulations (2010) through to managing flooding incidents as required by the Civil Contingencies Act 2004 (CCA).

## Policies, Plans and Strategies

The legislative framework has set out the need for a series of national, regional and local strategies.

In Central Government the Department of Environment Fisheries Food and Agriculture (DEFRA) sets out the National Flood and Coastal Erosion Risk Management Strategy. The Department for Communities and Local Government deals with Planning Policy and Building Regulations and the Cabinet Office with Emergency Response to flood incidents.

Regional strategies are found in Catchment Flood Management Plans prepared by the Environment Agency. The regional Local Resilience Forum prepare Multi-Agency Response Plans.

This Local Flood Risk Management Plan supports the joint Newcastle-Gateshead Core Strategy that provides local policies in the management of surface water on new developments.

### National Policies, Plans and Strategies

“Understanding the risks, empowering communities, building resilience - The national flood and coastal erosion risk management strategy for England” (September 2011)

Link: <https://www.gov.uk/government/publications/national-flood-and-coastal-erosion-risk-management-strategy-for-england>

It provides a national framework for managing all sources of flood and coastal erosion in a co-ordinated way and is central to the implementation of the FWMA2010.

It sets out three levels for roles and responsibilities for flood risk management:

- Policy and Strategic overview of flood risk management
- Planning risk management measures
- Implementing risk management measures

The measures proposed to achieve the strategic aims for managing flood risk are:

- Understanding flood risk and putting in place long-term plans to manage the risk and to make sure other plans take account of them.
- Avoid inappropriate development in areas of flood risk and to be careful to manage land elsewhere.

- Build, maintain and improve flood management infrastructure to reduce the risk of harm to people and damage to the economy, environment and society.
- Increase public awareness of flood risk that remains and engaging with people at risk to make their property more resilient
- To improve warnings of flooding, planning for a rapid response and promoting a faster recovery.

There are six guiding principles that will be used to achieve the strategic objectives:

- Community focus and partnership working
- A catchment cell based approach
- Sustainability
- Proportionate risk based approaches
- Multiple benefits
- Beneficiaries allowed and encouraged to invest in local risk management

### National Planning Policy Framework

Links:

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

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

<http://www.parliament.uk/documents/commons-vote-office/December%202014/18%20December/6.%20DCLG-sustainable-drainage-systems.pdf>.

This Framework sets out the Government's planning policies for England and how these are expected to be applied. It should be read alongside Planning Practice Guidance that provides more detailed guidance about the implementation of the National Planning Policy Framework (NPPF).

The NPPF seeks to avoid inappropriate development by directing it away from those areas at risk of flooding. It expects Local Plans to be supported by a Strategic Flood Risk Assessment and to develop policies to manage flood risk from all sources. This would take into account advice from the Environment Agency and other relevant risk management authorities, such as LLFA's.

When determining planning applications, Local Planning Authorities (LPA's) should ensure flood risk is not increased elsewhere. They may require a site-specific flood risk assessment when development is proposed in areas at risk of flooding.

The LLFA's are a Statutory Consultee for major planning applications where there is a surface water management aspect.

### Department for Transport

Transport resilience review (July 2014)

Link: <https://www.gov.uk/government/publications/transport-resilience-review-recommendations>

Government response: <https://www.gov.uk/government/publications/transport-resilience-review-governments-response>

Update: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/417406/transport-resilience-review.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/417406/transport-resilience-review.pdf)

The review was an independent study of all modes of transport and their ability to function in a wide range of extreme weather events. Progress on implementing its recommendations is being monitored by the Department for Transport.

### Local Highway Authority – Newcastle City Council

Well maintained highways

Sets out recommendations for highway authorities to consider in carrying out highway maintenance activities.

### Climate Change - National Adaptation Programme – Cities Commitment

Link to full document:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/209866/pb13942-nap-20130701.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209866/pb13942-nap-20130701.pdf)

As part of the 2013 National Adaptation Programme, Newcastle committed alongside England's seven other Core Cities to promote green and blue infrastructure in the context of spatial planning, flood risk management responsibility within local government and Local Nature Partnerships, integrated with the work of the sector-led Green Infrastructure Partnership.

### Flood Risk Management Plans

National guidance on the preparation of Flood Risk Management Plans has been provided by both the Environment Agency and the Local Government Association.

Links:

Environment Agency: <https://www.gov.uk/flood-risk-management-plans-what-they-are-and-whos-responsible-for-them>

<https://www.gov.uk/flood-risk-management-plans-frmps-how-to-prepare-them>

Local Government Association:

[http://www.local.gov.uk/c/document\\_library/get\\_file?uuid=ac7cd7c8-3388-4707-b4c2-10a7ab0f0940&groupId=10180](http://www.local.gov.uk/c/document_library/get_file?uuid=ac7cd7c8-3388-4707-b4c2-10a7ab0f0940&groupId=10180)

This strategy has focussed on the locally important issues from these two documents.

### Sustainable Drainage Systems

Links: <https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards>

<http://www.lasoo.org.uk/?publications=non-statutory-technical-standards-for-sustainable-drainage>

Non-statutory technical standards for sustainable drainage systems (March 2015)

This document sets out non-statutory technical standards for sustainable drainage systems that are required as part of the infrastructure for new developments.

Non-Statutory Technical Standards – Practice guidance has been prepared by Local Authority Suds Officer Organisation.

This guidance supports the Non Statutory guidance by providing explanation and clarification. It will be reviewed periodically to reflect best practice.

The Developer should consider drainage an integral part of the land acquisition due diligence process. It should be considered early in the development planning and design process, along with other key considerations such as:

- Layout
- Density
- Site access
- Topography
- Ground conditions
- Discharge destinations

Regional Policies, Plans and Strategies

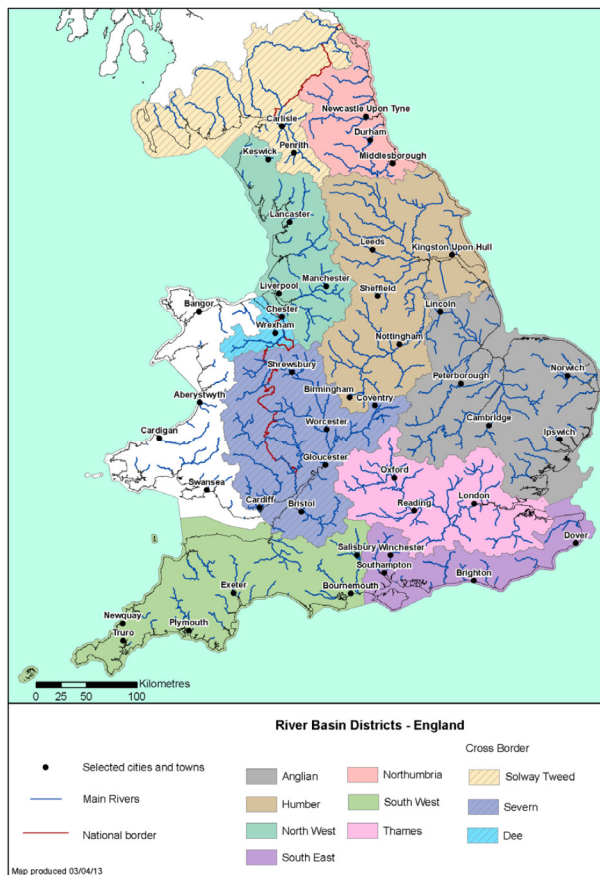
## Draft River Basin Management Plan for the Northumbria River Basin District 2014

Link for full document [https://consult.environment-agency.gov.uk/portal/ho/wfd/draft\\_plans/consult?pointId=s1405417943134#section-s1405417943134](https://consult.environment-agency.gov.uk/portal/ho/wfd/draft_plans/consult?pointId=s1405417943134#section-s1405417943134)

A river basin management plan is a strategic plan which gives everyone concerned with the river basin district a measure of certainty about the future objectives for water management in that district. The plans include environmental objectives for each body of water and a summary of the programme of measures necessary to reach those objectives.

The plans also focus on the objectives and actions for the most important and specially protected areas in the water environment, such as those which provide drinking water, opportunities for recreation, commercial fishing or which are sensitive to particular pressures.

Once approved by ministers, the environmental objectives are legally binding. All public bodies must have regard to the river basin management plans when exercising any functions affecting the water environment. The Environment Agency has a stronger duty to meet the objectives of the plans when it exercises its functions.



## Draft Northumbria River Basin Flood Risk Management Plan

- Link for full document: [https://consult.environment-agency.gov.uk/portal/ho/flood/draft\\_frm/consult?pointId=s1407245306889](https://consult.environment-agency.gov.uk/portal/ho/flood/draft_frm/consult?pointId=s1407245306889)

The strategic objectives are to manage the social, economic and environmental aspects of flood risk. They will be achieved by focussing on:

### **Social**

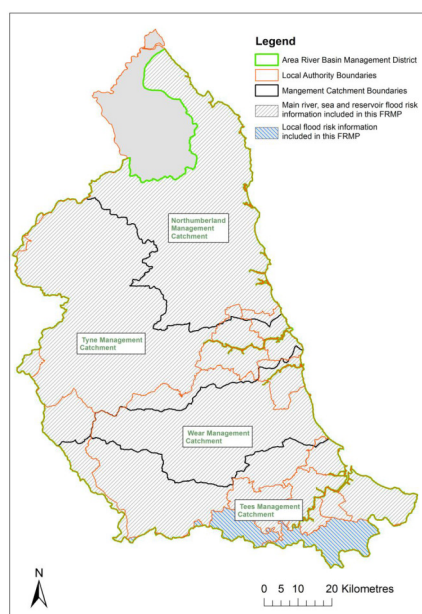
- Fewer people exposed to each category of flood hazard.
- Critical infrastructure to remain operational during flood events.
- Reduce the social impact of flooding on communities at risk.

### **Economic**

- Reducing direct economic flood damage to property and land.
- FRM expenditure to follow the level of flood risk in the catchment.

### **Environmental**

- Maintain and where possible improve the ecological function of designated sites through FRM activities.
- Allow river channel processes to operate naturally.
- No adverse impact on water quality as a result of flooding.
- Protect heritage sites from the effects of flooding and where possible use FRM activities to enhance the landscape.



## Managing flood risk, Tyne Catchment Flood Management Plan, policies and measures for managing flood risk Ouseburn Policy Unit Rev 2 February 2012

Link:

<http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCEQFjAA&url=http%3A%2F%2Fonecorestrategyng.limehouse.co.uk%2Ffile%2F2575763&ei=jo-eVealAoL4UrDQkcAB&usq=AFQjCNG5VCG39F8smNpm-gBpxFVsj20ORw&bvm=bv.96952980,d.d24>

The Tyne Catchment Flood Management plan was published in 2009 but by 2011 significant improvements had been made to our understanding of flood risk, particularly our understanding of surface water flooding. The introduction of the Flood and Water Management Act (2010) altered the roles and responsibilities for managing risk and emphasised the need for a local approach to managing risk.

In response to these changes the EA undertook a policy appraisal of the Lower Tyne Policy Unit in consultation with LLFA's. The opportunity was taken to update the list of measures needed to ensure flood risk from all sources is managed effectively over the next 50 to 100 years.

### **The Catchment was assessed and the preferred policy was:**

Policy Option 5 Take further action to reduce flood risk. The reasons for this were that it was the only policy option where the gains are shown to outweigh the losses. This policy is required to help manage risk more effectively within this Policy Unit reducing the risk to 1140 homes from fluvial flooding as well as other from SW flooding.



APPENDIX 1: CHARACTERISTICS OF THE POLICY UNIT

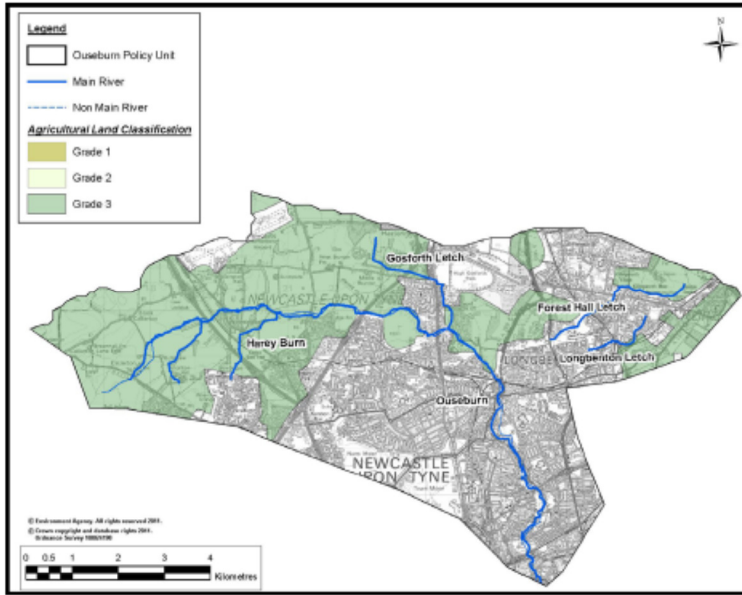


Figure 3: Physical characteristics of the policy unit

At the time the main driver for future fluvial flood risk within the policy unit was identified as climate change. It acknowledged that the projected increase in rainfall due to climate change was assumed to increase the surface water flood risk. The interaction between local drainage infrastructure, surface water and fluvial flooding would intensify.

## Local Policies, Plans, Strategies and Reports

Several local strategies and action plans have been prepared for and by the City Council. They all influence the way we intend to manage the risk of surface water flooding.

[Citywide Climate Change Strategy and Action Plan, 2010](#)

Link to  
[http://www.newcastle.gov.uk/sites/drupalncc.newcastle.gov.uk/files/wwwfileroot/environment-and-waste/citywide\\_climate\\_change\\_strategy\\_action\\_plan\\_october\\_2010\\_final.pdf](http://www.newcastle.gov.uk/sites/drupalncc.newcastle.gov.uk/files/wwwfileroot/environment-and-waste/citywide_climate_change_strategy_action_plan_october_2010_final.pdf)

The approach to managing flood risk in the City is closely linked to climate change and the way we intend to adapt to the changes and mitigate the impacts. The strategy aims to secure a long-term sustainable future for Newcastle, protecting us from climate change while maintaining economic prosperity.

### Water Cycle Study, 2010

This WCS was undertaken to give a high level review of potential future development against aspects of the water cycle, namely; water resources, water treatment and supply, wastewater, sewage treatment, flood risk and other environmental considerations. It informs long term planning, identifying where and when investment is required.

### Strategic Flood Risk Assessment Level 1, 2010

All local planning authorities are expected to carry out a strategic flood risk assessment (SFRA) to assess the risk to the area from flooding. It allows them to carry out a sequential test that will ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. The LPA has used the SFRA to support the [Core Strategy](#) and to help make planning decisions.

### Preliminary Flood Risk Assessment, 2011

Preliminary Flood Risk Assessment (PFRA) are the first of 4 stages in a 6 year planning cycle established by the Flood Risk Regulations 2009 to manage flood risk. LFA's are responsible for preparing the PFRAs and identified the flood risk areas.

They consider flooding from a variety of sources and an assessment of:

- floods that have taken place in the past and
- floods that could take place in the future

The PFRA identifies areas of significant flood risk that DEFRA assessed as areas within a square kilometre where more than 30,000 people live and were at risk.

The conclusion was that Newcastle did not have any areas at significant risk of flooding as defined by the Regulations. The main source of flooding was from localised surface water.

The PFRA was completed in 2011 and is programmed to be reviewed in 2017.

### **Strategic Flood Risk Assessment Level 2, 2011**

This was prepared to assess the flood risk for any sites in the Environment Agency Flood Zones 2 and 3 and to assist in the assessment of proposed development sites.

It identified Critical Drainage Areas (CDA's) where:

- There is an existing high risk of localised flooding from ordinary watercourses, including culverts surcharging and overland surface water flows and the potential for flooding from the sewer network due to failure/blockage or exceedance events when the storm return period is greater than the sewer design standard.
- Areas of significant redevelopment could have a significant impact on surface water runoff to local watercourses and the sewer network.

### **Newcastle-Gateshead Surface Water Management Plan, 2011**

This is a high level, strategic document which serves as a starting point to address the risk of surface water flooding across Gateshead and Newcastle.

It considered flood risk from surface runoff, groundwater and ordinary watercourses and the interaction with flooding from main rivers, the sea and sewers. Climate change and stakeholder views and preferences were also taken into account.

The work undertaken reviewed existing data to identify areas at risk of surface water flooding which have been called "hotspots. Eighteen were reviewed to evaluate potential means by which the risk of surface water flooding could be managed. These have been used as case studies from which to draw out surface water issues relevant to Gateshead and Newcastle.

It addresses the impact of new developments on drainage patterns and surface water flood risk but also considers areas with an existing risk of surface water flooding. The plan also provides a greater understanding of local flood risk and evidence to allow risk based decisions about sustainable surface water management in hotspot areas.

## Tyneside Sustainable Sewerage Study 2012

The urban sewer system collects wastewater from the north and south banks of the River Tyne and parts of south-east Northumberland. It conveys it to a single wastewater treatment works at Howdon, near the Tyne Tunnel, that serves a population of over 900,000.

The objective of the Study was to identify, and promote integrated sustainable drainage opportunities to be used by the partners to inform future planning across the region. It was informed by the fact that an urban drainage problem around flooding and pollution was best addressed by a shared response from all the relevant organisations.

Adopting a collaborative methodology helped a move towards an approach of shared responsibility in developing an understanding and addressing current and future sewerage issues. It aimed to provide a balance between good customer service, environmental needs and costs in addition to facilitating growth. The project steering group involved representatives of Northumbrian Water, the Consumer Council for Water, the Environment Agency and five LLFA's within Tyneside and Northumberland.

The group studied the impact of growth, urban creep and climate change on future urban drainage issues. A city-wide map of potential problem areas was generated by the project team sharing data on sewer capacity (from Northumbrian Water), population change (from the local authorities) and river flooding (the Environment Agency).

### Report into summer flooding 2012

The summer of 2012 was the wettest summer in 100 years, causing much of the grounds surface to become saturated with water. On 28 June 2012, "Thunder Thursday", 50mm rain fell in around 2 hours. For Newcastle, this was equivalent to the expected rainfall for the whole month of June. On the 5 August, 40mm rain fell in just an hour and a half. These events caused widespread, localised flooding across the city.

Due to the widespread nature of the flooding that occurred a survey was the most efficient way to collect data about what happened. Over 12,000 questionnaires were issued and almost 3,000 residents responded. Many residents also took the opportunity to contact the Council for advice and to send in photographs. From this information we are able to geographically map those areas where flooding was most widespread and severe.

The main findings were that:

- Around 500 properties suffered internal flooding to the house.
- In many other cases, gardens, driveways or garages were flooded.

- When flooding occurred, it happened very quickly. The majority within one hour.
- Externally flood water typically rose up to the level of air bricks.
- Many residents chose not to report the flooding in their street until the survey, but those who did had most often contacted the City Council.
- Many residents (66% of those who were flooded) were flooded for the first time.
- Around 200 properties that were flooded internally had been affected by flooding on previous occasions.
- One in every 5 residents whose property had been flooded internally had to move out of their property while repairs took place.
- Just under 80% of those residents whose property was flooded internally had insurance against flood damage.

This report formed our Section 19 FWMA investigation into the extensive flooding incident. It was used to prioritise areas for closer investigation with the intention of developing flood reduction schemes.

### **The Newburn Culvert Collapse and Citywide Flooding: A review of Extreme Events in Newcastle 2012 (2013)**

Link:

[http://www.newcastle.gov.uk/sites/drupalncc.newcastle.gov.uk/files/wwwfileroot/your-council-and-democracy/extreme\\_events\\_scrutiny\\_review.pdf](http://www.newcastle.gov.uk/sites/drupalncc.newcastle.gov.uk/files/wwwfileroot/your-council-and-democracy/extreme_events_scrutiny_review.pdf)

The report was prepared following an Overview and Scrutiny Committee review of the 2012 flooding and the collapse of the Newburn culvert.

It recognised that the City had responded well to dealing with the extreme events of 2012 but identified a number of areas for further improvement

### **Planning for the future, Core Strategy and Urban Core Plan for Gateshead and Newcastle upon Tyne 2010-2030**

The Plan sets out a clear framework for growth in Gateshead and Newcastle from 2010 to 2030 including the quantity and location of new housing, employment provision, shops, facilities and other services together with transport and other infrastructure provision.

Local authorities have a key role to play in local flood risk management so that flood risk is properly taken into account at all stages of the planning process, to avoid inappropriate development in areas at risk of flooding and to direct development away from the highest risk areas.

Newcastle LPA has considered flooding concerns in developing the Core Strategy and Urban Core Plan. They work alongside developers and other LLFA's to ensure that planning and drainage details are addressed and consider flood risk assessments submitted in support of planning application.

The Strategic Flood Risk Assessments (SFRA), and the Environment Agency's flood zone maps, identify areas at risk of flooding from all sources. Policy CS17 seeks to avoid flood risk to people and property where possible and manage flood risk through location, layout and design, taking into consideration the impacts of climate change as identified in the SFRA.

To assist in delivering Policy CS17, the Council has prepared a complimentary Flood Risk and Water Management Guidance Note, which sets out the local context and evidence base relating to flood risk and water management. The note will be subject to regular updating to ensure it remains current, as evidence on risk becomes more refined and in line with national requirements introduced through the Flood and Water Management Act 2010.

Howdon Sewage Treatment Works (STW) serves parts of the Local Authority areas of Newcastle, Gateshead, North Tyneside, South Tyneside and Northumberland. To ensure there is capacity to support growth, efforts will be made to separate surface water from the public foul sewerage system.

The Strategic Flood Risk Assessments (SFRA), and the Environment Agency's flood zone maps, identify areas at risk of flooding from all sources. Policy CS17 seeks to avoid flood risk to people and property where possible and manage flood risk through location, layout and design, taking into consideration the impacts of climate change as identified in the SFRA.

This should be at source wherever feasible. Policy CS17 sets the priority for the incorporation of Sustainable Drainage Systems (SuDS) into new developments to manage and minimise surface water. SuDS generally are landscaped facilities such as wetlands, retention ponds, soakaways, swales and/or permeable surfaces, the primary function being to reduce the volume and peak rates of water run-off from new development, but they should also fulfil their potential to provide new wildlife habitats and amenity spaces. SuDS can also improve water quality by increasing the filtration of pollutants, and thereby support the objectives of the Water Framework Directive.

There is further opportunity to combine flood alleviation, biodiversity and landscape enhancements in the upper reaches of the Ouseburn which will contribute to the protection and enhancement of the functional floodplain.

## Green Infrastructure and the Natural Environment

Link: <http://www.newcastle.gov.uk/planning-and-buildings/conservation-heritage-and-urban-design/conservation-and-urban-design/tree-strategy>

<http://www.newcastle.gov.uk/planning-and-buildings/trees-landscape-and-wildlife/wildlife-and-biodiversity>

The Core Strategy policy CS18 Green Infrastructure and the Natural Environment seeks to deliver a high quality and comprehensive framework of interconnected green infrastructure that offers ease of movement and an appealing natural environment for people and wildlife. This can be enhanced by surface water management features.

Green infrastructure includes, but is not limited to, wildlife sites, parks and gardens, areas of countryside, woodland and street trees, allotments and agricultural land, outdoor sports provision, local green spaces, footpaths, cycle and bridleways, areas of historic values, floodplains, ponds, lakes and watercourses. It can also include sustainable drainage systems that manage and convey surface water flows during extreme rainfall events.

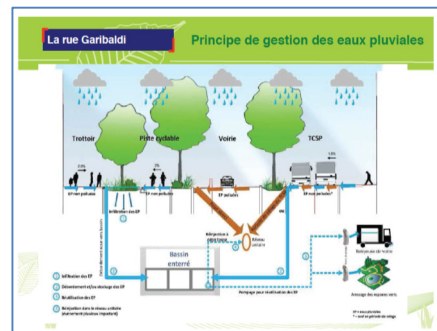
The Wild Life and Biodiversity Action Plan (2012) (BAP) is a ten year vision for the protection and enhancement of biodiversity in Newcastle & North Tyneside. The aim of the BAP is to ensure that we manage our natural environment more effectively to protect these natural resources and to leave a legacy that will benefit present and future generations.

In an urban context, they contain areas of open water, wetlands, rivers and watercourses providing semi-natural habitat and are extremely important in functioning as links and corridors for the movement of wildlife. Many have been physically modified, for instance by flood defence measures or flow regulation. This alters the patterns of sediment transport and nutrient exchange in river systems.



They have additional functions in an urban environment, which include conveyance of flood water, discharges from roads, industry and sewage treatment works, and provision of water for agriculture and industrial use and as a recreational resource. As a result, these functions need to be managed in association with their nature conservation interest, in order to protect and enhance the biodiversity resource. Although this plan is concerned with the channel and its associated habitats, it is also important that the impact of surrounding land use on watercourses is considered.

The concept that urban trees and the volume of soil in the planting pit under hard paving can assist in flood alleviation and prevention is well established. The City Council is continuing to develop its own design standards to help provide green infrastructure that can also help with water management. This approach has multiple benefits for the streetscape, water quality improvements and surface water management.



### Ouseburn Surface Water Management Plan, 2015

This plan has been prepared to align with the existing Core Strategy and the development of Strategic sites in the Ouseburn Catchment. It identifies and promotes sustainable surface water management opportunities within the catchment in order to:

- Reduce the risk to property and infrastructure whilst accommodating growth, urban creep and climate change.
- Contribute towards improving water quality in the catchment
- Contribute towards improved community health and wellbeing by promoting green/blue infrastructure in amenity areas
- Improve bio-diversity and habitat creation
- Identify alignments with other strategies, policies and plans to highlight opportunities for an integrated approach for surface water management planning going forward.

There are opportunities available but it requires co-operation and support from many stakeholders.

### City Centre Surface Water Management Plan, 2016

The City Centre is a complex mixture of interactions between land, terrain, buildings, highways, private drains, public sewers, watercourses and tidal rivers.

The need to accommodate future growth, climate change and urban creep without exacerbating existing flooding issues is a significant challenge. It may not always be practical or cost effective to continue to build systems with increased capacity and therefore it is necessary to find alternative ways of working if expected levels of service to the public and the environment are to continue.

This study was a platform for the development and application of robust methodologies to determine hydraulic risk based on current performance, interaction between drainage systems and future needs. Participants in the study included:

- Northumbrian Water (NW)
- Newcastle City Council (NCC)
- Environment Agency (EA)

The objectives were:

- Working in partnership with other drainage bodies to understand current and future drainage issues
- Establish, document and implement data share and communication protocols



- Promoting integrated sustainable drainage solutions  
Promoting 'best possible' service to the public balanced against environmental needs and cost.
- Providing risk based evidence to inform future business planning

The final report will be published in early 2016.

### Guidance on Sustainable Drainage 2016

Following the changes in national Planning Policy the regional LLFA's have begun to develop a guidance note on sustainable drainage and its implementation.

The City Council's LLFA and LPA have prepared local guidance to support that document.

### Highway Design and Adoption Standards 2015

These standards predate the introduction of recent guidance on flood risk management and policies on the future ownership and maintenance of sustainable drainage systems. That issue is under consideration at present.

### Groundwater (Early 2016)

An assessment of possible flood risk from groundwater sources was undertaken by Newcastle University for the City Council.

Information available from the British Geological Survey (BGS) indicates that Newcastle generally does not have a high risk of groundwater flooding, although areas on the edges of floodplains of the Tyne and tributaries are indicated to be susceptible.

Historical evidence indicates that there also areas at higher elevations across the City that have persistent localised seepages, and there are possible discharges from abandoned shallow mine workings, although these form only a small percentage (less than 3%) of the overall number of reported flood incidents in the Newcastle area (Newcastle City Council Preliminary Flood Risk Assessment, 2011).

The conclusions are that the reported problems are predominantly within the urban areas of the City, and are largely related to interactions between the built environment and subsurface water in various forms. Movement of subsurface water depends on understanding these complex pathways as well as the influence of below-ground barriers to groundwater movement such as basements and retaining walls. Impacts are felt as problems of dampness and seepage into basements, seepage of groundwater onto roads and pavements, and discharges from some mine workings.

Groundwater flood risk in Newcastle is currently classified as low in comparison to national guidelines, but individual locations have been shown to be affected by various factors. It is likely that groundwater flood risk may increase in general, due to

a combination of wetter winters and rising water levels in deeper mine workings, and this is most likely to affect areas of natural groundwater discharge (i.e. in low-lying areas in and adjacent to valleys).

Groundwater flood risk in other areas is more likely to be affected by the built environment, and should be assessed on a site by site basis.

### Tyne Catchment Plan, Tyne Rivers Trust (2012)

Links: <http://www.tynecatchment.org/wp-content/uploads/2012/05/Survey-final-report.pdf>

<http://www.tynecatchment.org/wp-content/uploads/2012/12/Tyne-Catchment-Plan-electronic-version.pdf>

The work of the Trust has **two main themes**, to:

- Conserve and restore river habitat, and adapt to / mitigate for the physical impacts of weather extremes and climate change
- Improve people's understanding of rivers, catchments, weather extremes and climate change.
- Increase community participation in monitoring change and taking action to improve and protect water environments.

The Trust's Plan identifies projects that will:

- deliver better rivers for people to enjoy and value
- increase community involvement in local decision-making about river issues
- engage and educate those who don't know the value and importance of rivers
- create robust and resilient environments which will cope with weather extremes and climate change
- make best use of the available resources, research and evidence in supporting work across the catchment to help deliver the targets set out in European legislation like the Water Framework Directive and the Habitats Directive.

### Ouseburn Evidence and Measures Project, Tyne Rivers Trust (December 2015)

Link <http://www.tynecatchment.org/wp-content/uploads/2015/09/AF026-Ouseburn-BN-OR-v13.pdf>

This study looked into the reasons why the Ouseburn currently fails to meet EU Water Framework Directive (WFD) water quality targets for Good Status, due to high phosphate levels which impact on the river's ecological health (invertebrates, fish and diatoms).

There were multiple suspected causes of pollution which contributes to poor water quality. These include agricultural sources, golf courses, sewage discharge, and sewer misconnections.

The variety of potential pollution sources and their dispersed nature means the Ouseburn is perceived as a complex and challenging waterbody which is very difficult to address.

Water quality and drainage pressures on the catchment are expected to increase, with over 6000 new homes planned and around 130 ha (1.3 km<sup>2</sup>) of business developments proposed by 2030.

Three principal areas of action were identified:

- Engage with rural land managers and carry out follow-up investigations and joint-agency work around manure and nutrient management.
- Assessments of stream bed sediments and field soils in specific rural locations and priority tributaries.
- Investigations at specific locations for industrial and domestic sewer misconnections when identified, together with increased monitoring and new continuous water quality monitoring locations.
- A strategic approach between Local Authorities, the Environment Agency and Northumbrian Water towards development sites in the Ouseburn catchment.

### Blue Green Cities Project (Summer 2016)

Link: <http://www.bluegreencities.ac.uk/bluegreencities/index.aspx>

This is a national project that has chosen Newcastle upon Tyne as a Demonstration City. The project aims to recreate a naturally-oriented water cycle while contributing to the amenity of the City by bringing water management and green infrastructure together. This is achieved by combining and protecting the hydrological and ecological values of the urban landscape while providing resilient and adaptive measures to deal with flood events. Blue-Green Cities generates a multitude of environmental, ecological, socio-cultural and economic benefits. The innovative Blue-Green approach

to water management in the City aims to satisfy the demands of urban drainage and planning via coherent and integrated strategies, and places value on the connection and interaction between blue and green assets.

One strand of the project was to establish a Learning and Action Alliance in the City. Typically they are an open arrangement where participants create a joint understanding of a problem and its possible solutions based on rational criticism and coherence through discussion. They operate in an atmosphere of trust and mutual ownership and facilitate the identification of innovative ideas for the solution of complex problems outside the constraints of existing formal institutional settings. They can help develop a vision, in this case, the Blue-Green Vision for the City of Newcastle, and ideas are then presented in formal inter-organisational decision-making processes.

The objective is to develop a Blue-Green vision for the City of Newcastle, including strategies for flood risk management that are integrated with city planning, economic growth and urban green infrastructure development, and that create a multitude of environmental, socio-cultural and economic benefits. Ultimately, to define the desirable state for Newcastle, assess the problems and solutions, and mainstream ideas into political/policy frameworks for potential implementation.



The outcomes will vary depending on the vision of the group but all individuals/organisations will have the opportunity to network with other stakeholders (including those that they may not normally engage with), learn from discussions (and freely contribute to discussions outside of their professional remit) and benefit from data, information and contact sharing. We are at the start of a journey to build trust between partners to enable the building of a vision for the City of Newcastle.

## Mayors Adapt

The City is a member of Mayors Adapt, the European Commission's initiative on preparing for the impact of climate change. Membership commits the City to assess the risks posed by climate change, and identify, assess, prioritise and implement local adaptation actions.

These can be either through development of an adaptation strategy, or by embedding consideration of climate change within key policies and plans. The City is then required to monitor and evaluate progress and report progress every two years to the Commission.

### Development Management

The Local Planning Authority (LPA) deals with individual planning applications for development. By following the NPPF and Core Strategy policies they encourage sustainable drainage and ensure that any development does not increase flood risk elsewhere.

If appropriate they will consult the Environment Agency, Northumbria Water. The LLFA is a statutory consultee for major applications with a surface water aspect to them.

A major development is defined as one with:

- 10 or more dwellings
- With a development area greater than 0.5Ha or over
- Office/light or general industrial or retail development with a floor area greater than 1000 sq m or covering a development area greater than 1.0 Ha
- Gypsy/traveller site with 10 or more pitches

Minor developments (up to a maximum of 10 dwellings or 1,000m<sup>2</sup> of non-residential property) should still provide sufficient detail on surface water management and the use of SuDs must be prioritised. This should be based on the nature of development.

Minor development is defined as any development below these numbers or areas and including

- Other Development
- Householder applications
- Change of Use (no operational development)
- Adverts
- Listed building extensions/alterations
- Listed building demolition
- Application to demolish an unlisted building within a Conservation Area
- Certificates of Lawfulness

### Partnership with Local Planning Authority

There has been co-operation over flood management and sustainable drainage related issues and this will need to continue now the planning process uses the LLFA as a statutory consultee. There are multi-disciplinary teams working together on the

strategic development sites around the City. The LLFA will attend meetings and assist the LPA in the preparation of Supplementary Planning Documents and other complimentary documents.

#### Duty to Cooperate

The duty of Local Authorities and Risk Management Authorities to cooperate in relation to the planning of sustainable development and the exercise of their flood risk management functions appears across several acts of parliament and legislation, such as the Localism Act 2011, the Planning and Compulsory Purchase Act 2004, the Flood and Water Management Act 2010 and the National Planning Policy Framework. As stated in the National Planning Policy Framework, public bodies have a duty to cooperate on planning issues that cross administrative boundaries. This particularly highlights strategic priorities such as infrastructure for flood risk and climate change mitigation.

The desired outcome of this co-operation is the development of a robust approach to data collection and the use of evidence, flood risk management, investigation, infrastructure provision and the adoption and maintenance of SuDS. This should lead to the implementation of a co-ordinated approach for developing planning policy in relation to flood risk management.

CONSULTATION

## Civil Contingencies and Community Resilience

### Civil Contingencies Act 2004

This aims to deliver a single framework for civil protection in the UK. The Act is separated into 2 substantive parts: local arrangements for civil protection (Part 1); and emergency powers (Part 2).

Newcastle City Council is at the core of the response to most emergencies and is defined under the act as a Category 1 responder.

Under this legislation the City Council have a legal obligation to:

- assess the risk of emergencies occurring and use this to inform contingency planning
- put in place emergency plans
- put in place business continuity management arrangements for Newcastle City Council
- put in place arrangements to make information available to the public about civil protection matters and maintain arrangements to warn, inform and advise the public in the event of an emergency
- share information with other local responders to enhance co-ordination
- co-operate with other local responders to enhance co-ordination and efficiency
- provide advice and assistance to businesses and voluntary organisations about business continuity management (Local Authorities only)

The Act divides local responders into two categories, imposing a different set of duties on each. Category 1 responder include; local authorities, emergency services, NHS, Port Health Authorities and the Environment Agency. Category 2 responders include utility companies, transport companies and the Health and Safety Executive. The Act also states that where appropriate Category 1 & 2 responders should involve voluntary organisations.

Category 1 and 2 organisations come together under Local Resilience Forums (LRF's) based on police force areas. The Northumbria LRF is the principle mechanism for multi-agency co-operation on civil protection issues between responders at the local level.

The Council's Resilience Team manages the requirements of the CCA by working with the LRF to provide:



- A Community Risk Register which includes a number of predefined flood risks that includes coastal, river and surface water flooding.
- Information to the emergency services about the flood risk at high risk pinch points on the road network.
- A tactical level flood plan that covers the whole of the LRF area.

Within the City Council the team co-ordinate the:

- distribution of weather warnings internally throughout the City Council
- respond to major flooding events in conjunction with the cities Major Incident Team
- preparation of the local Flood Plan for the City

#### National Flood Emergency Framework for England DEFRA December 2014

This Framework sets out the government's strategic approach for organisations involved in planning for and responding to flooding from:

- the sea;
- rivers;
- surface water;
- groundwater;
- reservoirs;
- artificial waterways and canals

The purpose of the Framework is to:

- ensure operating authorities (i.e. Environment Agency, Lead Local Flood Authorities, Highway Authorities, Water and Sewerage Companies) and delivery bodies understand their respective roles and responsibilities;
- give all organisations involved in an emergency flooding situation a common point of reference - bringing together information, guidance and key policies in a single planning document;
- establish clear thresholds for emergency response arrangements;
- place proper emphasis on the multi-agency approach to managing flooding events;
- provide clarity on the means of improving resilience and minimising the impact of flooding events;
- provide a basis for individual responders to develop and review their own plans;
- be a long term asset that will provide the basis for continuous improvement in flood emergency management.

## Detailed Guidance on Developing a Multi-Agency Flood Plan June 2011

For many parts of England flooding poses a significant risk and it is well recognised within many Community Risk Registers. LRF's are encouraged to develop a specific flood plan to complement other plans and provide more detail to generic Major Incident Plans or Strategic Emergency Response Plans.

The reason for having a specific flood plan is because of the complex and diverse nature of flooding and the consequences that arise, requiring a comprehensive and often sustained response from a wide range of organisations. This guidance is therefore geared toward helping LRFs to collectively develop a Multi-Agency Flood Plan (MAFP).

### Flood Incident Management Plan

It has six key customer focused outcomes that the EA aim to achieve by 2020 by:

- making people being aware of their risk and the impact.
- having plans in place to trigger actions when a flood occurs.
- giving people warning in good time to take action.
- keeping people and responders informed throughout periods of flooding
- Increasing the effectiveness of response and help to aid recovery.
- Providing an efficient Flood Incident Management Service.

### Flooding in England: Lead Government Department Plan January 2015

**Link:**

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/399931/pb14297-flood-lead-department-plan.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/399931/pb14297-flood-lead-department-plan.pdf)

This Lead Government Department Plan is designed primarily for use by Defra staff involved in flood emergency planning and those who would be involved in the response to a flooding incident. But it will also help others involved in flood emergency planning and response arrangements to design their own internal processes to fit with those of Defra.

## Data Management

### Statutory Guidance

The Flood and Water Management Act 2010 identified a new duty for risk management authorities to co-operate with each other. Working together we can achieve more effective results than working alone. Both the LLFA's and the EA have powers to request information from other parties about their flood and coastal erosion risk management functions.

### Available Data

There are many sources of data that can be used to provide information to the LLFA about its flood risk management function, a detailed list of known sources is provided in Appendix 7.

The sewer records held by Northumbrian Water contain useful information for both the LLFA and LHA to carry out their responsibilities and work.

The Environment Agency GeoStore has publicly accessible data that assists in developing an overall picture of flood risk in the City. As and when updates or new data becomes available it will be acquired.

## Co-operation

Co-operation involves organisations and individuals meeting together to exchange experience and knowledge, see Appendix 5.

## Asset Register

To comply with Section 21 of FWMA a lead local flood authority must establish and maintain a register of structures or features which, in its opinion are likely to have a significant effect on a flood risk in its area and a record of information about each of those structures or features, including information about ownership and state of repair.

# WHERE ARE WE GOING

CONSULTATION

CONSULTATION

## WHAT HAPPENS NOW?

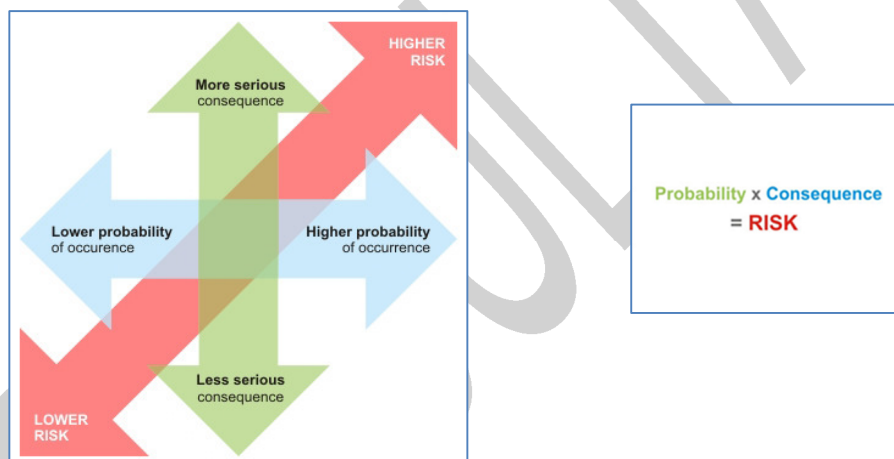
### What is a flood?

A flood is defined as occurring when land not normally covered by water becomes covered by it (FWMA2010). This can happen due to a variety of reasons including heavy rainfall or a river overflowing. It does not include flooding from a sewer system unless that's due to heavy rain or a burst water main.

### What is flood risk?

Flood risk is made up of a combination of the consequence and probability of flooding. We can manage it by reducing either the consequence or the probability of flooding occurring.

Probability of flooding is the chance of a flood occurring in a location during a period of time. In the past engineers have measured the risk statistically by using return periods. For example a rainstorm described as having a 1 in 40 year return period means the rain that fell was expected to occur on average once every 40 years.



In a period of climate change with limited certainty about the future this is not a good way to describe risk. Probability has been described in a variety of ways, currently it is being expressed as a percentage i.e. 1% meaning there is a 1 in 100 chance of a flood occurring in a year. This is seen as being much easier to understand.

In simple terms the descriptions indicate the volume of surface water that needs to be managed and designed for. A storm with a one in 40 chance of occurring is more frequent than a storm with a one in 100 chance of occurring. The one in 40 will bring less rain than a one in 100 storm. A greater storm could occur and defences will overtop causing flooding. There is never any certainty that a particular location with defences will not be flooded under certain circumstances.

It doesn't matter how it is measured the risk of a flood occurring is there all the time.

The Environment Agency has prepared maps showing the areas at risk of flooding from several causes. The areas are identified using predicted water levels and take the location, type and condition of any flood defences and ground levels into account, whether or not they are currently shown on the Flood Map.

Link: <https://www.gov.uk/prepare-for-a-flood>

The maps are only a guide to the extent of flooding. Flooding is influenced by many variables including where a rainstorm occurs, the characteristics of the drainage catchment, Variations in rain over a wide area, how wet the ground is already and if the rivers are full from a previous storm.

CONSULTATION

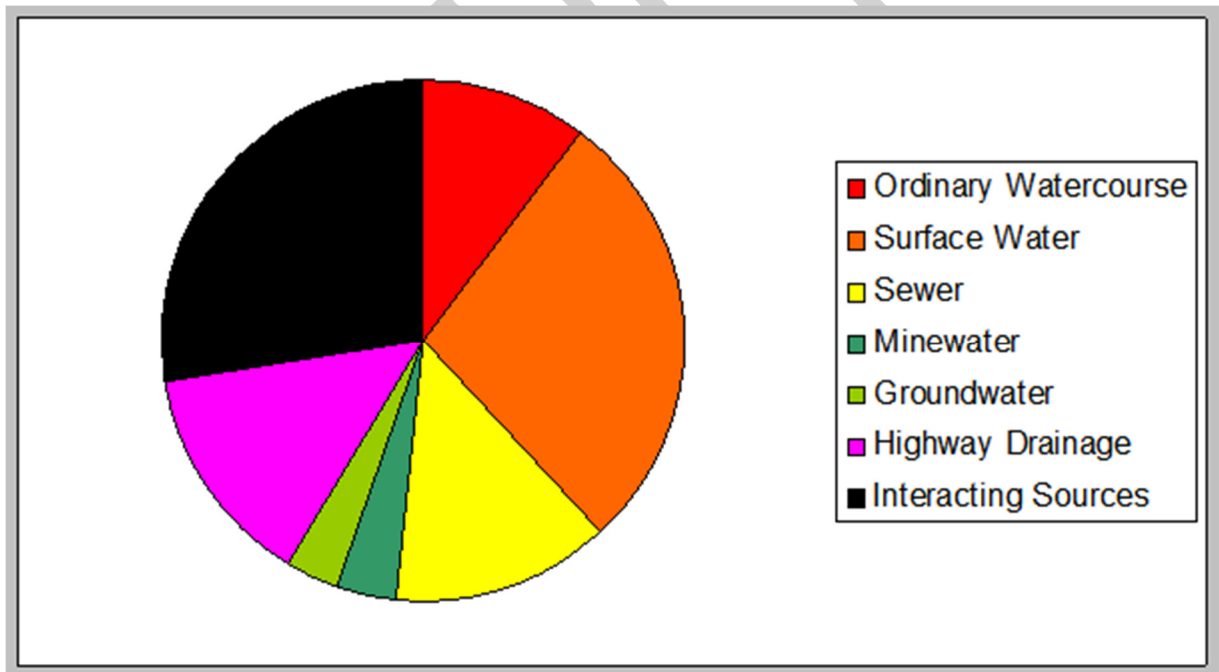
## What are the existing causes of flooding in Newcastle?

The Preliminary Flood Risk Assessment (2011) included a survey of historic flood data based on 29 records of flooding over three major flood events in 2000, 2005 and 2008.

It identified the main cause of flooding to be surface water moving overland linked to incapacity in highway drainage and sewers and the interaction of those systems with main rivers and ordinary watercourses.

The diagram below shows the relative importance of each cause:

- Surface water and interacting sources each account for 23.2%
- Sewer and highway drainage follow, being responsible for 11.6% each.
- Ordinary watercourses are 8.7%,
- Groundwater and minewater are both 2.9%





## Detailed Investigations

Link: <http://www.newcastle.gov.uk/environment-and-waste/climate-change-and-energy-saving/flood-management-in-newcastle/summer-2012-flooding-report>

[http://www.newcastle.gov.uk/sites/drupalncc.newcastle.gov.uk/files/wwwfileroot/your-council-and-democracy/extreme\\_events\\_scrutiny\\_review.pdf](http://www.newcastle.gov.uk/sites/drupalncc.newcastle.gov.uk/files/wwwfileroot/your-council-and-democracy/extreme_events_scrutiny_review.pdf)

The “Thunder Thursday” event on 28 June 2012 was estimated to be about a 1 in 100 chance (1%) rainstorm. That summer the City Council issued 13,000 questionnaires to residents in streets reported as being affected by flooding. The data collected was summarised in the Summer 2012 Flooding Report and provided a detailed assessment on the impact of the severe storm on the City.

The primary source of the flooding identified by residents during the 2012 events was runoff from roads, followed by flooding from manholes and runoff from playing fields or other grassed areas. Very few residents indicated streams or burns as contributing to the source of the flooding.

This confirms that surface water, especially when rain falls on saturated ground, remains one of the main causes of flooding in the City. It results in the drainage networks being overwhelmed and unmanaged flows runs over the surface of the ground. Any drainage network has a limited capacity to deal with extreme rain.

Earlier in 2012 the collapsed culvert at Newburn also highlighted the need for more detailed understanding of culverts and their condition. Many of them are in multiple ownerships with each owner having riparian ownership rights and responsibilities. The impact and response to this particular collapse was investigated in the Scrutiny Committee report of 2013.

## Environment Agency Hydrology report

Link:

<https://www.whatdotheyknow.com/request/150881/response/363901/attach/5/June%2028%202012%20Tyne%20Flood%20Hydrology%20Report.pdf>

During a short space of time on June 28 2012 – “Thunder Thursday” - up to 2 inches (50mm) of rain fell with a peak intensity that matched many notable flash floods. Return periods for the short duration rainfall were in excess of 100 years at Whitley Bay and Jesmond Dene and several rain gauges recorded totals with a return period over 50 years.

One of the most noteworthy characteristics of this event was the rapid rise experienced in some of the more urban watercourses. The Ouseburn at Crag Hall rose one metre in an hour.

The ensuing surface water flooding brought traffic chaos to the City Centre and all major routes around Tyneside.

### Response to 2012 flooding incidents

Immediately following the 28 June event in 2012 the City adopted a risk based approach to our priorities and this was to:

- Identify culverts with low risk but high impact potential.
- Improve the resilience of the highway network
- Protect public buildings
- Where the opportunity arises protect private property as an additional benefit on any of these.

All recorded incidents were listed and prioritised using the scoring system in Appendix 10.

A priority group of five detailed investigations were carried out as funding became available and a second group of nine studies followed to ensure we began to identify potential schemes to manage flood risk, see Appendix [13](#).

Opportunistic schemes have occurred by working in partnership with Northumbrian Water. Where practical we aim to improve highway drainage in areas where they are carrying out surface water sewer improvements.

The updated Map for Surface Water Flooding (uMfSWF) December 2013 is the best estimate of the flood risk across the City. When compared with the actual flood incidents from the 2012 events there remains a mis-match in some areas.

The table in Appendix 11 shows the estimated number of properties at risk from surface water flooding as well as those from river and/or tidal flooding.

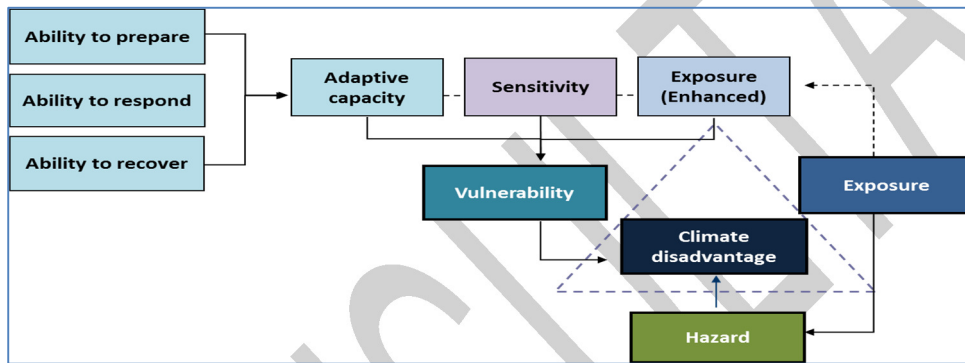
### Impacts on community

Flooding has the potential to disproportionately affect certain sections of society, based on their surrounding built environment, personal factors which affect individual sensitivity to being affected by flooding (such as age or health conditions), and factors such as income or access to insurance which affect people’s ability to prepare for, respond to, and recover from, extreme weather events.

The Joseph Rowntree Foundation and University of Manchester have developed a framework which groups these factors and evaluates them alongside exposure to extreme weather events, to show overall disadvantage.

Link: [http://www.climatejust.org.uk/sites/default/files/Case\\_Study\\_Newcastle%20City%20Council%20-%20Final%20-%204%20December%202014.pdf](http://www.climatejust.org.uk/sites/default/files/Case_Study_Newcastle%20City%20Council%20-%20Final%20-%204%20December%202014.pdf)

Figure 2.2-1 JRF/ University of Manchester climate disadvantage framework

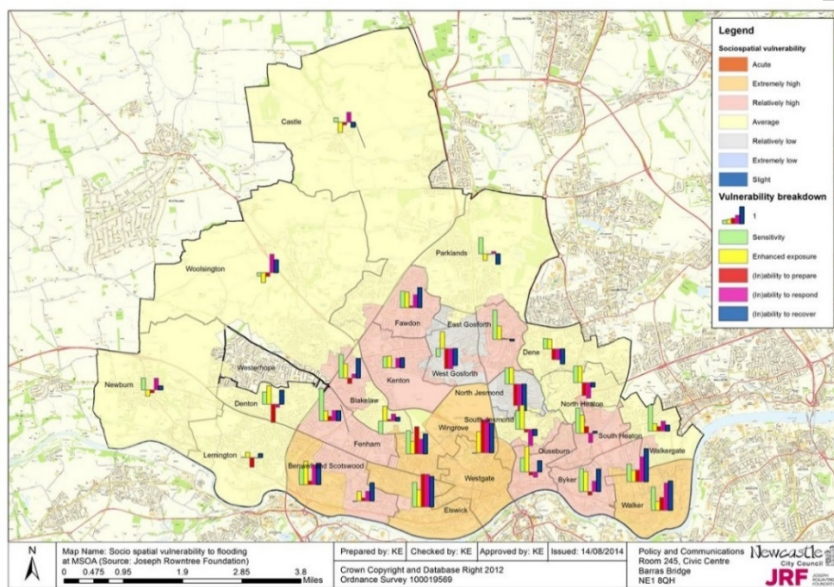


Social factors: Adaptive capacity (prepare/respond/recover)	Personal factors: Sensitivity	Environmental factors: Enhanced exposure
Low income	Age (very young & elderly)	Neighbourhood characteristics (green/blue space)
Tenure: ability to modify living environment	Health status: illness	Housing characteristics: (e.g basement/ high rise/ single storey buildings)
Mobility and access to services	Special care	Buildings
Social isolation	Homeless, tourists, transient groups	High housing density
Information and local knowledge		

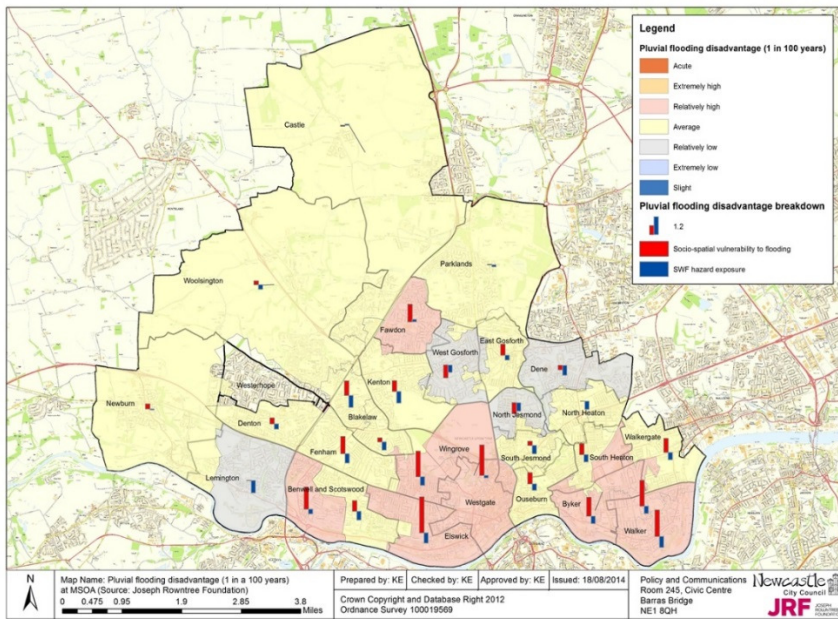
Access to insurance		
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Table 2.2-1: Factors driving vulnerability to flooding

The map below breaks down the social vulnerability to flooding in Newcastle into categories of enhanced exposure, sensitivity, and the ability to prepare, respond and recover. These show that social vulnerability to flooding is driven by different factors across the City, with varying levels of personal sensitivity, exposure and adaptive capacity.



Social vulnerability is an important consideration when developing flood risk responses to ensure that those who are most vulnerable are not disproportionately affected by flooding. The map below shows how exposure to a 1 in a 100 year surface water flooding event combines with underlying social vulnerability to produce a varying map of disadvantage. The red and blue bars show how the overall risk level has been determined, in comparison to the national rankings.



## Regional Impact on Transport

There were considerable delays on the road network, commuter trips were increased to hours in some cases. This would have had an effect on the economic life of the region. National links were lost on the rail and road networks. Locally the Metro system was disrupted.

With effort from the organisations involved, delays were minimised and in many cases back to normal the following morning.

## Future flood risk

It is difficult to assess the relationship between general climate change projections and weather patterns. Looking at uplifts of duration and intensity of rainfall based on UKCP09 predictions is a useful proxy for this. All the risk management authorities are working to consider the implications of climate change in more detail. Findings from these projects will be incorporated into the future revision of the PFRA and this Strategy, as more detail becomes available.

[http://www.thebiggreenpledge.org.uk/sites/www.thebiggreenpledge.org.uk/files/Adaptation\\_research/UKCP09%20Climate%20Projections%20for%20Newcastle%20upon%20Tyne.pdf](http://www.thebiggreenpledge.org.uk/sites/www.thebiggreenpledge.org.uk/files/Adaptation_research/UKCP09%20Climate%20Projections%20for%20Newcastle%20upon%20Tyne.pdf)

## Climate Change

## How will Climate Change affect Flood Risk in Newcastle?

There is clear scientific evidence that the world's climate is changing and it is expected to affect temperature and precipitation levels in the UK. The most accurate and up to date predictions for climate change are from the United Kingdom Climate Predictions 2009. The predictions allow users to explore a range of potential emissions Intergovernmental Panel on Climate Change (IPCC) scenarios (low, medium or high), over a range of probabilities.

For the purposes of this strategy, we have considered climate change projections up to 2080 in Newcastle, the range of scenarios are set out below:

Climate change over time will affect the frequency and intensity of rainfall events, see link above and Appendix XX.

### In winter months:

- the heavy rainfall events become more frequent (i.e. the future return period is smaller than the present day return period)
- biggest change is projected to occur between the present day and the 2040s.

### In summer months the situation is less clear:

- Summer rainfall extremes could either increase in frequency or decrease.
- The potential for a "Toon Monsoon"/"Thunder Thursday" event will still remain.
- For the 1 in 100 chance event, the uncertainty means that by the 2080s such an event could occur with a probability between 1 in 20 (more frequent) and 1 in 140 (less frequent).

### Sea level rises:

- will begin to affect riverside locations along the river frontage running from Low Walker upstream to Newburn.
- Main area of concern within the City is the Quayside area where an area around the Swing Bridge is already affected by Spring Tides.

## Impact on Flood Risk Management

It is anticipated that future climate change will put increasing pressure on flood management in the City. There will be a cost to the region if transport links are out of use and trips and deliveries delayed. Local Authorities will have to identify resources to deal with the initial incident. Those same resources may be involved in carrying out

repairs to networks. This has a delaying affect on planned works. The impact of any single event is extensive and costly.

The City will have to adapt to higher precipitation levels and more intense rainfall events that will put current drainage systems under more strain and increase the risk of surface water flooding.

In this context, a range of solutions from the catchment to the individual property scale will be appropriate, and will need to employ both hard and soft engineering approaches, such as use of Green Infrastructure. These will be in addition to policies and programmes for new and existing development.

The framework to be used in the design of projects to reduce flood risk will follow the guidance in NPPF and Planning Practice Guidance for Sustainable Drainage and Climate Change and follow adaptive pathways – this means that they will plan for a certain amount of climate change as is considered economically viable, but will allow for upgrades in the future.

This situation will need to be monitored and managed to ensure the City remains resilient to the impact of climate change and can remain functioning regardless of transport, employment, etc

## How do we assess flood risk?

Link: <https://www.gov.uk/.../system/.../pb13546-swmp-guidance-100319.pdf>

<https://www.gov.uk/.../pb13546-swmp-guidance-annex-100319.pdf>

The source – pathway – receptor (SPR) concept provides a useful basis for considering the assessment and management of local flood risk and its consequences.

Term	Description
<b>Sources - What causes the flooding?</b>	physical conditions or load on the system (such as rainfall, river and coastal water levels) that create the risk.
<b>Pathways - How does it move across the ground?</b>	provide the routes for flood water to pass to receptors and are divided into three key groups: <ul style="list-style-type: none"> <li>• above-ground/major system (surface topography, watercourses and drainage channels or roads);</li> <li>• below-ground/minor system (sewer networks and highway drains);</li> <li>• “interface” assets that control transfers of flow between the two systems.</li> </ul>
<b>Receptors - What does the water affect?</b>	the properties, people, infrastructure assets and environmentally or culturally significant sites in the floodplain which are at risk of flooding.
<b>Consequences – What is the result?</b>	Either a flooding incident develops or with mitigation the water is directed to rivers and the sea without causing damage.

In urban areas a formal distinction between a source and a pathway is not always clear. There are often multiple sources, pathways and receptors linked to local flood risk in a specific location. It will depend on the level of detail considered and what has happened during a flooding incident.

Part of the risk is related to the consequences receptors suffer; the economic, social, environmental or cultural impacts that may result from a flood. Consequences can be



expressed in monetary terms or using other measurements such as counting numbers of properties, lengths of road or areas of agricultural land affected by flooding.

Decisions on the inclusion of particular flood source, mechanisms and mitigation measures (such as flood defence structures or sustainable drainage systems) can be tailored according to local requirements.

This is often referred to as pluvial flooding and is defined as being caused by extreme rainfall and results in flash flooding. Heavy rain fall can generate surface water run-off beyond the capacity of the local drainage or watercourse network. Surface water is unable to enter the sewerage system and it begins to flow overland. Watercourses are affected by these overland flows and discharges from the sewer network and in turn their capacity may be exceeded. The consequence is flooding to land, infrastructure and homes.

All of the City's Tyne river frontage, and it is tidal rather than fluvial flooding, is the greatest risk. The boundary between Newcastle and North Tyneside is about 8.5km upstream of the river mouth at Tynemouth. The Quayside is about 16km and the limit at Wylam about 32km.

Although there are several dams in the catchment, for example Kielder and Derwent Reservoirs, they represent a very small percentage of the land area and do not have a significant effect on high flows. For example the highest recorded flows on the Tyne were in 1995, 2005, 2015 – all after development of the Kielder dam.

## Local and Significant Flood Risk

### Datasets

There are a number of data sources which can be used for assessing the risk of flooding in Newcastle and these are listed in Appendix 8(?).

We believe the latest mapping provided by the EA in December 2013 combined with the detailed records of the 2012 events give a good indication of the extent of surface water flood risk in the City. This mix of prediction along with actual flood events is some of the best data available.

The EA mapping for risk of flooding from Rivers and the Sea gives a good indication of flooding adjacent to the main and ordinary rivers within in the City boundary. These are the River Tyne and its tributary the Ouseburn. Harey Dene and Gosforth Letch are tributaries of the Ouseburn.

Historic watercourses, now lost because they are included in the sewer network or built over, have been identified and mapped where evidence of their existence is available. Modern street levels may still slope towards the location of these historic watercourses.

Link:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/316280/Local\\_flood\\_risk\\_assessment\\_-\\_project\\_report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/316280/Local_flood_risk_assessment_-_project_report.pdf)

The nationally produced surface water flood mapping only indicates where surface water flooding could occur. It is based on the flooding that takes place from the 'surface runoff' generated by rainwater (including snow and other precipitation) which:

- (a) is on the surface of the ground (whether or not it is moving),
- (b) has not yet entered a watercourse, drainage system or public sewer.(FWMA2010).

It does not fully represent flooding that occurs solely from groundwater or drainage systems or public sewers during catchment-wide rainfall events.

### Defining Local Significant Flood Risk

If the LLFA has a flood reported to it the FWMA2010 requires them to decide if it is necessary or appropriate to investigate the incident and to answer two specific questions:

- a) which risk management authorities have relevant flood risk management functions,

(b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.

If it is decided to carry out an investigation then the LLFA must publish the results and notify any relevant RMA's.

It is important to establish what flood events the LLFA will be expected to investigate.

A starting point is to establish guidelines on what is a significant flood risk. A proposed definition is:

#### Flood Investigation framework

1. A flood occurs and is present for some time with no known source.
2. Any property experiences internal flooding.
3. A single property experiences repeated internal flooding within 5 years of the initial flooding.
4. A single commercial property experiences internal flooding or a single commercial property greater than 500m<sup>2</sup> floor area experiences internal flooding.
5. One or more items of critical infrastructure experience flooding.
6. A transport link is impassable for at least:
  - a. 2 hours - Strategic transport routes
  - b. 6 hours – Minor less important transport routes
  - c. 10 hours –other local roads and other locations
7. The LLFA consider that an investigation is required.
8. The investigation is carried out and recorded.
9. The findings are published on our website.

The investigation will be carried out in an appropriate way depending on the size of the incident and resources available to the LLFA. For example the 2012 flooding event resulted in flooding in over 150 streets. To allow them to be investigated in an efficient way the LLFA commissioned an extensive questionnaire survey. Other incidents may

be one visit to talk to a resident or business owner. The LLFA has no power to force another RMA to take action.

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## Scheme Assessment and funding

It is important to be sure that any particular scheme has been appraised to ensure it will deliver its objectives effectively. The EA guidance on appraisal of projects is shown as an example. Other funding sources, such as the EU, will require different information. The systems are there to identify that the funding will be spent in a way that complies with appropriate legislation, strategies and plans and for the benefit of the communities around them.

## Flood and Coastal Erosion Risk Management appraisal guidance

March 2010

Link: <http://webarchive.nationalarchives.gov.uk/20131108051347/http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/geho0310bsdb-e-e.pdf>

The guidance describes how to undertake an appraisal and aims to help users undertake them efficiently. It encourages experience and knowledge to be applied at all stages. The design is based on the following key principles, to help people involved in flood risk management to:

- undertake appraisals that reduce the threat to people and their property and deliver the greatest environmental, social and economic benefits in line with the Government's sustainable development principles;
- engage through an open and transparent process with those affected by flooding, erosion or their management activities to enable full account to be taken of social, environmental and economic issues and to build trust with local communities;
- identify what level of information and effort is needed. The guidance recognises that proportionality is needed in the effort expended on addressing uncertainty within appraisals;
- identify and assess solutions that could provide benefits wider than just those associated with managing the risk of flooding or erosion;
- identify who benefits and who loses from a particular solution and where contributions could fund delivery;
- promote approaches which reflect both national and local priorities;
- identify and assess sustainable, adaptable and flexible solutions that work with natural processes;

- understand how change (including climate change) could affect future flood and erosion risk and how to identify and appraise options that enable adaptation to changing risk;
- promote partnership working to deliver wider benefits.

#### Funding for Flood Risk Reduction schemes

Links:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/221094/pb13896-flood-coastal-resilience-policy.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/221094/pb13896-flood-coastal-resilience-policy.pdf)

<https://www.gov.uk/guidance/flood-and-coastal-defence-funding-submit-a-project>

Once a project has been developed and proved to be one that can progress then it needs to be funded.

A major source of funding for the LLFA is the Environment Agency Flood Defence Grant in Aid system. This is supported by the Northumbrian Regional Flood and Coastal Committee (NRFCC) which agrees the regional programmes to go forward into the national programme.

The NRFCC also administers the Local Levy that is raised by a levy on each local authority in the Northumbria region. The levy is based on Band D Council Tax properties in each area.

The EA has a strict criteria on what funding may be obtained for and these are:

- projects - standalone schemes to build or improve defences and structures
- strategies - a series of interconnecting projects for complex flood or coastal erosion risk situations
- studies - investigations of your FCERM options or their environmental effects on designated areas

It can fund:

- new flood and coastal defences (eg channels, walls, embankments) and structures (eg sluices, pumping stations)
- improve existing defences and structures
- benefit wildlife, eg improving or protecting habitat

It will also consider funding other types of FCERM works, such as:

- dredging and de-silting - one off projects to bring a channel to a condition where it can then be maintained
- fish or eel pass or screening - works to halt and reverse the decline in European eel stock on FCERM assets

Local authorities, highways authorities and water companies can bid for FDGiA funding for works that:

- create a new FCRM asset
- reinstate the design life of an existing FCRM asset
- extend the design life of an existing FCRM asset

Highway authorities and water authorities can only apply for FDGiA funding for projects to reduce flood risk which wouldn't ordinarily be within their remit.

### Other Sources

The LLFA has developed working relationships with other RMA's so we can access a variety of funding sources. The EA is funded for its own schemes linked to managing flooding from the sea and rivers and WFD by the FDGiA system.

Northumbrian Water are required by the Water Services Regulation Authority, better known as OFWAT, to develop a five year programme for its proposed capital investment schemes.

The City Council will take opportunities to work with both organisations to deliver flood alleviation schemes for our communities. This has already worked in Brunton Park where all three organisations have worked together along with the local community to deliver a major project in the area.

Where Northumbrian Water are upgrading sewer networks to reduce the risk of sewer flooding for residents the City Council has taken the opportunity to improve the highway drainage network.

# HOW WILL WE GET THERE

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## Objectives for managing local flood risk

The measures proposed to achieve the strategic aims for managing flood risk and to be consistent with the national strategy are:

- Understanding flood risk and putting in place long-term plans to manage the risk and to make sure other plans take account of them.
- Avoid inappropriate development in areas of flood risk and to be careful to manage land elsewhere.
- Build, maintain and improve flood management infrastructure to reduce the risk of harm to people and damage to the economy, environment and society.
- Increase public awareness of flood risk that remains and engaging with people at risk to make their property more resilient
- To improve warnings of flooding, planning for a rapid response and promoting a faster recovery.

There are six guiding principles that will be used to achieve the strategic objectives:

- Community focus and partnership working
- A catchment cell based approach
- Sustainability
- Proportionate risk based approaches
- Multiple benefits
- Beneficiaries allowed and encouraged to invest in local risk management

## How will these objectives be achieved?

In general terms the local objectives will be achieved locally by:

- Engaging with local communities to help them understand risk and involving them in developing local projects.
- Being involved with other LLFA's and partners to manage flood risk in the city
- Considering the impacts of climate change and mitigating the impact for the future.
- Targeting resources to areas where there is greatest risk.
- Supporting projects that include multiple benefits.
- Obtaining contributions from those who benefit from a project.

Appendix 14 demonstrates how we are meeting these objectives.

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## When will these measures be implemented?

Following the 2012 flooding incidents and a review of the questionnaire responses we received from residents we identified over 500 residential properties and over 50 businesses were affected by flooding.

The overall spread of locations was mapped and from that we identified a number of priorities and local areas where schemes could be progressed. The priority areas identified are listed in Appendix 12.

The fundamental phasing of the schemes is set by the availability of funding allocations from the Environment Agency Flood Defence Grant in Aid and Local Levy. Under Partnership Funding they will support a proportion of a project. The remainder is made up of contributions from the City Council and/or other beneficiaries; the circumstances will change from scheme to scheme. If the costs of a project rise then the impact on the overall programme has to be assessed and decisions made about how to proceed.

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## Environmental Assessment

Due to several projects being in preparation it is proposed to carry out individual Environmental Assessments on each project that are relevant to the scale of a project and the environmental issues it needs to consider. The practical solution is to complete this work in the time before options are assessed prior to the initial public consultation events.

This will ensure that the assessments to be delivered in a timely fashion as well as being relevant and up to date.

In general it is expected that any scheme will provide improvements to water quality, whether or not that water ultimately ends up in a watercourse or the sewer network. National policies seek to obtain multiple benefits from any project. Besides water quality, this can be considered an enhancement of bio-diversity along with less easily quantified health and well-being improvements.

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## Local Partnerships and Governance

The LLFA attends local and regional meetings where there is a common theme of managing flood risk and surface water. They give an opportunity to exchange experience and knowledge.

The list in Appendix XX shows the formal meetings that the LLFA attends.

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## Funding

### National and local funding sources.

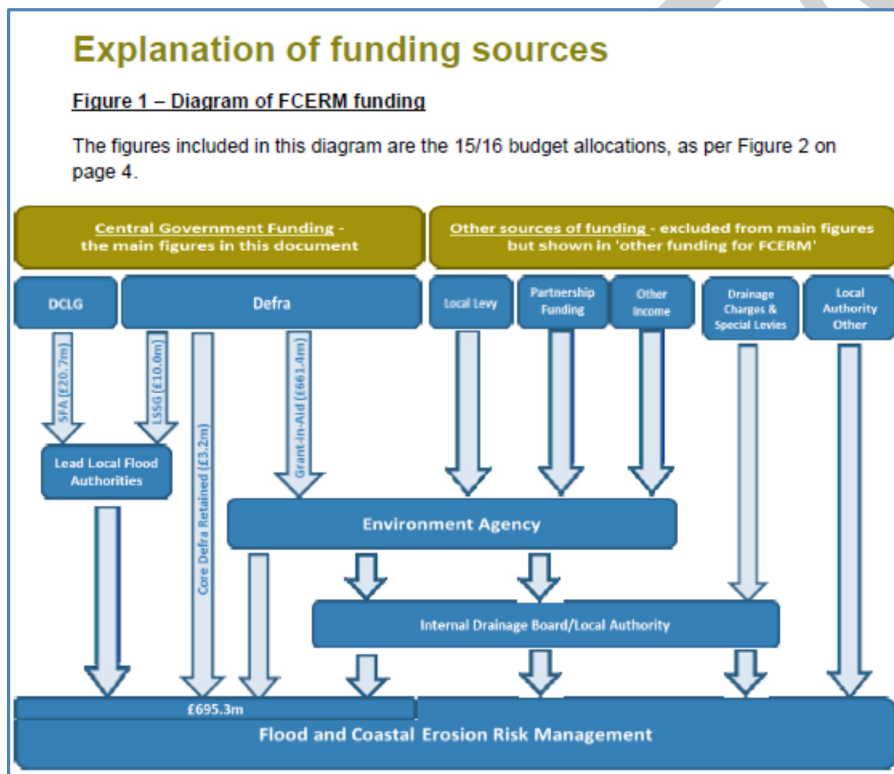
Link:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/401305/Central\\_Government\\_Funding\\_for\\_Flood\\_and\\_Coastal\\_Erosion\\_Risk\\_Management\\_in\\_England\\_feb\\_2015.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/401305/Central_Government_Funding_for_Flood_and_Coastal_Erosion_Risk_Management_in_England_feb_2015.pdf)

The amount of flood and coastal erosion risk management Grant in Aid (funding from DEFRA) available to each capital scheme depends on the number of houses protected, the damages prevented and other benefits a project would deliver. Where there is a shortfall in funding, local contributions are sought.

That can come from Local Authorities, the Local Levy administered by Northumbria RFCC, or private contributions from beneficiaries, such as Northumbrian Water or Developers.

The figure below is extracted from this document linked above and published by DEFRA in December 2015. It shows some of the complexity behind the funding for any specific project. Typically it will include contributions from the City Council, Environment Agency and third party beneficiaries of the outcomes.



The City Council is aware of the limitations that inadequate resources has on the future of the City. It will continue to search for ways to obtain funding support from appropriate sources.

CONSULTATION

## Communications and Engagement with Communities

Link [http://www.ciria.org/Resources/Free\\_publications/c751.aspx?zbrandid=4701&zidType=CH&zid=27991280&zsubscriberId=1041059484&zbdom=http://ciria-susdrain.informz.net](http://www.ciria.org/Resources/Free_publications/c751.aspx?zbrandid=4701&zidType=CH&zid=27991280&zsubscriberId=1041059484&zbdom=http://ciria-susdrain.informz.net)

Communication and engagement techniques for local flood risk management

This is a two way process between individuals, groups or organisations and early discussions and engagement are more likely to lead to a better outcome.

We do talk to residents and businesses who require advice or assistance about managing flood risk especially after a flood has occurred. But it has to be done in a way that depends on the nature and scale of the issues.

Engagement and communication needs to consider:

- Informing people and letting them know what is going on.
- Consulting to gather local information and listening to feedback on options.
- Involving people to provide opportunities for discussion and sharing ideas.
- Collaborating to develop a partnership, decision making and responsibility.
- Empowering communities especially when they may need to deliver something.

Choosing the best technique is important and the table below shows the large number of options available. We have assessed how well we think we are using each option. There are areas for improvement that will need to be considered if the demand is identified. It is possible that the circumstances of how flooding happens in the City means that some issues don't need any further improvement.

Communication & Engagement Techniques				
			Do we do it now?	How well do we do?
	<b>Communication</b>	<b>Techniques</b>		
1	Information and Publicity Materials	newsletter, posters, leaflets	Y	***
2	Local Media	radio, television, press, community circulations	Y	**

3	Website	web page	Y	***
4	Social and Electronic Media	twitter, facebook, chat rooms, blogs and forums	Y	*
5	Geographical Information System (GIS) Maps and Paper Maps	GIS	Y	**
6	Visualisation Tools	maps, computer animations, video, photographs	Y	*
7	Door Knocking	leaflet, letter drops, property visits	Y	**
8	Telephone Contact	active dialogue	Y	***
9	Engaging Local Councillors	Ward Committees,	Y	***
10	Surveys	questionnaires, feedback forms, face to face interviews, surveys and focus groups	Y	***
11	Communication through Education	universities, access to schools, outreach groups	Y	*
12	Communication with and through Existing Groups	partners, organisations, local authorities	Y	**
13	Site visits and Activities	site visits	Y	***
14	Public Meetings	consultation meetings	Y	**
15	Public Exhibitions	staffed and unstaffed exhibitions	Y	***
16	Flood Fairs	organised events for all partners, organisations, public	Y	***
17	Deliberate, Interactive Workshops	consultation and engagement, forum	Y	*
18	Community Flood Planning	Resilience planning	Y	*
19	Innovative Methods	variable methods depending on situation to attract attention	?	*

\* Some work but needs improvement

\*\* Reasonable but improvement possible

\*\*\* Well no improvement needed

## Monitoring and Reviewing

### Reviewing and reporting the LFRMS

A full list of the significant Strategies, Plans and Programmes and their timelines is provided in Appendix 16 and is a guide to timescales for reviews.

The Flood Risk Regulations 2009 established a six year review programme for the strategic Preliminary Flood Risk Assessment, Flooding hazard and risk mapping and Flood Risk Management Plans.

The plan should be revised and relaunched every six years in line with six yearly review programme set out by the Flood Directive 2009. The next review of this plan is proposed to take place by 2021. Until then the LLFA will offer to take part in any reviews and forward plans offered by other RMA's and stakeholders.

### Scrutiny

The FWMA2010 requires LLFA's to ensure that adequate scrutiny arrangements are put in place, including arrangements to review and scrutinise the exercise by RMA's of their flood risk management functions which may affect the City.

Following the flood events of 2012, Scrutiny investigated the City's response to the major flooding incidents of that year and the Newburn culvert collapse. As part of the process, a protocol was agreed whereby debriefs from Major Incidents such as flood events are now shared with the chair of overview and scrutiny committee to allow them to consider whether there is merit in any review.

The Overview and Scrutiny Committee will have the opportunity to review the LFRMP and its outcomes.

### Progress against the National Adaptation Programme and Mayors Adapt commitment

Progress on the actions contained in the LFRMP will be reported as part of the general reporting processes for both the National Adaptation Programme and the Mayors Adapt programme.

Reports will be passed to the Committee on Climate Change, which monitors progress against the National Adaptation Programme as part of its statutory role providing independent advice to Government on preparing for climate change. Information will also be used to inform the City's response to the European Commission on its progress under the Mayors Adapt commitment every 2 years.

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## APPENDICES

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## Appendix 1 Legislation, Plans, Policies and Strategies

### Legislation

	Link to primary legislation	How it affects Flood Risk Management
<b>Common Law</b>		
Living on the Edge	<a href="https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/454562/LIT_7114.pdf">https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/454562/LIT_7114.pdf</a>	A guide to the rights and responsibilities of riverside ownership
<b>Legislation</b>		
Water Act 2014	<a href="http://www.legislation.gov.uk/ukpga/2014/21/contents">http://www.legislation.gov.uk/ukpga/2014/21/contents</a>	Deals with main river maps, records of waterworks, regulation of the water environment, provision of flood insurance for household premises and Regional Flood and Coastal Committees.
Water Framework Directive 2000/60/EC (Water Quality 2013)	<a href="https://www.gov.uk/government/policies/improving-water-quality">https://www.gov.uk/government/policies/improving-water-quality</a> <a href="http://ec.europa.eu/environment/pubs/pdf/factsheets/water-framework-directive.pdf">http://ec.europa.eu/environment/pubs/pdf/factsheets/water-framework-directive.pdf</a>	Establishes a legal framework to protect and restore clean water across Europe and ensure its long-term, sustainable use.
Flood and Water Management Act 2010	<a href="http://www.legislation.gov.uk/ukpga/2010/29/contents">http://www.legislation.gov.uk/ukpga/2010/29/contents</a>	The management of risks in connection with flooding and coastal erosion. removed the automatic right to connect to sewers
Conservation of Habitats and Species	<a href="http://www.legislation.gov.uk/uksi/2010/490/contents/made">http://www.legislation.gov.uk/uksi/2010/490/contents/made</a>	Regulations transposed Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora

Regulations 2010		
Flood Risk Regulations 2009	<a href="http://www.legislation.gov.uk/uksi/2009/3042/contents/made">http://www.legislation.gov.uk/uksi/2009/3042/contents/made</a>	Transposes European Directive 2007/60/EC on the assessment and management of flood risks
Health Act 2009	<a href="http://www.legislation.gov.uk/ukpga/2009/21/contents">http://www.legislation.gov.uk/ukpga/2009/21/contents</a>	Funding options
Climate Change Act 2008	<a href="http://www.legislation.gov.uk/ukpga/2008/27/contents">http://www.legislation.gov.uk/ukpga/2008/27/contents</a>	Sets requirements to assess the risks of climate change and prepare a national adaptation programme in 5 year cycles. Also creates the Committee on Climate Change to advise on the country's preparedness to a changing climate.
Civil Contingencies Act 2004	<a href="http://www.legislation.gov.uk/ukpga/2004/36/contents">http://www.legislation.gov.uk/ukpga/2004/36/contents</a>	A single framework for civil protection in the United Kingdom
Strategic Environmental Assessment Directive 2001	<a href="https://www.gov.uk/government/publications/strategic-environmental-assessment-directive-guidance">https://www.gov.uk/government/publications/strategic-environmental-assessment-directive-guidance</a>	Preparation of an environmental report in which the likely significant effects on the environment are identified, described and evaluated.
Local Government Act 2000	<a href="http://www.legislation.gov.uk/ukpga/2000/22/contents">http://www.legislation.gov.uk/ukpga/2000/22/contents</a>	Promotion of economic, social or environmental well-being
Environment Act 1995	<a href="http://www.legislation.gov.uk/ukpga/1995/25/contents">http://www.legislation.gov.uk/ukpga/1995/25/contents</a>	establishment of the Environment Agency and companies to promote the efficient use of water by customers
Water Industry Act 1991	<a href="http://www.legislation.gov.uk/ukpga/1991/56/contents">http://www.legislation.gov.uk/ukpga/1991/56/contents</a>	Powers and duties of the water and sewerage

		companies, thus replacing those set out in the Water Act 1989, and defined the powers of the Director General of Water Services (now Ofwat).
Water Resources Act 1991	<a href="http://www.legislation.gov.uk/ukpga/1991/57/contents">http://www.legislation.gov.uk/ukpga/1991/57/contents</a>	The functions of the National Rivers Authority (now the Environment Agency) and introduced water quality classifications and objectives for the first time
Land Drainage Act 1991 and 1994	<a href="http://www.legislation.gov.uk/ukpga/1991/59/contents">http://www.legislation.gov.uk/ukpga/1991/59/contents</a>	Requirements for land drainage and maintenance of watercourses
Building Act 1984	<a href="http://www.legislation.gov.uk/ukpga/1984/55/contents">http://www.legislation.gov.uk/ukpga/1984/55/contents</a>	Consolidate certain enactments concerning building and buildings and related matters.
Reservoirs Act 1975	<a href="http://www.legislation.gov.uk/ukpga/1975/23/contents">http://www.legislation.gov.uk/ukpga/1975/23/contents</a>	An Act to make further provision against escapes of water from large reservoirs or from lakes or lochs artificially created or enlarged.
Public Health Act 1936		Gives local authorities in England and Wales powers to treat as a statutory nuisance any water course, pond or ditch which is foul or in a state that will be harmful to health.

**National, Regional and Local Plans, Policies and Strategies**

<b>National</b>		
Pitt Report Learning Lessons from the 2007 floods	Report: <a href="http://webarchive.nationalarchives.gov.uk/20100807034701/http://archive.cabinetoffice.gov.uk/pittreview/thepittreview/final_report.html">http://webarchive.nationalarchives.gov.uk/20100807034701/http://archive.cabinetoffice.gov.uk/pittreview/thepittreview/final_report.html</a>  Review: <a href="https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69489/2012-01-31-pb13705-pitt-review-progress.pdf">https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69489/2012-01-31-pb13705-pitt-review-progress.pdf</a>	Investigation into 2007 flooding, recommendations that resulted in FWMA2010.
National Planning Policy Framework	<a href="https://www.gov.uk/government/publications/national-planning-policy-framework--2">https://www.gov.uk/government/publications/national-planning-policy-framework--2</a>	Planning Policy for England
Secretary of State Eric Pickles Suds Statement December 2014	<a href="https://www.gov.uk/government/speeches/sustainable-drainage-systems">https://www.gov.uk/government/speeches/sustainable-drainage-systems</a>	Advice about water drainage management
Planning Policy Guidance	<a href="http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/">http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/</a>	Advises on how planning can take account of the risks associated with flooding and coastal change in plan-making and the application process.
Non-statutory Guidance March 2015	<a href="https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf">https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf</a>	Non-statutory technical standards for the design, maintenance and operation of sustainable drainage systems to drain surface water.

LASOO Guidance	<a href="http://www.lasoo.org.uk/non-statutory-technical-standards-for-sustainable-drainage">http://www.lasoo.org.uk/non-statutory-technical-standards-for-sustainable-drainage</a>	Practice guidance about the non-statutory standards.
National Flood and Coastal Erosion strategy for England	<a href="https://www.gov.uk/government/publications/national-flood-and-coastal-erosion-risk-management-strategy-for-england">https://www.gov.uk/government/publications/national-flood-and-coastal-erosion-risk-management-strategy-for-england</a>	This document contains the following information: Understanding the risks, empowering communities, building resilience: the national flood and coastal erosion risk management strategy for England.
Flood risk management: information for flood risk management authorities, asset owners and local authorities	<a href="https://www.gov.uk/guidance/flood-risk-management-information-for-flood-risk-management-authorities-asset-owners-and-local-authorities">https://www.gov.uk/guidance/flood-risk-management-information-for-flood-risk-management-authorities-asset-owners-and-local-authorities</a>	Guidance and information on flood risk management and surface water management.
National Flood Emergency Framework	<a href="https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england">https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england</a>	Sets out strategic approach to planning for and responding to flooding from sea, rivers, surface water, groundwater and reservoirs.
Multi agency flood plan	<a href="https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england">https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england</a>	information, guidance and key policies and is a resource for all involved in flood emergency planning.
Flood Incident Management Plan		
Appraisal FCERM 2009	<a href="https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/481768/LIT_4909.pdf">https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/481768/LIT_4909.pdf</a>	Best practice implementation guidance on appraisal

FCERM Appraisal Guidance March 2010	<a href="https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/481768/LIT_4909.pdf">https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/481768/LIT_4909.pdf</a>	Best practice implementation guidance on appraisal
National Climate Change adaptation programme	<a href="https://www.gov.uk/government/publications/adapting-to-climate-change-national-adaptation-programme">https://www.gov.uk/government/publications/adapting-to-climate-change-national-adaptation-programme</a>	Sets out what government, businesses and society are doing to become more climate ready.
Private Drains and Sewers Regulations	<a href="https://www.gov.uk/government/publications/the-private-sewers-transfer-regulations">https://www.gov.uk/government/publications/the-private-sewers-transfer-regulations</a>	Explain and give guidance on the regulations.
<b>Regional</b>		
Draft River Basin Management Plan	<a href="https://consult.environment-agency.gov.uk/portal/ho/wfd/draft_plans/consult?pointId=s1406201344676#section-s1406201344676">https://consult.environment-agency.gov.uk/portal/ho/wfd/draft_plans/consult?pointId=s1406201344676#section-s1406201344676</a>	Each river basin district (RBD) has a plan to safeguard its waters to protect human health, water supply, natural ecosystems and biodiversity.
Draft Flood Risk Management Plan	<a href="https://consult.environment-agency.gov.uk/portal/ho/flood/draft_frm/consult?pointId=s1407245306889#section-s1407245306889">https://consult.environment-agency.gov.uk/portal/ho/flood/draft_frm/consult?pointId=s1407245306889#section-s1407245306889</a>	Proposals to reduce flood risk for communities and deal with the impacts of flooding when it occurs.
<b>Local</b>		
Preliminary Flood Risk Assessment	<a href="https://www.newcastle.gov.uk/sites/default/files/wwwfile/roo/planning-and-buildings/planning/pfrafinalreportaugust2011.pdf">https://www.newcastle.gov.uk/sites/default/files/wwwfile/roo/planning-and-buildings/planning/pfrafinalreportaugust2011.pdf</a>	Explains the 6 year cycle of planning to reduce flood risk in England.
Strategic Flood Risk	<a href="https://www.newcastle.gov.uk/wwwfile/roo/legacy/regen/ldf/NewcastleLevel1SFRA.pdf">https://www.newcastle.gov.uk/wwwfile/roo/legacy/regen/ldf/NewcastleLevel1SFRA.pdf</a>	Needs to have enough detail for the <u>sequential test</u>



Assessment Level 1		to be applied. See also NPPF.
Strategic Flood Risk Assessment Level 2	<a href="https://www.newcastle.gov.uk/wwwfile/root/legacy/regen/ldf/SFRALevel2Final.pdf">https://www.newcastle.gov.uk/wwwfile/root/legacy/regen/ldf/SFRALevel2Final.pdf</a>	Needs to have enough detail for the <u>exception test</u> to be applied. See also NPPF.
Tyneside Sustainable Sewerage Study	<a href="http://www.waterprojectsonline.com/case_studies/2012/Northumbrian_Tyneside_Sewerage_2012.pdf">http://www.waterprojectsonline.com/case_studies/2012/Northumbrian_Tyneside_Sewerage_2012.pdf</a>	Analysis to achieve a greater understanding of the hydraulic capacity of the Tyneside sewer network which will inform future measures.
Newcastle Gateshead Surface Water Management Plan	<a href="http://www.google.co.uk/url?sa=t&amp;rct=j&amp;q=&amp;esrc=s&amp;source=web&amp;cd=4&amp;ved=0ahUKEwjiwvOJ5sLKAhUCPRQKHSvaAEoQFggwMAM&amp;url=http%3A%2F%2Foncorestrategynl.limehouse.co.uk%2Ffile%2F2575749&amp;usq=AFQjCNF0j6BmBPxHm2Vp5KpkXQmUfeUdCw&amp;bvm=bv.112454388,d.d24">http://www.google.co.uk/url?sa=t&amp;rct=j&amp;q=&amp;esrc=s&amp;source=web&amp;cd=4&amp;ved=0ahUKEwjiwvOJ5sLKAhUCPRQKHSvaAEoQFggwMAM&amp;url=http%3A%2F%2Foncorestrategynl.limehouse.co.uk%2Ffile%2F2575749&amp;usq=AFQjCNF0j6BmBPxHm2Vp5KpkXQmUfeUdCw&amp;bvm=bv.112454388,d.d24</a>	Outlines the preferred surface water management strategy
Water Cycle Study	<a href="https://www.newcastle.gov.uk/wwwfile/root/legacy/regen/ldf/NewcastleGatesheadWCSOutlineReport.pdf">https://www.newcastle.gov.uk/wwwfile/root/legacy/regen/ldf/NewcastleGatesheadWCSOutlineReport.pdf</a>	To strategically plan the most sustainable water infrastructure
Surface Water plan for Ouseburn Catchment MWH August 2015	tbc	
Surface water Plan for City Centre catchment AMEC August 2015	tbc	
Climate Change Strategy	<a href="http://www.newcastle.gov.uk/environment-and-waste/climate-change-and-">http://www.newcastle.gov.uk/environment-and-waste/climate-change-and-</a>	Response to the threats and opportunities

	<a href="#">energy-saving/our-climate-change-commitment</a>	connected to climate change.
Core Strategy and Urban Core Plan for Gateshead and Newcastle March 2015	<a href="http://www.newcastle.gov.uk/planning-and-buildings/planning-policy/core-strategy-and-urban-core-plan">http://www.newcastle.gov.uk/planning-and-buildings/planning-policy/core-strategy-and-urban-core-plan</a>	Strategic planning framework that will guide development in Newcastle and Gateshead to 2030.
Gateshead and Newcastle Councils Core Strategy and Urban Core Plan Sustainability Appraisal Report December 2013	<a href="https://www.gateshead.gov.uk/DocumentLibrary/Building/PlanningPolicy/Core-Strategy-Documents/EL07.-Core-Strategy-and-Urban-Core-Plan-Sustainability-Appraisal-Report.pdf">https://www.gateshead.gov.uk/DocumentLibrary/Building/PlanningPolicy/Core-Strategy-Documents/EL07.-Core-Strategy-and-Urban-Core-Plan-Sustainability-Appraisal-Report.pdf</a>  Annexes  <a href="https://www.gateshead.gov.uk/DocumentLibrary/Building/PlanningPolicy/Core-Strategy-Documents/EL07.-Core-Strategy-and-Urban-Core-Plan-Sustainability-Appraisal-Report.pdf">https://www.gateshead.gov.uk/DocumentLibrary/Building/PlanningPolicy/Core-Strategy-Documents/EL07.-Core-Strategy-and-Urban-Core-Plan-Sustainability-Appraisal-Report.pdf</a>	Structured approach to predicting and assessing the economic, social and environmental effects that are likely to arise
Newcastle City Council Environmental Policy	<a href="http://www.newcastle.gov.uk/environment-and-waste/climate-change-and-energy-saving/environmental-policy-and-strategy/environmental-policy">http://www.newcastle.gov.uk/environment-and-waste/climate-change-and-energy-saving/environmental-policy-and-strategy/environmental-policy</a>	Commitment to improving the environment in its progress towards a sustainable city.
Newcastle and North Tyneside Biodiversity Action Plan	<a href="http://www.newcastle.gov.uk/environment-and-waste/biodiversity-and-ecology/biodiversity-action-plan">http://www.newcastle.gov.uk/environment-and-waste/biodiversity-and-ecology/biodiversity-action-plan</a>	Plan for priority habitats and species in the Newcastle and North Tyneside area
Blue Green Cities project	<a href="http://www.bluegreencities.ac.uk/bluegreencities/index.aspx">http://www.bluegreencities.ac.uk/bluegreencities/index.aspx</a>	Project will produce a range of outcomes useful for academics, practitioners and the general public.
Suds Guidance for Developers	<a href="https://www.newcastle.gov.uk/sites/default/files/wwwfileroot/environment-and-waste/newcastle_suds_guidance_21.01.2016.pdf">https://www.newcastle.gov.uk/sites/default/files/wwwfileroot/environment-and-waste/newcastle_suds_guidance_21.01.2016.pdf</a>	Signposts developers to the legislation, policy and technical information required when submitting Flood Risk

		Assessments and drainage strategies.
Summer flooding 2012 report	<a href="http://www.newcastle.gov.uk/sites/drupalnc.newcastle.gov.uk/files/wwwfileroot/environment/environment/microsoft_word_-_summer_2012_flooding_report_-_final_-_july_2013.pdf">http://www.newcastle.gov.uk/sites/drupalnc.newcastle.gov.uk/files/wwwfileroot/environment/environment/microsoft_word_-_summer_2012_flooding_report_-_final_-_july_2013.pdf</a>	Report into widespread localised flooding
Overview and Scrutiny review	<a href="http://www.newcastle.gov.uk/sites/drupalnc.newcastle.gov.uk/files/wwwfileroot/environment-and-waste/extreme_events_scrutiny_review_2012.pdf">http://www.newcastle.gov.uk/sites/drupalnc.newcastle.gov.uk/files/wwwfileroot/environment-and-waste/extreme_events_scrutiny_review_2012.pdf</a>	Investigation into flood events and culvert collapse

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**Appendix 2 Legislative Responsibilities**

Body	What risk management functions they are responsible for	How they Implement their risk management measures	How is this Co-ordinated
<p><b>Environment Agency (EA)</b></p>	<p>Flooding from main rivers, sea and it is the enforcement Authority for Regulating the safety of reservoirs</p>	<p>Provide a Strategic overview of all forms of flooding.</p> <p>Develop a National Strategy to cover all types of flooding.</p> <p>Manage the Regional Flood and Coastal Committee Use powers to request information.</p> <p>Use powers to designate structures and features.</p> <p>Allow flooding and erosion for nature conservation and cultural heritage.</p> <p>Consider Flood and Coastal Erosion Risk Management (FCERM) in carrying out other works that may affect it.</p> <p>Consider local flood risk strategies.</p> <p>Report to Ministers about flood and coastal erosion risk management.</p> <p>The Agency has continuing roles to:</p> <p>Manage fluvial flooding from main rivers.</p> <p>Contribute to sustainable development when carrying out their functions.</p> <p>Issue local levies to LLFA's.</p> <p>Regulate reservoirs.</p>	<p>European, national and regional plans and strategies.</p> <p>Regionally at workshops.</p> <p>Locally at meetings of Inland Water Group and Tyne Wear Flood Risk Management Partnership</p>
<p><b>Lead Local Flood Authority (LLFA)</b></p>	<p>Flooding from surface run-off, groundwater and ordinary watercourses.</p>	<p>Develop, maintain, apply and monitor a strategy for managing local flood risk in their area.</p>	<p>Attendance at national, regional and local events and meetings</p>

Body	What risk management functions they are responsible for	How they Implement their risk management measures	How is this Co-ordinated
(Newcastle City Council and adjacent local authorities)		<p>Strategic leadership of local risk management authorities by setting up a Strategic partnership.</p> <p>Powers to request information from any person in connection with the flood management function.</p> <p>Duty to investigate and publish reports on flooding incidents where appropriate or necessary and to identify which authority has the relevant flood risk management function and what they have done or intend to do.</p> <p>Duty to maintain a register of structures or features with a significant effect on flood risk.</p> <p>Power to do works to manage flood risk</p> <p>Power to designate structures and features that could affect flood risk and are considered to be significant.</p> <p>Decision making process for consenting works on Ordinary Watercourses by third parties that may affect water flow.</p> <p>To carry out flood management functions consistent with national strategies.</p> <p>Contribute towards sustainable development in carrying out flood management functions.</p>	by the Flood Risk Management Team
Unitary Authorities	Making Decisions on new development and flood risk management activities as Planning Authority in partnership with LLFA.	Land use planning to ensure development is appropriate for the area.	Local Planning Authority

Body	What risk management functions they are responsible for	How they implement their risk management measures	How is this Co-ordinated
(Newcastle City Council, other Tyne Wear authorities and Northumberland CC)	Civil Contingencies	Emergency response to flooding supported by Met Office and EA.	Resilience Team
Water and sewerage Companies (Northumbrian Water)	<p>Planning for the future development and maintenance of services.</p> <p>Taking into account FCERM plans in their forward planning process.</p> <p>Ensuring their assets and systems are resilient to flood risk.</p> <p>Ensuring the required level of service can be maintained in the event of a flood incident.</p>	<p>Managing the risks of flooding from water supply, surface and foul or combined sewer systems</p> <p>Work with developers and landowners to reduce the amount of rainfall entering sewers through the use of Suds systems.</p> <p>Work to manage reservoir safety</p> <p>Act consistently with national and local strategies when carrying out flood risk management functions.</p> <p>Be subject to scrutiny from LLFA's democratic processes.</p> <p>Be responsible for flooding from sewers except in extreme weather</p>	With internal and external stakeholders as appropriate
Other Utility and infrastructure providers	<p>Planning for the future development and maintenance of services.</p> <p>Taking into account FCERM plans in their forward planning process.</p>		As meetings are arranged.

Body	What risk management functions they are responsible for	How they implement their risk management measures	How is this Co-ordinated
All utilities including gas, water, electric, telecom, etc	Ensuring their assets and systems are resilient to flood risk.  Ensuring the required level of service can be maintained in the event of a flood incident.		
Highway Authority	To keep roads passable for the usual traffic at any time of the year	Inspection and maintenance of highway drainage assets. Updating or renewing infrastructure	Highway Inspection and maintenance. Highway improvement schemes.
Riparian owners and landowners	Rights and responsibilities related to watercourses on the land they own	Common law duty to maintain watercourses, ditches etc to prevent them causing a nuisance.	By private landowners and advice from LLFA



## Appendix 3 Risk Management Partners

### Lead Local Flood Authority

- Newcastle City Council

We are expected to consider flood risk with the following local authorities where there is a common border;

- North Tyneside Council,
- Gateshead
- South Tyneside
- Northumberland County Council,

### Water and Sewage Company (WaSC)

- Northumbrian Water

### Environment Agency

- Northumbria and Yorkshire Region

### Highway Authorities

- Newcastle City Council
- Northumberland County Council
- North Tyneside Council
- Gateshead Council
- Highways England (formally Highways Agency)

### External

Potential partners are those who can or will be influenced by any project that includes some form of flood risk reduction within it. They will vary from project to project.

## Internal partners

Their responsibilities offer an opportunity for them to provide input into local flood risk management in appropriate circumstances:

Directorate	Division	Section
Regulatory Services		Resilience Team
		Contaminated Land Records
		Car Parking Services
Investment and Delivery		Planning Policy
		Development Management Highway Development Planning applications Green infrastructure Public Rights of Way Strategic Housing Local Transport Plan
Communities	Technical Consultancy	Flood Management, highway design, S278 and S38 adoption Local Transport Plan
	Highway Maintenance Organisation	Highway asset management, inspection and maintenance.
	HLS	Highway drainage and landscape maintenance
		Landscape Design
Policy and Communications		Climate change mitigation and adaptation. sustainability, funding applications, media management

## Appendix 4 Local Partnerships and Representation

Organisation	Attendance and reason	Main interests
Northumbria Regional Flood and Coastal Committee	Environment Agency, Council members representing each Lead Local Flood Authorities (LLFAs) and independent members with relevant experience including Northumbrian Water	<p>Ensures there are coherent plans for identifying, communicating and managing flood and coastal erosion risks across catchments and shorelines</p> <p>encourage efficient, targeted and risk-based investment in flood and coastal erosion risk management that represents value for money and benefits local communities</p> <p>provide a link between the Environment Agency, LLFAs, other risk management authorities, and other relevant bodies to build understanding of flood and coastal erosion risks in its area</p> <p>Sets Local Levy to contribute to funding of regional schemes to manage flood risk</p>
Inland Water Group	EA and all regional LLFA's.	Management of EA programme and issues of common interest
Northumbria Integrated Drainage partnership	NWL/EA/all regional local authorities.	Support NWL in prioritising surface water management projects across the region
Tyne Wear FRM Partnership	Newcastle City, North Tyneside, South Tyneside, Sunderland and Gateshead LLFA's, EA and NW.	To provide support for local regional work to manage surface water flood risk.
North of Region Sustainable Drainage Group	Tyne-Wear, Northumberland and Durham LLFA's	Develop local regional guidance on suds design and maintenance for developers
Northumbrian Water Quarterly meetings	Northumbrian Water, LLFA, YHN, Planning and Environmental Health	Local management of public and private drain and sewer networks

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## Appendix 5 Policy CS17 Flood Risk and Water Management

Taken from Newcastle Gateshead Core Strategy March 2015

Development will avoid and manage flood risk from all sources, taking into account the impact of climate change over its lifetime. Development will:

1. Avoid and manage flood risk to people and property by:
  - i. Locating new development in areas with the lowest risk where appropriate by applying the Sequential Test,
  - ii. Managing flood risk from development to ensure that the risk is not increased on site and/or elsewhere, where appropriate by applying the Exception Test,
  - iii. Ensuring opportunities for development to contribute to the mitigation of flooding elsewhere are taken,
  - iv. Prioritise the use of Sustainable Drainage Systems (SuDS), given the multifunctional benefits to water quality, green space and habitat enhancement,
  - v. Ensuring development is in accordance with the Council's Strategic Flood Risk Assessment, and
  - vi. Requiring a Flood Risk Assessment for sites over 0.5ha in Critical Drainage Areas as identified in the Council's Strategic Flood Risk Assessments.
2. Ensure water supply and foul and surface water infrastructure are provided with adequate capacity.
3. Not adversely affect water quality and where possible seek to improve water quality.
4. Separate, minimise and control surface water runoff, discharging in order of priority to:
  - i. Infiltration based Sustainable Drainage Systems,
  - ii. A watercourse,
  - iii. A surface water sewer, and
  - iv. A combined sewer.

**Policy CS17 Flood Risk and Water Management**  
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  - ii. A watercourse,
  - iii. A surface water sewer, and
  - iv. A combined sewer.

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## Appendix 6 Data sets and Information available to LLFA

Type of data	Source	Dataset
Historic/recorded	NCC	Local Climate Impacts Profile (2000 – 2007)
		Envirocall records regarding flooding
		Summer 2012 Flooding Questionnaire responses
		Historic Ordnance Survey mapping and sewer records
		Consultants reports
		Culverts
		Highway Drainage
	NW Data sharing	Sewer flooding locations
		Sewer network
	Tyne and Wear Fire and Rescue	Records of calls regarding flooding
EA Geostore	Historical Flood Map (fluvial): Areas Susceptible to Surface Water Flooding Flood Map for Surface Water	
Various	MP's, Ward and Parish Councillors, Residents and Flood Room reports.	
	Highways England	Highway Drainage records
Modelled	EA Geostore	EA Flood Map (for fluvial and tidal flooding)
		updated Flood Map for Surface Water Flooding
	NCC	Surface water management plan for the Ouseburn Catchment
	ESI	ESI Groundwater Flood Risk map
	NCC	Surface Water Management Plan for the City Centre
	NCC	Modelling of strategic development sites for SWMP
	NWL	Tyneside Sustainable Sewerage Study Integrated Urban Drainage Models

	Newcastle University	CityCat Drainage Model
Assessments/Plans/Studies	NCC	Newcastle Preliminary Flood Risk Assessment (PFRA)
		Newcastle Strategic Flood Risk Assessment (SFRA) Level 1 defined Critical Drainage area
		Newcastle Strategic Flood Risk Assessment (SFRA) Level 2 defined Critical Drainage area
		Newcastle-Gateshead Surface Water Management Plan (SWMP)
	Newcastle Gateshead	Water Cycle Study
	EA	Tyne Catchment Flood Management Plan (CFMP)
	EA	Draft River Basin Flood risk plan
	NW and Partners	Tyneside Sustainable Sewerage Study

This data can be in many formats depending on its historic nature or the original use, for example:

- paper files, notes, reports and other hard copy documents;
- public registers;
- databases, spreadsheets;
- electronic documents;
- e-mails;
- drawings and plans;
- photographs, video or microfilm;
- data and information, which may be included in or with software;
- methodologies.



## Appendix 7 S19 FWMA2010 Duty to investigate Flooding incidents

The Flood and Water Management Act 2010 (the Act) Section 19 places a duty on the Council, as the Lead Local Flood Authority, to investigate flooding incidents that it becomes aware of, to the extent that it considers necessary or appropriate.

### *Local authorities: investigations*

- (1) *On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate-*
  - (a) *which risk management authorities have relevant flood risk management functions, and*
  - (b) *whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.*
- (2) *Where an authority carries out an investigation under subsection (1) it must-*
  - (a) *publish the results of its investigation, and*
  - (b) *notify any relevant risk management authorities'*

The LLFA will investigate all flooding incidents that are reported by the public, or that otherwise come to its attention and comply with the following criteria::

- Internal flooding of habitable property, excluding garages, out-buildings and conservatories unless they have a direct means of access into a habitable part of the building.
- Flooding that breaches or threatens critical infrastructure e.g electricity sub stations and switching centres, strategic roads and bus routes, railways, bridges, flood defences, water treatment works and pumping stations.
- Flooding that directly results in serious injury or death.
- Flooding that incurs a significant economic impact to businesses.
- Flooding that places vulnerable individuals or vulnerable communities at risk e.g. hospitals, care and nursing homes, schools, secure units etc.
- The LLFA may consider a flood investigation necessary if they consider it is useful to do so.

Any investigations undertaken will seek to establish the likely causes of the flooding incident, the relevant risk management authorities, and identify any recommended actions to be undertaken by the relevant risk management authorities in order to reduce the risk of a recurrence.

The investigations will be undertaken during, or as soon as possible after, the flooding incident, and will be appropriate to the scale and nature of the flooding incident.

Small scale flooding incidents, and incidents where the relevant risk management authorities are immediately apparent or are undertaking actions to alleviate the cause of the flooding incident, are likely to require limited investigations.

Large scale flooding incidents, incidents where the relevant flood risk management authorities are unclear, and incidents where a number of risk management authorities are involved, are likely to require more detailed investigations. In such circumstances the Council will work closely with the risk management authorities involved and may, where appropriate, prepare a detailed report.

#### **Flood Investigation Procedure**

1. Flood incident report received by the LLFA;
2. Incident logged.
3. Initial LLFA assessment undertaken as to whether it considers it necessary or appropriate to prepare a section 19 report.
4. Decision recorded.
5. If investigation required investigator appointed;
6. Carry out investigation to identify which risk management authorities have relevant flood risk management functions,
7. Ask for relevant information from each flood risk management authority may have be involved.
8. Establish whether each of them has exercised, or is proposing to exercise, their functions in response to the flood.
9. Flood investigation report drafted in consultation with partner risk management authorities;
10. Draft report issued for comment;
11. Report and associated actions agreed
12. Finalised report published on the Council's internet site.

Appendix 8 Flood Risk

What is a flood incident?

To build up a picture of how the flood incident happens we use this simple model:



The table below illustrates the complexity behind this of establishing the causes and remedies for any flood incident. Various landowners and responsibilities are involved all down the route.

Source	Pathway	Receptor
River/ burn/ stream/ dene	Roads	Shops/offices/businesses
Parks/open spaces	River/ burn/ stream/ dene	Critical infrastructure – electric sub-station, doctors surgeries
Farmland	School playing fields	Homes
Roads	Farmland	Public buildings – schools, libraries
Footpath	Railway	Parks/open spaces
		Farmland

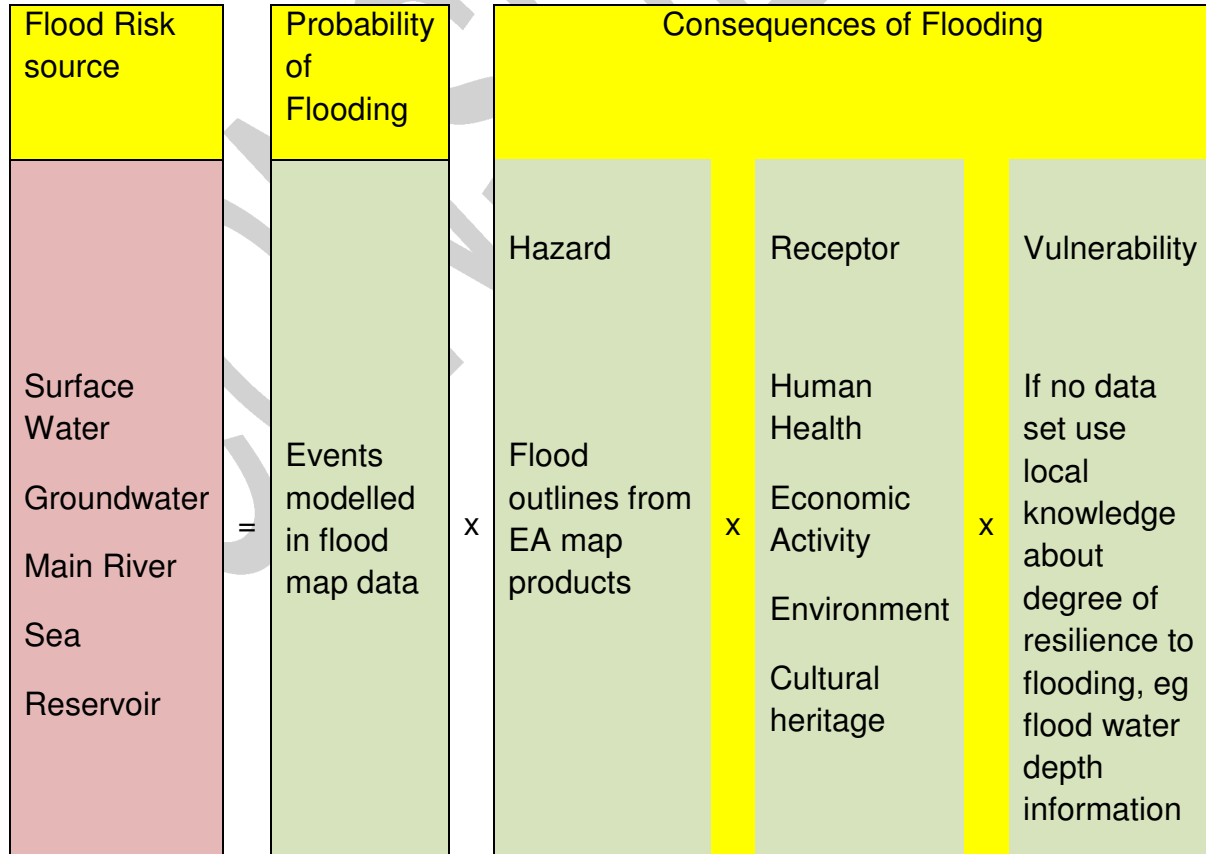
Flood Impact	Flood Risk Indicator Name	Type	Example	comments
Human Health	Residential properties	Count	Residential properties can be selected from the NRD where the MCM code=1 (see Environment Agency, 2010a).  There are different methods for counting properties that use either arbitrary points within the buildings' footprints or the buildings' footprints themselves. The different methods are described in Environment Agency (2010e) and will produce very different estimates of the number of properties at risk (increased by a factor of 2-5 if using footprint polygons).	
	People	Count	Residential properties x 2.34 per property	Used to support the identification of indicative Flood Risk Areas as part of the England and Wales PFRA
	Critical services	Count	As per Annex 6 of PFRA final guidance (Environment Agency, 2010a).	Used to support the identification of indicative Flood Risk Areas as part of the England and Wales PFRA
Economic Activity	Non-residential properties	Count	As per Annex 6 of PFRA final guidance (Environment Agency, 2010a).	Used to support the identification of indicative Flood Risk Areas as part of the England and Wales PFRA
	Infrastructure network	Length	Select and combine road and railway polylines from the NRD.	
	Agricultural land	Area	Select relevant agricultural land classifications from NRD (e.g. all grades or only Grades 1, 2 and 3).	
Environment	Pollution	Count	Consider Pollution Prevention and Control (PPC) and Control of Major Accident Hazard (COMAH) sites. May need to be supplemented with data held by Local Resilience Forums.	Similar information supplied to LLFAs on the CD of supporting materials for PFRA in December 2010

	Designated environmental sites	Area	Consider Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, and Sites of Special Scientific Interest (SSSI). May need to be supplemented with data held by local Environment Agency office.	Similar information supplied to LLFAs on the CD of supporting materials for PFRAs in December 2010
Cultural Heritage	Designated Heritage assets	Count/Area	Consider World Heritage sites, Scheduled Monuments (SMs), listed buildings, and parks and gardens. May need to be supplemented with data held by local planning authority.	Similar information supplied to LLFAs on the CD of supporting materials for PFRAs in December 2010

**RISK**

The previous methods provide data that can be used to assess the risk to any receptor.

What is flood risk? It's an estimate of the impact of a flood from any source of any type, the chance of a flood occurring and its many consequences, see diagram below.



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## Appendix 9 Prioritisation Methodology (2012)

Following the 2012 events the City Council developed the following prioritisation methodology to assist in prioritising flood risk areas.

### Private property

Impact – high/med/low based on number of properties affected (internal flooding)

Low (1) - <5

Medium (2) - 5-10

High (3) - More than 10

Likelihood – high/medium/low based on repeat incidents

Low (1) - no known previous incidents prior to June 2012

Medium (2) - repeat incidents in 2012

High (3) - multiple incidents, including flooding prior to 2012

Where there is a potential funding criteria available aligned to social need the following criteria will be added:-

Deprivation – based on Index of Multiple Deprivation

High (3) - 20% most deprived

Medium (2) - 20-40% most deprived

Low (1) - 60% least deprived

### Transport Infrastructure

Likelihood – high/medium/low based on number of previous incidents

Low (1) – no known reports (or very few) prior to 2012

Medium (2) – Road closed more than once in 2012

High (3) – Road closed more than once in 2012, previous issues with flooding, or has flooded since summer 2012 in more minor events

Impact

High (3) - Major routes – the Coast Road, CME, Metro, Central Station

Medium (2) - A roads, or city centre B roads

Low (1) - other transport infrastructure – minor classification roads

### Public Buildings

Likelihood – high/medium/low based on repeat incidents

Low (1) - no known previous incidents prior to June 2012

Medium (2) - repeat incidents in 2012

High (3) - multiple incidents, including flooding prior to 2012

Impact

Low (1) – External areas out of use

Medium (2) – Partial closure of facility  
 High (3) – Closure of facility for more than a day

Where there is a potential funding criteria available aligned to social need the following criteria will be added:-

Deprivation – based on Index of Multiple Deprivation

High (3) - 20% most deprived  
 Medium (2) - 20-40% most deprived  
 Low (1) - 60% least deprived

**Parks & Countryside**

Likelihood

Low (1) - no known previous incidents prior to June 2012  
 Medium (2) - repeat incidents in 2012  
 High (3) - multiple incidents, including flooding prior to 2012

Impact

Low (1) – Can be used but causes inconvenience  
 Medium (2) – Minor H&S issues, minor disruption adjacent to the boundary, limited access to facilities  
 High (3) – Potentially significant H&S issues, major disruption adjacent to the boundary, no access to facilities

**DELIVERABILITY**

Likelihood of being able to progress project

High (3) – Can be progressed and completed in current or early in next financial year  
 Medium (2) – Can be progressed and complete later in next or subsequent years  
 Low (1) – Cannot be progressed within timescale of available budget

**PRIORITISATION**

**Flood Damage – Roads/footpaths, culverts, parks & countryside**

Human Impact

High (3) – Causing significant disruption to people’s lives  
 Medium (2) – Causing some disruption to people’s lives  
 Low (1) – Causing little or no disruption to people’s lives

Economic Impact

High (3) – Significant effect on the local economy  
 Medium (2) – Some effect on the local economy  
 Low (1) – Little or no effect on the local economy



Deterioration Impact

High (3) – Significant increase in cost and disruption if nothing is done

Medium (2) – Some increase in cost and disruption if nothing is done

Low (1) – Little or no increase in cost and disruption if nothing is done

**Flood Prevention – Transport Infrastructure, culverts, private property and public buildings**

Human impact of an event if nothing was done

High (3) – Significant impact on people’s lives over a sustained period

Medium (2) – Significant impact on people’s lives over a short period

Low (1) – Little or no impact on people’s lives

Financial impact of an event if nothing was done

High (3) – Significant cost to the city’s economy

Medium (2) – Significant cost to the local economy

Low (1) – Little or no cost to the economy

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## Appendix 10 Existing Property at risk of flooding

## From surface water

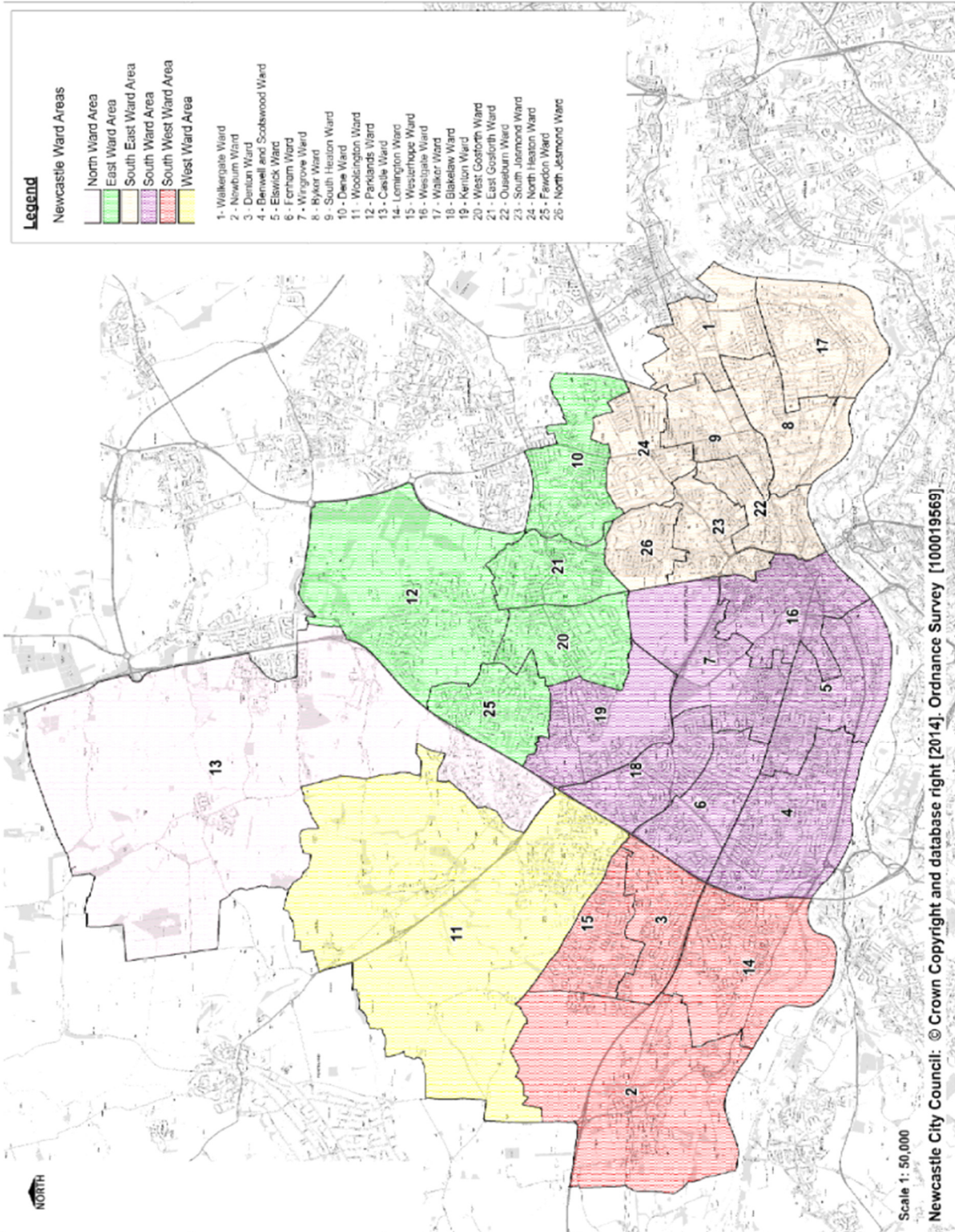
Ref	Ward	Residential Property			Critical infrastructure	Commercial and Shopping Premises
		Risk Band				
		High	Medium	Low		
1	Walkergate	0	9	84	2	0
2	Newburn	4	4	77	5	13
3	Denton Ward	1	8	79	2	2
4	Benwell and Scotswood	0	2	48	0	8
5	Elswick	0	13	53	2	6
6	Fenham	0	3	61	2	0
7	Wingrove	3	5	24	1	3
8	Byker	0	0	17	1	8
9	South Heaton	0	0	0	5	0
10	Dene	0	0	6	1	0
11	Woolsington	0	5	79	5	0
12	Parklands	0	0	15	0	0
13	Castle	0	4	55	2	2
14	Lemington	0	2	28	0	3
15	Westerhope	1	3	26	0	0
16	Westgate	0	22	122	6	21
17	Walker	3	9	43	0	1
18	Blakelaw	0	12	51	2	1
19	Kenton	0	0	11	0	0
20	West Gosforth	0	2	21	2	5
21	East Gosforth	0	3	38	3	0
22	Ouseburn	0	0	5	1	2
23	South Jesmond	0	0	22	2	2
24	North Heaton	2	4	22	0	0
25	Fawdon	2	23	74	3	0
26	North Jesmond	1	1	25	1	1
Total		17	134	1086	48	78

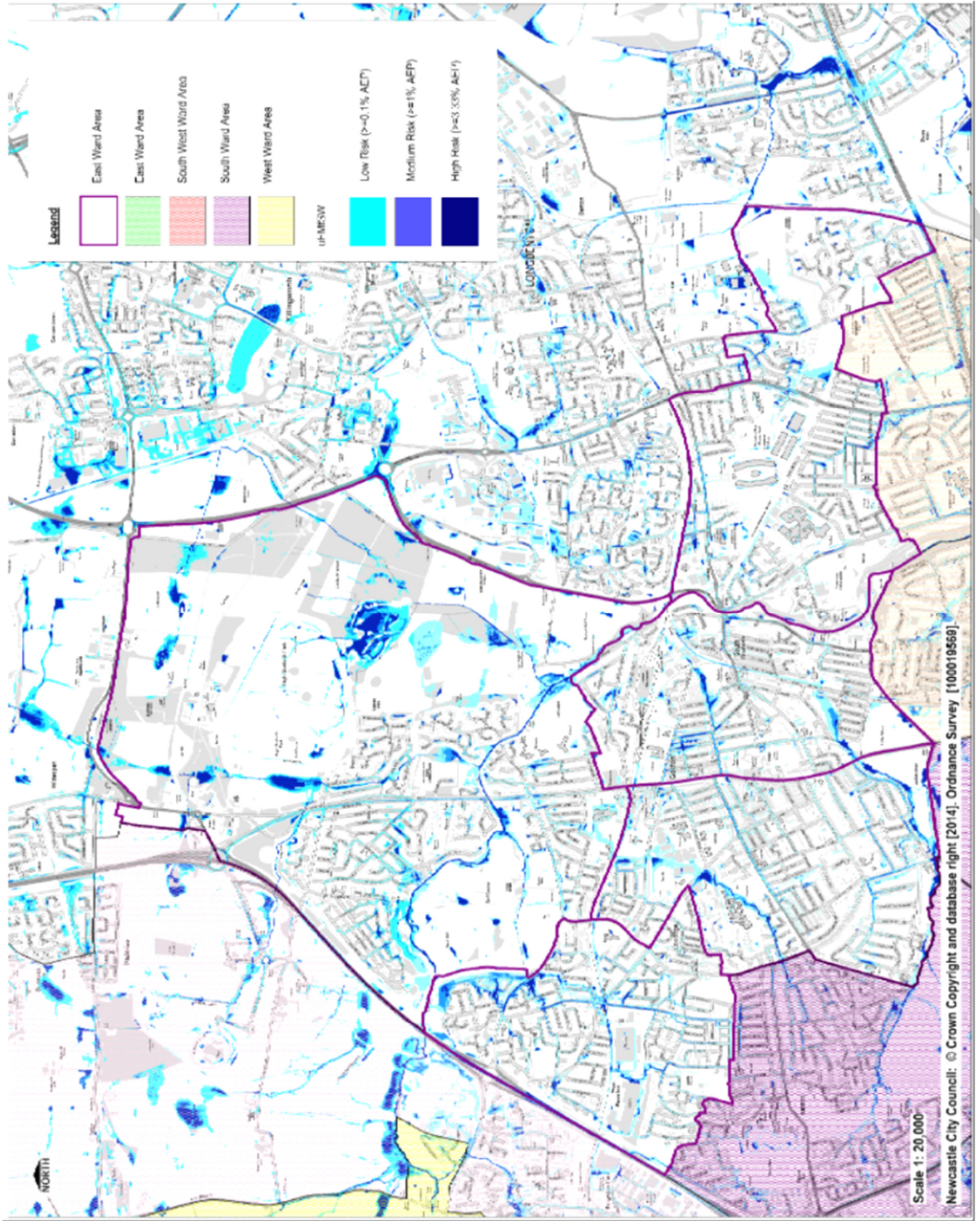
## From rivers

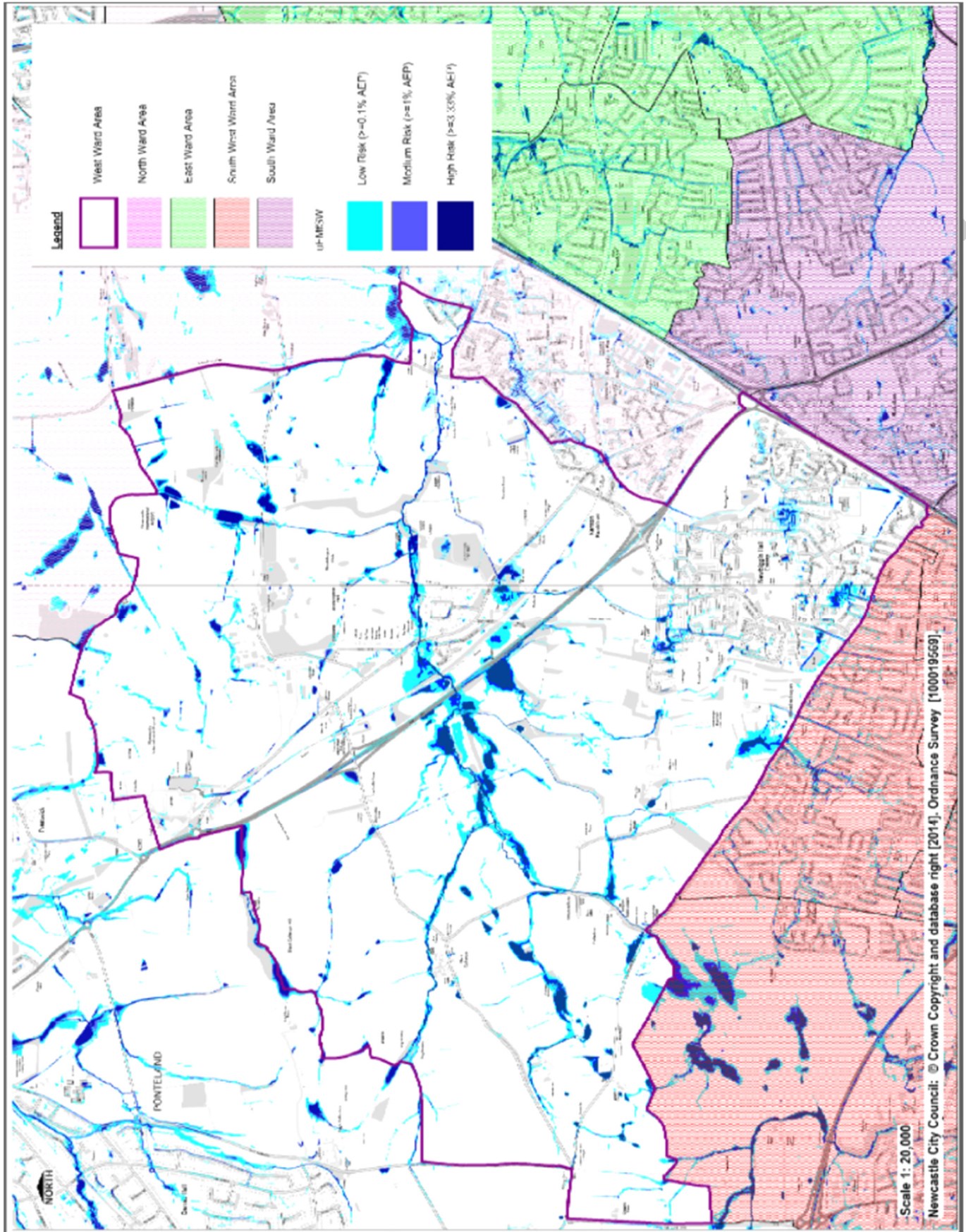
From PFRA table 5-2 flood zones 2 and 3

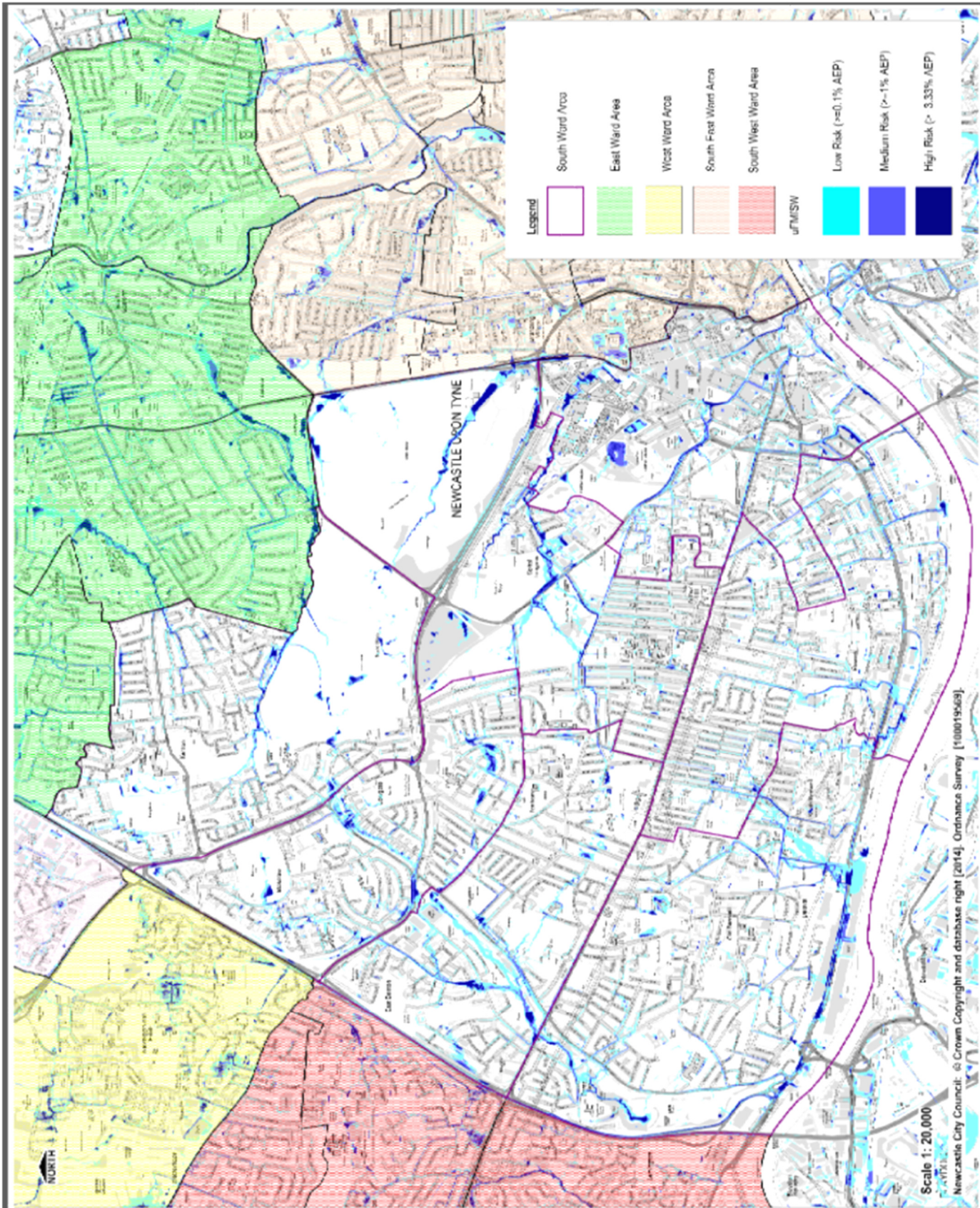
Table 5-2. Number of properties found in Flood Zones 2 and 3.

FLOOD ZONE	TOTAL PROPERTIES	RESIDENTIAL PROPERTIES	NON-RESIDENTIAL PROPERTIES
2	523	423	100
3	313	229	84

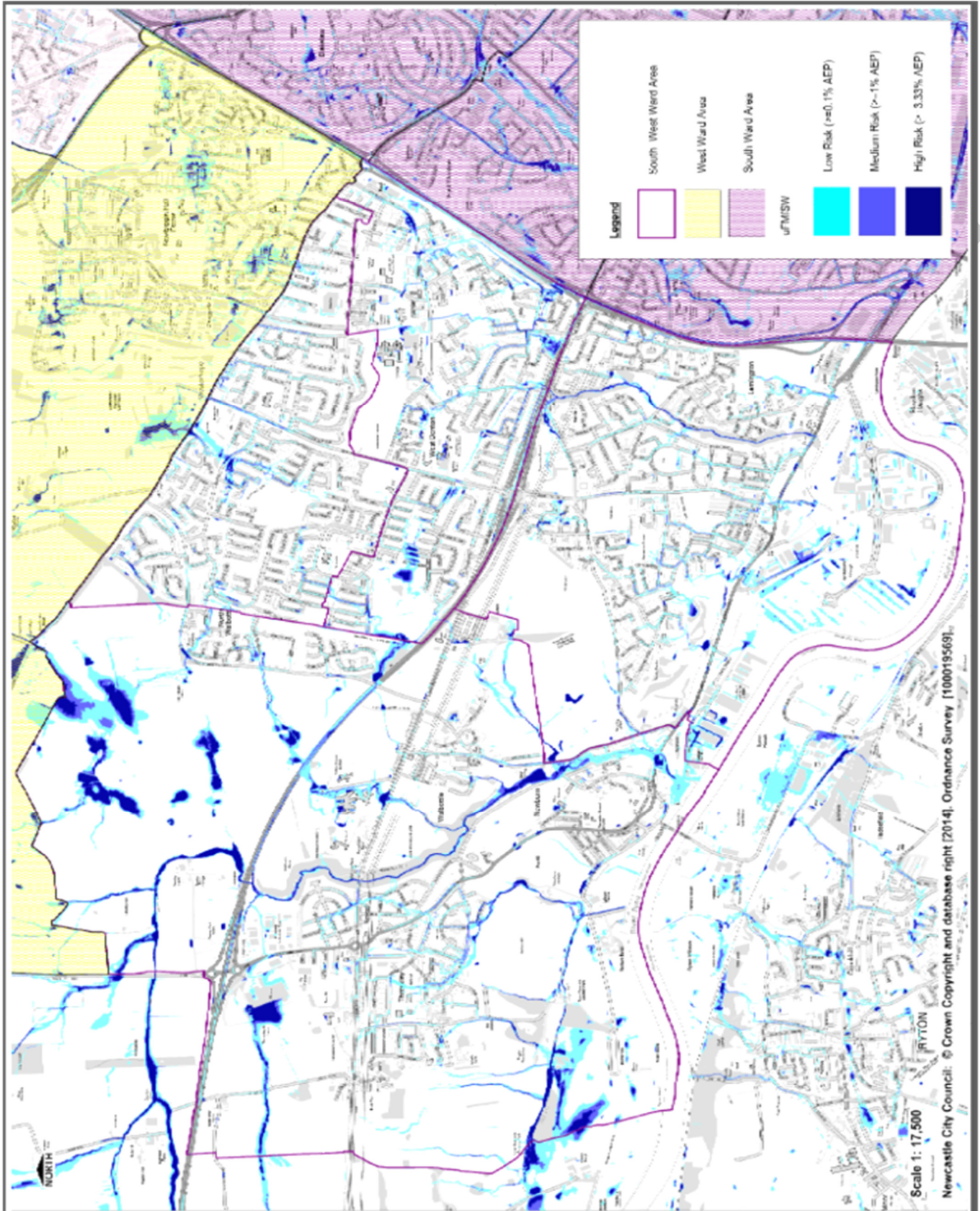


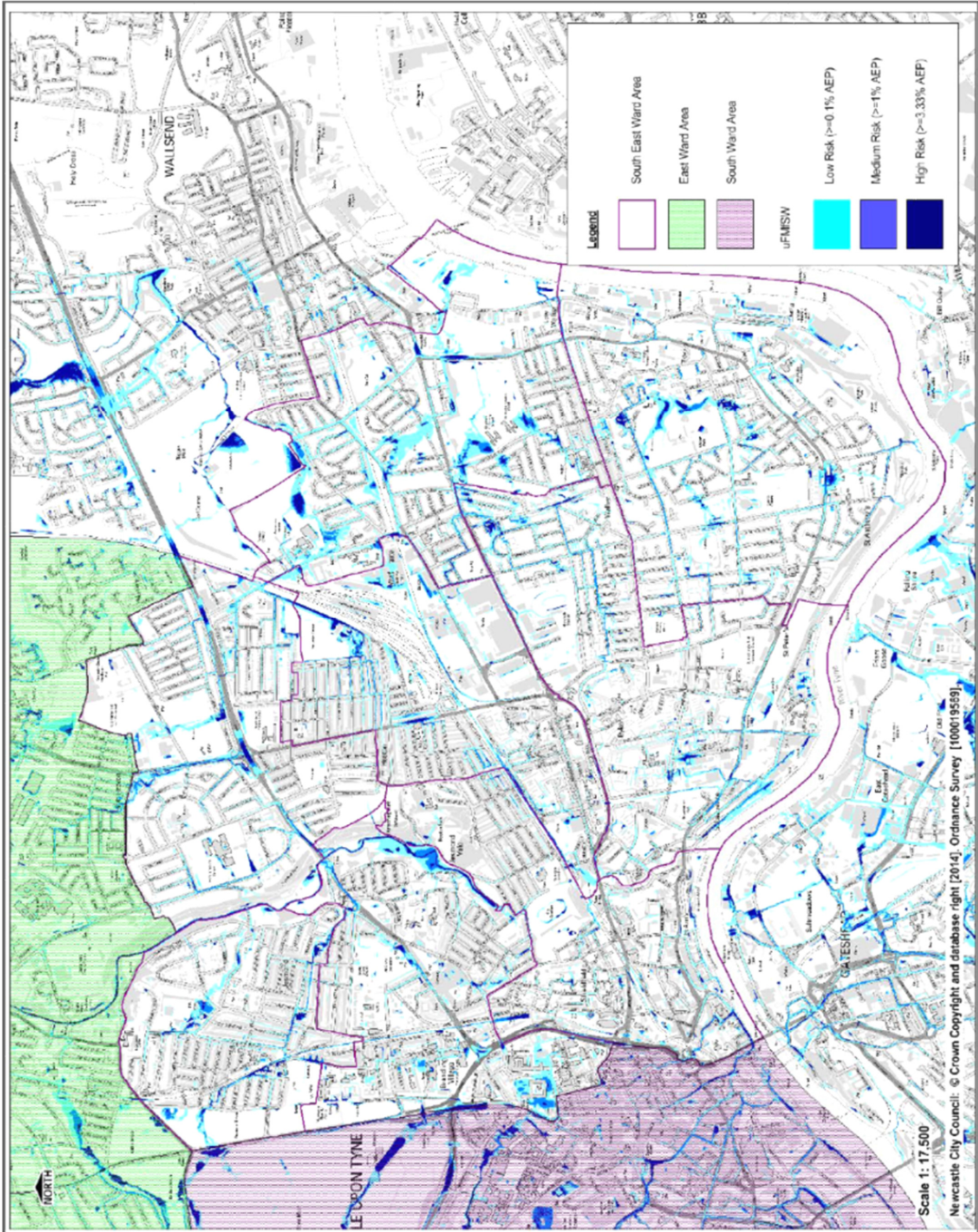


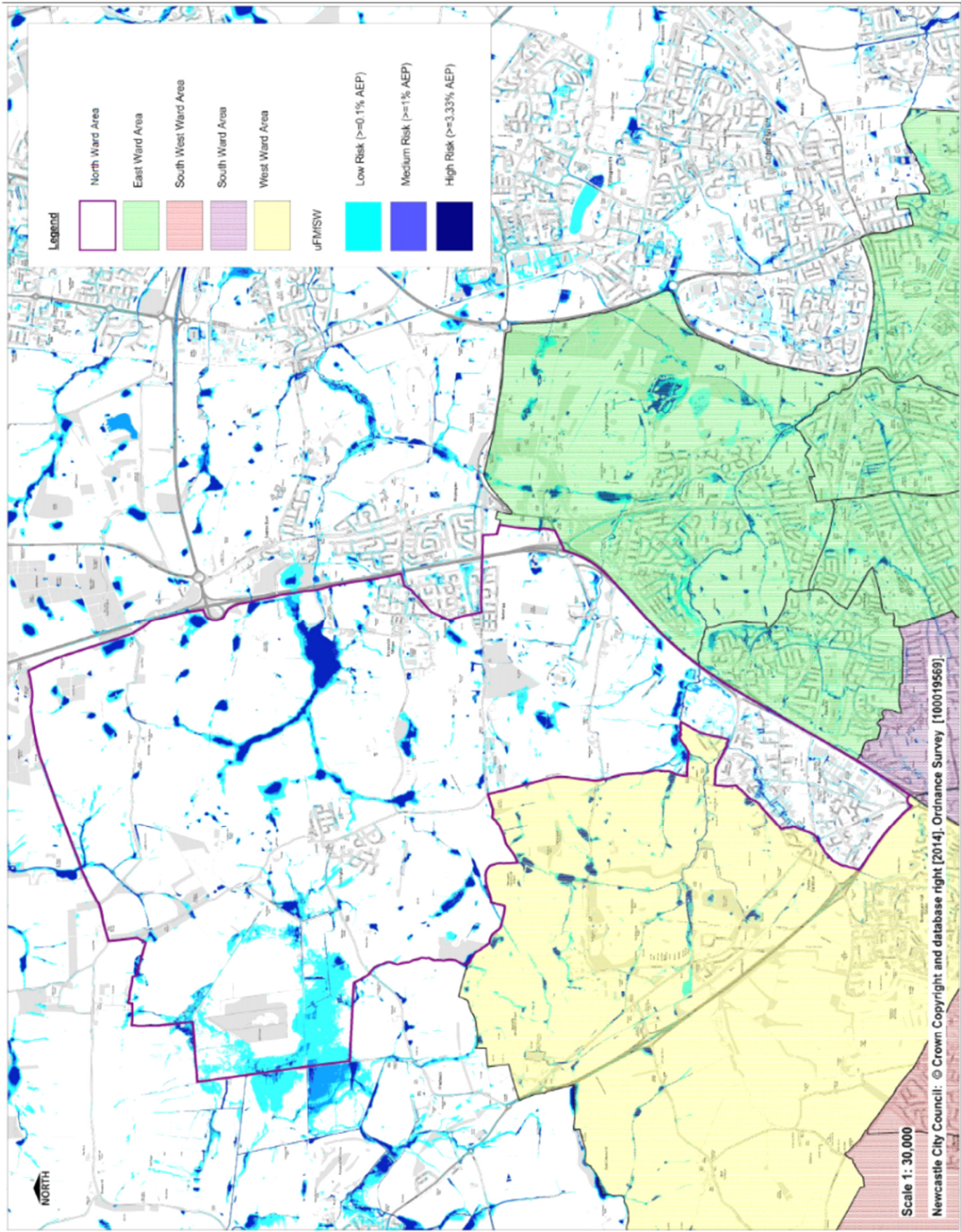












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## Appendix 11 Local Definition of Significant flooding

The proposed definition of Significant Surface Water Flooding is:

1. A flood occurs and is present for some time with no known source.
2. Any property experiences internal flooding, i.e. water has entered the property;
  - Basements and below ground level floors are included;
  - Garages are included if in the fabric of the building.
  - Garages adjacent or separate from the main building are not included;
  - Includes occupied caravans and park homes, but not tents.
  - This definition is based on homes, but includes businesses where water has entered the fabric of the buildings.
3. Properties affected by flooding:
  - those where water has entered gardens or surrounding areas which restricts access,
  - or where flooding has disrupted essential services to the property such as sewerage.
  - For businesses this includes those where the flood waters are directly preventing them trading as usual.
4. Single or multiple residential property in a local area experiences repeat internal flooding within 5 years of a previous flooding incident.
5. A single commercial property experiences internal flooding or a single commercial property greater than 500m<sup>2</sup> floor area experiences internal flooding.
6. One or more items of critical infrastructure experience flooding.
7. A transport link is impassable for at least:
  - a. 2 hours - Strategic transport routes
  - b. 6 hours – Minor less important transport routes
  - c. 10 hours –other local roads and other locations
8. Any incident that the LLFA consider that an investigation is required.

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## Appendix 12 Detailed technical investigations & Proposed Programme

Following the 2012 flooding events investigations into options for managing surface water flood risk were initiated in the areas shown below.

Area	Main receptor
<b>First group</b>	
Walkergate	Property, Public buildings and transport
Fairways Estate	Property and transport
Gosforth High Street	Transport
Kenton Road	Transport
Central Motorway	Transport
Coast Road	Transport
<b>Second group</b>	
Kingston Park	Property
Fawdon	Property and commercial
West Gosforth	Property and public buildings
Jesmond	Property and commercial
North Walker	Property
South Walker	Property
Quayside	Property and transport

Lead Risk Management Authority & Project Name	Northumbria RFCC Capital Investment Programme 2015/16 to 2020/21							FCRM Schemes						FCRM Schemes						Households with Reduced Risk of Flooding (OM2)	Households with Reduced Risk of Coastal Erosion (OM3)	Hectares of Water Dependant Habitat Created (OM4a)																			
	Total 2015/16 - 2020/21	FCRM GIA - 2015/16 - 2020/21	Local Levy - 2015/16 - 2020/21	Public Contributions - 2015/16 - 2020/21	Private Contributions - 2015/16 - 2020/21	Other EA - 2015/16 - 2020/21	Still Rqd - 2015/16 - 2020/21	FCRM GIA - 2016/17	FCRM GIA - 2017/18	FCRM GIA - 2018/19	FCRM GIA - 2019/20	FCRM GIA - 2020/21	FCRM GIA - 2021/22	Local Levy - 2016/17	Local Levy - 2017/18	Local Levy - 2018/19	Local Levy - 2019/20	Local Levy - 2020/21	Local Levy - 2021/22																						
<b>Newcastle City Council</b>																																									
Appletree Gardens Flood Alleviation Scheme	176,876	78,563	56,437	41,876																		50																			
Brandling Park Flood Alleviation Scheme	79,000	57,305	14,695	7,000																		4																			
Coast Road Drainage Scheme	195,500	56,500	44,000	95,000			96,400	79,100					21,400	35,100																											
Fairways Estate Flood Alleviation Scheme	90,000	48,062	27,938	14,000																		15																			
Fawdon Flood Alleviation Scheme	188,500	88,500	55,000	45,000			143,500						88,500									55,000		12																	
Newcastle Central Motorway Drainage Scheme	91,650	54,100	37,550				74,100	17,550					54,100									20,000	17,550																		
Newcastle Culvert Repairs and Access Improvements	429,200	294,200	135,000				203,500						133,500									70,000			20																
Newcastle Local Flood Alleviation Schemes	774,600	544,600	140,000	90,000			181,530	181,530	321,540				181,530	181,530	181,540								140,000		110																
Newcastle Quayside Flood Alleviation Scheme	800,000	800,000									800,000	2,200,000				800,000	1,200,000																								
Scrogg Road Flood Alleviation Scheme	551,050	277,800	173,250	100,000			186,500	314,550					136,500	141,300									173,250		90																
West Gosforth Flood Alleviation Scheme	87,100	49,600	17,500	20,000			67,100						49,600									17,500			16																



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## Appendix 13 Climate Change Assessment

### Regional Sea level rises to 2115

Although Newcastle is an inland City the river is tidal along the full length of the Authorities southern boundary with Gateshead and South Tyneside. We must take account of changes in sea level and assess their influence on tide levels. This will begin to affect property near a river that may not be at risk at present. There may be some increased interaction between sewer networks and river levels with the chance of localised flooding.

	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
East of England, east midlands, London, south-east England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South-west England	3.5	8.0	11.5	14.5
North-west England, north-east England (north of Flamborough Head)	2.5	7.0	10.0	13.0

#### Notes to table 4:

A, For deriving sea levels up to 2025, the 4mm per year, 3mm per year and 2.5mm per year rates (covering the three geographical groups respectively), should be applied back to the 1990 base sea level year. From 2026 to 2055, the increase in sea level in this period is derived by adding the number of years on from 2025 (to 2055), multiplied by the respective rate shown in the table. Subsequent time periods 2056 to 2085 and 2086 to 2115 are treated similarly.

## National Peak Rainfall Intensities and River Flows to 2115

<b>Table 5: Recommended national precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights Parameter</b>	<b>1990 to 2025</b>	<b>2025 to 2055</b>	<b>2055 to 2085</b>	<b>2085 to 2115</b>
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%		
Offshore wind speed	+5%			+10%
Extreme wave height	+5%			+10%

## Notes to table 5:

A, Refer to Department for Environment, Food and Rural Affairs FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts, October 2006, for details of the derivation of this table.

B, For deriving peak rainfall, for example, between 2025 and 2055 multiply the rainfall measurement (in mm per hour) by 10 per cent and between 2055 and 2085 multiply the rainfall measurement by 20 per cent. So, if there is a 10mm per hour event, for the 2025 to 2055 period this would equate to 11mm per hour; and for the 2055 to 2085 period, this would equate to 12mm per hour. Other parameters in table 5 are treated similarly.

Predicted detailed rainfall changes for Newcastle upon Tyne to 2080's

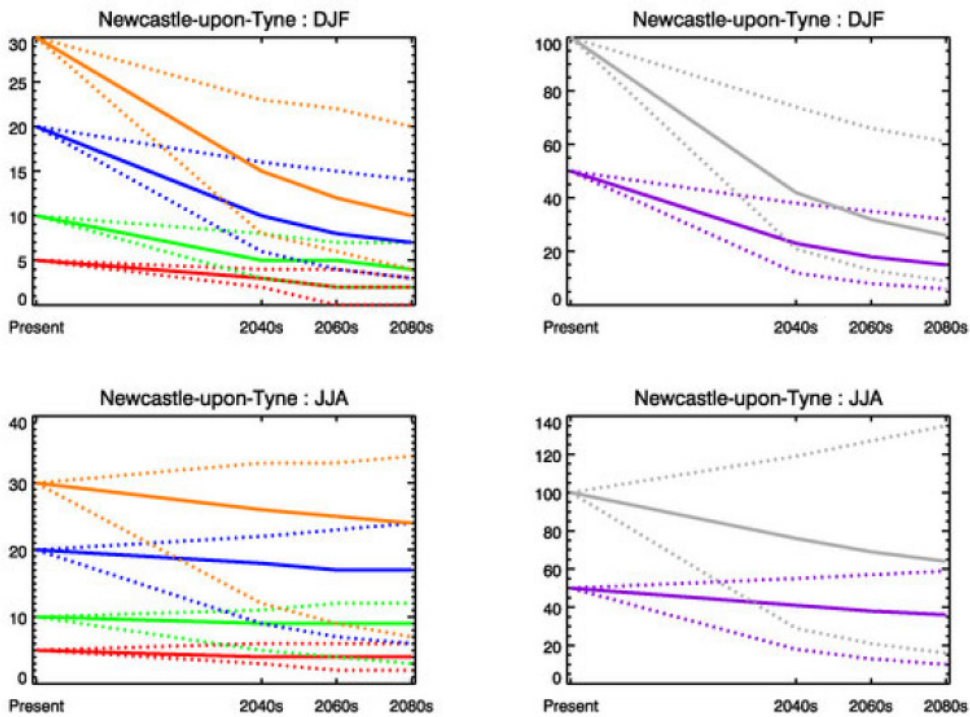
Variable	Probability Level	2020s			2050s			2080s		
		Low Emissions	Med. Emissions	High Emissions	Low Emissions	Med. Emissions	High Emissions	Low Emissions	Med. Emissions	High Emissions
% Increase in precipitation (Annual)	10%	-4.54%	-4.84%	-5.27%	-6.7%	-5.72%	-6.04%	-5.76%	-6.6%	-7.82%
	50%	0.71%	0.23%	0.02%	-0.75%	-0.17%	0.00%	0.34%	-0.1%	0.53%
	90%	6.28%	5.61%	5.62%	5.58%	5.8%	6.5%	6.89%	6.66%	9.49%
	Wider Range	-5.27% to 6.28%			-6.7% to 6.5%			-7.82% to 9.49%		
% Increase in precipitation ( Summer (JJA) )	10%	-17.76%	-20.22%	-17.03%	-29.18%	-31.07%	-32.23%	-30.58%	-37.74%	-44.88%
	50%	-5.31%	-6.6%	-4.14%	-12.11%	-15.34%	-15.18%	-13.94%	-19.01%	-23.62%
	90%	8.2%	8.49%	9.72%	7.42%	1.36%	2.74%	3.49%	0.85%	-0.75%
	Wider Range	-20.22% to 9.72%			-32.23% to 7.42%			-44.88% to 3.49%		
% Increase in precipitation ( Winter (DJF) )	10%	-3.96%	-4.64%	-3.1%	-0.21%	1.48%	2.07%	2.6%	2.84%	5.9%
	50%	6.39%	5.91%	6.88%	12.16%	14.99%	16.92%	16.56%	20.19%	27.07%
	90%	18.51%	18.34%	18.67%	28.23%	33.3%	37.17%	36.4%	46.15%	60.21%
	Wider Range	-4.64% to 18.67%			-0.21% to 37.17%			2.6% to 60.21%		
% Change in precipitation on the wettest day (mm/day) Winter	10%	-7.66%	-6.76%	-6.15%	-2.85%	-0.71%	-0.55%	-0.40%	2.75%	4.88%
	50%	5.38%	5.27%	7.00%	10.93%	13.54%	14.72%	14.77%	19.23%	24.60%
	90%	20.52%	19.12%	22.26%	27.56%	31.03%	33.77%	33.97%	40.88%	52.15%
	Wider Range	-7.66% to 22.26%			-2.85% to 33.77%			-0.4% to 52.15%		
% Change in precipitation on the wettest day (mm/day) Summer	10%	-13.88%	-15.84%	-16.60%	-16.14%	-20.52%	-20.21%	-15.6%	-22.47%	-26.81%
	50%	0.8	-0.33	-0.92%	-0.65%	-4.23%	-3.77%	-0.61%	-5.38%	-8.03%
	90%	18.01%	18.01%	17.63%	17.69%	14.86%	15.47%	17.03%	14.55%	13.64%
	Wider Range	-13.88% to 18.01%			-20.52% to 17.69%			-26.81% 17.03%		

Source: UKCP09 projections for Newcastle

Key points to note are:

- Annual rainfall may remain constant.
- Summer rainfall totals may decline
- Winter rainfall is expected to increase
- Winter wettest days may be significantly wetter
- Summer wettest days may be slightly drier

	Baseline (1960-1991)	Relative Change			Absolute change		
		2020s	2050s	2080s	2020s	2050s	2080s
Summer mean precipitation	2mm/day	-20.2% to 9.7%	-32.23% to 7.42%	-44.88% to 3.49%	1.6-2.19mm/day	1.36-2.15mm/day	1.10-2.07mm/day
% Change in precipitation on the wettest day (mm/day) Summer	NA	-13.88% to 18.01%	-20.52% to 17.69%	-26.81% to 17.03%	NA	NA	NA
Winter mean precipitation	2mm/day	-4.64% to 18.7%	-0.3% to 37%	206% to 60.2%	1.91-2.37mm/day	1.99-2.74mm/day	2.05-3.20 mm/day
% Change in precipitation on the wettest day (mm/day) Winter	NA	-7.66% to 22.26%	-2.85% to 33.77%	-0.4 to 52.15%	NA	NA	NA



**Figure 1.** Change in return period for rainfall events with present-day return periods of 1 in 5 (red), 1 in 10 (green), 1 in 20 (blue), 1 in 30 (orange) [left-hand panels] and 1 in 50 (purple) and 1 in 100 years (grey) [right-hand panels]. The return periods are shown on the y-axis. The central estimate (50<sup>th</sup> percentile) is indicated by a solid line, and the 10<sup>th</sup> and 90<sup>th</sup> percentiles, calculated using the full range of probabilistic projections from UKCP09, illustrate the possible range of return periods and are shown by dotted lines. The present-day return periods are positioned at 1980 on the x-axis (marked as 'Present'). Changes for winter (DJF, top row) and summer (JJA, bottom row) have been calculated separately. Note that the scale of the y-axis is different for each panel

Source: Ofwat (2010) Changes in the frequency of extreme rainfall events for selected towns and cities

Appendix 14 National FCERMS

The strategy must be consistent with the national flood and coastal erosion risk management strategy for England (FWMA2010) that states:

**The overall aim of the strategy is to ensure the risk of flooding and coastal erosion is properly managed by using the full range of options in a co-ordinated way.**

[Understanding the risks, empowering communities, building resilience - The national flood and coastal erosion risk management strategy for England” (September 2011)]

Measure to achieve strategic aims	Achieving the Objectives	Guiding Principles	EA activity	Newcastle City Council activity	How will success be identified by Newcastle City Council	Target date
<p><b>Understanding the risks of flooding and coastal erosion, working together to put in place long-term plans to manage these risks and making sure that other plans take account of them</b></p>	<p><b>Understanding risks</b></p>	<p><b>Community focus and partnership working</b></p>	<p>Make sure that the appropriate data and information is shared consistently</p> <p>Providing additional information and guidance to help others assess their specific flood risks</p> <p>Develop and maintain national information on current and future risks arising from all sources of flooding and coastal erosion</p>	<p>Take opportunities within projects to work together in partnership to provide more holistic schemes and mutual benefit.</p> <p>Working together to develop sustainable projects.</p> <p>Development of regional suds advice for new developments.</p> <p>Standardise responses to planning applications. Continue to attend regional meetings and support appropriate initiatives.</p> <p>Quarterly meetings with NW and EA and regional authorities.</p> <p>Attend regional meetings such as TWFRM Partnership, Inland Water Group, Tyne Rivers Trust and Northumbria Integrated Drainage Partnership</p> <p>Encourage local communities and landowners to take action and contribute to reducing flood risk.</p> <p>Focus city for Blue-Green infrastructure academic project.</p> <p>Provide local input into decision making as a statutory consultee, consultation and maintaining partnerships with communities.</p> <p>Assist in LPA making risk based planning decisions.</p> <p>Local review of data for projects.</p> <p>Risk based approach to directing resources.</p> <p>Assist in preparation of emergency plans and responses to flood incidents.</p> <p>Review strategic plans</p> <p>Taken note of FCERM strategy, CFMP. Develop Surface water plans for Ouseburn and City Centre.</p>	<p>Develop working relationships with RMA's and identified beneficiaries.</p> <p>Regular attendance at meetings.</p> <p>Respond to major planning applications with surface water content.</p> <p>Provide advice on FRA's within the CDA identified in SFRA Level 2</p> <p>Use of priority scoring system for capital schemes</p> <p>Assisted in completion Local Flood Plan</p> <p>Review of PFRA and risk maps</p> <p>Projects identified and funded</p>	<p>On-going</p>
			<p><b>Catchment Cell based approach</b></p>	<p>Development of strategic plans such as catchment flood management plans and shoreline management plans and assist lead local flood</p>	<p>Use updated information to review the LFRMP and planning applications</p>	<p>Review completed</p>

Measure to achieve strategic aims	Achieving the Objectives	Guiding Principles	EA activity	Newcastle City Council activity	How will success be identified by Newcastle City Council	Target date
			<p>authorities in developing local flood risk management strategies and other plans that may affect or be affected by FCERM.</p> <p>Contribute to and take account of the national information provided by the Environment Agency and information from CFMPs, SM Ps and other plans as appropriate. Similarly strategic flood risk assessments (SFRAs) and coastal change vulnerability assessments produced in support of land-use planning decisions may form an important part of this work.</p>	Ouseburn and City Centre Surface Water Management Plans completed	Completion of Plans	Summer 2016
		<b>Sustainability</b>	Lead local flood authorities will establish and maintain a register of assets and other features that help to manage risks	<p>In place and to review following setting of definition of "significant flood risk" by the LFRMP</p> <p>Review predictions as they are updated and assess impact on flood risk.</p> <p>Develop specific local factors for climate change</p>	Asset Register reviews	On-going
		<b>Proportionate Risk based approaches</b>	Lead local flood authorities will develop and maintain information on flooding from ordinary watercourses, surface water and groundwater in the areas they cover.	<p>Use this information to review LFRMP and to map local flood risk.</p> <p>Review of SFRA and Critical Drainage areas</p> <p>Review LFRMP against latest draft of RBMP and RBFMP before publication</p>	On-going	As required
		<b>Multiple benefits</b>		Use GIS to map areas where there are opportunities for multiple benefits.	Review each project	On-going
		<b>Beneficiaries encouraged to invest in local risk management</b>		Identify project specific beneficiaries	Review each project	On-going
<b>Flood Risk Management scheme planning</b>		<b>Community focus and partnership working</b>	<p>Plans should identify the opportunities to manage the risks of Flooding</p> <p>Helping communities understand the risks they face</p> <p>Communities are involved in the development of these plans</p> <p>Through RFCCs, seek to ensure consistency between strategic and local plans</p> <p>LLFA to develop, maintain and monitor local flood risk management strategies that will build on CFMPs and SMPs and inform future developments of these plans.</p> <p>Ensure that flood and coastal erosion risk management activities are co-ordinated, facilitate sustainable risk management and make it easier to deliver multiple benefits</p> <p>Local resilience forums (LRFs) will develop, maintain and monitor multi-agency flood plans to plan for coping with the impacts of floods when they happen</p> <p>The Environment Agency will, where it is actively involved in capital investment, maintenance and the provision of warnings, continue to</p>	<p>Funded projects included in LFRMP</p> <p>Copies of EA risk maps on lime and in LFRMP</p> <p>Consult with local communities on projects</p> <p>Attend RFCC meetings</p> <p>Use EA plans to develop LFRMS</p> <p>Funding applications to EA for FDGiA require this</p> <p>Provide input into Flood Plans</p> <p>Working relationships with EA</p>	<p>Consultation on projects</p> <p>Attending meetings with residents and providing advice</p> <p>Completion of funding applications</p> <p>Completion of Flood Plan</p>	<p>On-going</p> <p>As required</p> <p>As required</p> <p>Summer 2016</p>

Measure to achieve strategic aims	Achieving the Objectives	Guiding Principles	EA activity	Newcastle City Council activity	How will success be identified by Newcastle City Council	Target date
			engage fully with the local risk management authorities and communities.  Work in partnership with others to make sure the plans and strategies are consistent with, and developed in conjunction with, related plans in the same area including local and neighbourhood development plans. Should also enable better linkages with other land-management plans and other activities, including land use planning, infrastructure investment plans and agriculture to ensure the best use of pooled resources;			
		<b>Catchment Cell based approach</b>	Linking with other plans such as river basin management plans (RBMPs)  Risk management actions are well co-ordinated across catchments  Catchment flood management plans (CFMPs) in place and monitored	Take account of current plans in preparation of LFRMP and SWMP's.  Responding to EA with evidence	As required	On-going
		<b>Sustainability</b>	Consider the wider carbon costs or benefits of adopting different FCERM measures  Contribute to the achievement of sustainable development, balancing the needs of society, the economy and the urban, rural and natural environment, taking account of the cultural heritage and seeking to secure environmental benefits;  Ensure that the costs of, and the schedule for carrying out, measures are clear and understood and that the measures selected reflect expected climate change impacts on future risk;  Meet legal requirements to assess the impacts of strategies (for example strategic environmental assessments or appropriate assessments as required by the Habitats Directive)	Comply with local sustainability policies and plans in all activities	As required	On-going
		<b>Proportionate Risk based approaches</b>	RFCC will review and approve Environment Agency plans and expenditure.  The Environment Agency will publish and regularly update its programme for implementing new risk management schemes and maintaining existing assets.  In managing the risks of flooding particularly from ordinary water courses, surface water and groundwater, lead local flood authorities and other authorities will need to work in partnership to co-ordinate their risk management activities.  Appraise and adopt, as appropriate, the full range of measures that may be available to manage risks.  Record the measures being implemented and provide local information to support the Environment Agency in developing the national understanding of risk and to meet the requirements of the Flood Risk Regulations	Attendance at RFCC meetings.  Agree to accept programme  Work with other RMA's.  Review options for any project and record	As required	On-going
		<b>Multiple benefits</b>	Supporting biodiversity, habitat creation or improving water quality.  Combinations of options should be considered and selected	Work with appropriate stakeholders to ensure these issues fully considered	As required	On-going
		<b>Beneficiaries encouraged to invest in local risk management</b>		Identify beneficiaries on scheme specific basis, can be in cash or in kind, eg access to land.	Contributions to full cost of scheme received	On-going



Measure to achieve strategic aims	Achieving the Objectives	Guiding Principles	EA activity	Newcastle City Council activity	How will success be identified by Newcastle City Council	Target date
	<b>Risk Management in rural areas</b>	<b>Community focus and partnership working</b>				
		<b>Catchment Cell based approach</b>				
		<b>Sustainability</b>				
		<b>Proportionate Risk based approaches</b>	Value agricultural land and the damages that can occur as a result of flooding and coastal erosion in assessing risk management options  Value the protection of rural and urban areas on an equal like-for-like basis	Consider rural fringe to the City and assess options when developing projects	As required	On-going
		<b>Multiple benefits</b>		Review projects to assess viability of any potential multiple benefits	As required	On-going
		<b>Beneficiaries encouraged to invest in local risk management</b>		Identify beneficiaries	Contributions obtained	On-going
<b>Avoiding inappropriate development in areas of flood and coastal erosion risk and being careful to manage land elsewhere to avoid increasing risks</b>		<b>Community focus and partnership working</b>	co-operation between the lead local flood authority and the planning authority	EA provided input into Core Strategy.  LLFA as statutory consultee for major applications takes note of policies identified in NPPF and Core Strategy, CS17.  LLFA to comment on FRA's for other applications	Major planning applications  Minor applications	On-going
		<b>Catchment Cell based approach</b>	Managing land use and developing/re-developing areas within a catchment or along the coast that are not directly at risk, to ensure that risks are not increased in other areas without prior agreement.	Planning applications for major schemes and minor applications in NCC defined CDA to assess this.  Investigate feasibility of on-line risk based assessment for minor applications like RBKC Small suds.	Major and minor applications	On-going
		<b>Sustainability</b>		Local plans and policies taken into consideration in Core Strategy including climate change  Include advice in developer guidance	Planning applications and designs	On-going

Measure to achieve strategic aims	Achieving the Objectives	Guiding Principles	EA activity	Newcastle City Council activity	How will success be identified by Newcastle City Council	Target date
		<b>Proportionate Risk based approaches</b>	Avoid inappropriate building or redevelopment in areas of high flood risk. Risks are effectively identified in local strategies	EA consulted on Core Strategy. Introduction of LLFA as statutory consultee for major planning applications with water management element. Reviewing planning applications with flood risk element prior to introduction of regulations	As required by planning application	On-going
		<b>Multiple benefits</b>		Developing regional guidance for developers about flood risk management and suds	Document agreed and available to developers	Summer 2016
		<b>Beneficiaries encouraged to invest in local risk management</b>		Encourage developers to work with RMA's and local communities and other interested stakeholders	Resistance to application reduced	On-going
<b>Building, Maintaining and improving FCERM systems to reduce the likelihood of harm to people and damage to the economy, environment and society</b>		<b>Community focus and partnership working</b>	FCERM systems are interlinked and their development and management should be carried out collaboratively to ensure these links are maintained effectively implementing measures so that they do not compromise, and where possible make it easier, for emergency services, local communities and infrastructure operators to cope with and respond to floods when they happen. Environment Agency continuing to develop and implement more efficient approaches to the procurement of capital schemes and making contractual frameworks accessible to other risk management authorities.	Projects being taken forward will continue to involve residents and businesses affected by flooding or the flood risk reduction project works Consult with all local residents affected by flooding or the works Seek contributions from stakeholders benefitting from a flood risk reduction project Assess procurement options on offer	As required	On-going
		<b>Catchment Cell based approach</b>	Sustainable Drainage Systems (SuDS) in new developments and redevelopments to manage surface water flood risk.	Compliance with national guidance and Core Strategy and regional policies	As required on any scheme with a surface water aspect	On-going
		<b>Sustainability</b>	Understanding and managing the whole-life costs of assets, for example using an 'asset management cycle' approach Minimise the impacts of development on flood risk and to improve water quality. New or re-developments should also consider how damages and risk to life from flooding can be avoided through better design and layout.	Consider options available for local management of assets. Environmental assessment of options to be undertaken prior to choice of preferred option. Review projects to enhance natural projects if they can support a reduction in flood risk Review projects to enhance environmental improvements if they can support a reduction in flood risk Continue to develop and seek funding for projects that improve wellbeing, reduce flood risk and allow changes to be made in future for the impact of climate change.	As required	On-going
		<b>Proportionate Risk based approaches</b>	Innovative approaches to managing risk may be undertaken alongside or instead of more traditional approaches. Maintaining reservoir safety will be risk-based	Consider innovative options if offered as an option Take advantage of opportunistic projects if practical by working with other RMA's to carry out supporting improvements to highway drainage	As required	On-going

Measure to achieve strategic aims	Achieving the Objectives	Guiding Principles	EA activity	Newcastle City Council activity	How will success be identified by Newcastle City Council	Target date
				Impact of reservoir safety to be reviewed as new information becomes available		
		<b>Multiple benefits</b>	In all cases, projects can seek to provide wider benefits for the community, for example improving the natural and built environment, preserving cultural heritage, supporting tourism, agriculture, economic development, and recreation.	Identify beneficiaries and other RMA's to work with on a specific project.	As required by project	On-going
		<b>Beneficiaries encouraged to invest in local risk management</b>	<p>The provision of funding from central government towards the construction and maintenance (including river and watercourse channel maintenance) of risk management assets.</p> <p>Forming partnerships with beneficiary groups can help to secure any additional funding necessary to achieve these aims.</p> <p>Considering alternative options for the operation, maintenance or replacement of FCERM assets by the Environment Agency or other public authorities, where public funding cannot be justified.</p> <p>Minimising barriers (for example, in administration) that may prevent landowners, community groups or individuals taking steps to manage risks.</p>	<p>Maximise contributions from funding sources.</p> <p>Identify appropriate beneficiaries</p> <p>Take part in innovative projects</p>	As required	On-going
	<b>Achieving wider environmental objectives and other benefits</b>	<b>Community focus and partnership working</b>	<p>Partnership working with local communities.</p> <p>Links with other plans such as RBMPs and infrastructure investment plans can help this approach and secure wider sources of funding,</p>	<p>Consultation with affected communities about projects to reduce flood risk and multiple benefits</p> <p>Keep them updated on progress</p>	As required	On-going
		<b>Catchment Cell based approach</b>	<p>Benefits of the work should outweigh any harmful consequences to: human health; the social and economic welfare of individuals and communities; infrastructure, and the environment (including cultural heritage).</p> <p>These provisions are important to ensure a proper balance between sustaining and enhancing the environment and reducing the risks to homes and businesses.</p>	<p>Assess options to identify optimum.</p> <p>Complete Environmental assessment for each project</p>	As required	On-going
		<b>Sustainability</b>	<p>Risk management authorities to aim to make a contribution to sustainable development</p> <p>Work with natural processes wherever possible</p> <p>Role of FCERM schemes in reducing the impacts of climate change should also be considered.</p>	Newcastle City Council's procurement policies and social value act commitment will ensure all contractors are required to minimise environmental impact and provide social and economic benefit to society.	As required	On-going
		<b>Proportionate Risk based approaches</b>				

Measure to achieve strategic aims	Achieving the Objectives	Guiding Principles	EA activity	Newcastle City Council activity	How will success be identified by Newcastle City Council	Target date
		<b>Multiple benefits</b>	<p>Flood risk and coastal erosion management measures provide a significant opportunity to improve the natural, rural and built environment, helping to shape places to provide better environments for people and businesses as well as provide habitats for wildlife and improve biodiversity.</p> <p>Maintenance and restoration of a range of ecosystem services, or natural functions of the environment, can provide valuable additional benefits</p> <p>Obligations set out through the EC Water Framework, Habitats and Birds Directives and other domestic commitments that link to FCERM must be met.</p>	<p>Comply with National, regional and local plans and strategies to identify range of potential benefits from a project.</p> <p>Assess funding options for benefit</p>	As required	On-going
		<b>Beneficiaries encouraged to invest in local risk management</b>		Seek contributions	Contribution to project received	On-going
<b>Building public awareness of the risk that remains and engaging with people at risk to encourage them to take action to manage the risks that they face</b>		<b>Community focus and partnership working</b>	<p>Communities and individuals in areas at risk of flooding and coastal erosion should take responsibility for understanding the risks and, where appropriate, take steps to protect themselves and others.</p> <p>The Environment Agency, lead local flood authorities and coastal erosion risk management authorities will work in partnership with communities to build awareness of flood and coastal erosion risks.</p> <p>liaise with those groups who may be better placed to provide links with communities such as local flood action groups or other organisations that represent the views of those living and working in areas at risk.</p> <p>link with the Cabinet Office's initiative to develop wider community resilience to threats and hazards.</p> <p>Communities, assisted by lead local flood authorities, should plan for the future and take appropriate steps to adapt to changing flood risks</p>	<p>Provide advice to residents and businesses interested in protecting their property</p> <p>Following 2012 events arranged for visit to City by National Flood Forum</p> <p>Seek to involve residents to manage some assets including closing flood gates or regular inspections for damage and reporting.</p>	Contact with resident	On-going
		<b>Catchment Cell based approach</b>				
		<b>Sustainability</b>		Inspect and clear culvert screens of debris before, during and after events	Reduced flood risk at culverts	On-going
		<b>Proportionate Risk based approaches</b>		<p>We will never say a flood won't occur but we will explain residents can help themselves to manage that risk in areas where a wider scheme is not viable.</p> <p>Encourage residents and businesses near main rivers to sign up for Environment Agency Flood warnings – alongside River Tyne and the Ouseburn for example.</p>	Speaking to residents and businesses	On-going
		<b>Multiple benefits</b>		Work with stakeholders to ensure risks are properly assessed and projects can provide practical benefits.		Project based

Measure to achieve strategic aims	Achieving the Objectives	Guiding Principles	EA activity	Newcastle City Council activity	How will success be identified by Newcastle City Council	Target date
				Consult and involve local communities in assessing options and developing design.		
		<b>Beneficiaries encouraged to invest in local risk management</b>	Householders and businesses at flood risk should take the appropriate steps to protect their properties through property level resistance and resilience measures.  Support this work by raising awareness and understanding and assisting the wider take up of flood resistance and resilience measures to reduce damage to buildings.	Seek contributions from beneficiaries, residents or businesses.  Encourage use of resilient features inside property.  Encourage residents and or businesses to establish local flood action groups.	Contributions received	On-going
<b>Improving the detection, forecasting and issue of warnings of flooding, co-ordinating a rapid response to flood emergencies and promoting faster recovery from flooding</b>		<b>Community focus and partnership working</b>	<p>Ensuring an effective response to incidents when they do happen</p> <p>Local flood risk management strategies should place a high priority on supporting communities and individuals in the event of floods.</p> <p>Encourage the formation of local flood action groups.</p> <p>Mechanisms for preparing for floods and other civil emergencies are set out in the Civil Contingencies Act (2004)</p> <p>Using local resilience forums (LRFs) that facilitate the preparation of emergency plans and co-operation between organisations that have emergency planning duties under the Act.</p> <p>Working with other LRFs to ensure provision of mutual aid and co-ordinated incident response within a catchment</p> <p>Reduce flood risks where needed during an incident</p> <p>Develop a single information portal to share consistent high-level information with the public on flooding before, during and after floods.</p> <p>National multi-agency register of flood rescue assets and the operational arrangements that will govern their use is being finalised and will be co-ordinated by the Fire and Rescue Services National Coordination Centre.</p> <p>Assessing whether there is a need to introduce a statutory duty on Fire and Rescue Services and other organisations to undertake work on flooding following the completion of the Flood Rescue National Enhancement Project</p> <p>Post-flood recovery is led by local authorities. Government has published the principles for when it will, in exceptional circumstances, consider providing additional financial support to assist affected local authorities with the costs of recovery.</p> <p>The issues likely to be faced in post-flood recovery should be considered in advance of an incident to understand the priorities within a community and opportunities for more sustainable reconstruction.</p> <p>Vehicles and their occupants may also be at high risk during floods and drivers can place themselves and their passengers in danger by underestimating the hazards presented, or hidden, by flood waters.</p> <p>People must also take great care to avoid placing themselves and others at risk when wading through flood waters and when working to protect or repair property during and after a flood incident.</p>	<p>To provide reviews of incidents as appropriate.</p> <p>NCC attended meetings and provided support</p> <p>Multi agency Flood Plan supported within EA and neighbouring Tyne Wear authorities</p> <p>Assist in preparation of Local Flood Risk Response Plan</p> <p>National Flood Forum visited City following 2012.</p> <p>Attend ward meetings/residents groups as necessary.</p>	Assist City council Resilience Team in developing their responses to flood incidents	On-going

Measure to achieve strategic aims	Achieving the Objectives	Guiding Principles	EA activity	Newcastle City Council activity	How will success be identified by Newcastle City Council	Target date
		<b>Catchment Cell based approach</b>				
		<b>Sustainability</b>	The overall aim is to provide people at risk of flooding from rivers, ground and surface water and the sea with appropriate, intuitive, targeted and effective flood information, forecasts and warnings that prompt the right actions and reduce the impacts and consequences of floods.	Information available on City Council website with links to other sources.		On-going
		<b>Proportionate Risk based approaches</b>	Environment Agency will continue to develop and improve the flood warning service working with the other risk management authorities to develop warnings for surface water flood risks	Pass information on to residents and businesses about flood warning availability	Encourage residents to sign up for warnings	On-going
		<b>Multiple benefits</b>				
		<b>Beneficiaries encouraged to invest in local risk management</b>				

Appendix 15 Northumbria River Catchment

Extracted from Draft Tyne River Basin Flood Risk Plan, 2015

Action name	Action details	Action location	Source of flood risk or coastal erosion											Category of Objective	Describe objective	Measures	Timing	Priority	Partnership Implementing Measures	Statutory or voluntary measure	Responsible authority	NCC Action	
			Flooding from rivers	Flooding from Rivers (ordinary watercourses)	Flooding from Rivers (main river plus ordinary)	Flooding from sea	Coastal erosion	Flooding from reservoirs	Surface water flooding	Groundwater flooding	Sewer flooding	Social	Environment										Economic
																Prevention, protection, preparedness etc	FRMP Planning Cycles e.g. 2015 - 2021; 2021 - 2027 etc	Critical, Very High, High, Moderate, Low	Action owner (bold), plan owner and support organisations	Statutory or voluntary	Action Owner		
Tyne - Lower Tyne 3	Establish and maintain a register of structures or features which are likely to have a significant effect on flood risk in the area together with information about them. Use this register to identify the location of pinch points where flood water may overflow.	Catchment Wide	N	N	Y	N	N	N	N	N	N	N	Y	N	N	By developing a register we are aware of structures which may impact on flood risk and ensure that such structures are maintained	M2 - Prevention	2015 - 2021	High	Newcastle City Council   Environment Agency	Statutory FRMP	Newcastle City	Completed
Tyne - All-4	Ensure that all water company assets such as Sewage treatment works and Water Treatment Works which are at risk of flooding are resilient to enable them to resume operation with minimal disruption	Catchment Wide	N	N	Y	N	N	N	N	N	N	N	Y	N	N	Ensuring that key infrastructure can operate during flooding or recover rapidly after flooding assists in making communities more resilient to flooding and speeds up the recovery process	M3 - Protection	2015 - 2021	Moderate	Northumbria Water   Environment Agency	Statutory FRMP	Northumbrian	
Tyne - Lower Tyne 6	Consider the vulnerability of key infrastructure such as roads, schools, community buildings and prepare suitable measures to ensure the assets are resilient and are able to remain open or be open rapidly during and after flood events	Catchment Wide	N	N	Y	N	N	N	N	N	N	N	Y	N	N	Ensuring key infrastructure can operate during, or recover rapidly after, flooding assists in communities	M4 - Preparedness	2015 - 2021	Low	Newcastle City Council   Environment Agency	Statutory FRMP	Newcastle City Council	On-going

																							es being resilient to flooding and speeds up recovery									
Tyne - Ouseburn	Work in partnership to develop flood alleviation scheme to address flood risk from multiple sources	Gosforth	Y							Y		Y	Y	Y	Y	Y	Y						Working in partnership to reduce the frequency of flooding from all sources	M2 - Prevention	2015 - 2021	High	Environment Agency   Northumbria Water   Newcastle City	Statutory FRMP	Environment Agency			
Tyne - Ouseburn 1	Investigate opportunities to protect residential properties	Killingworth / Longbenton	Y	Y						Y		Y	Y	Y	Y	Y						Working in partnership to develop opportunities to reduce flooding from all sources	M2 - Prevention	2015 - 2021	High	Environment Agency   Northumbria Water   Newcastle City   North Tyneside	Statutory FRMP	Environment Agency				
<b>Proposed measures</b>																																
Tyne - Lower Tyne 9	Investigate ideas to reduce flood risk to the quayside area of Newcastle	Newcastle	Y																			Working in partnership to identify opportunities to reduce the frequency of flooding from all sources	M3 - Protection	2015 - 2021	Low	Environment Agency   Northumbria Water   Newcastle City	Statutory FRMP	Environment Agency				

Flood Incident Management Plan

To achieve these outcomes they intend to deliver the following developments in the service over the next five years:

- Greater personalisation of the service to focus on advice and warning on risk to life as well as property risk.
- Greater use of volunteers for monitoring and response activities.
- Delivering a nationally consistent, forecast-led warning service.
- Sharing more data and information in a visual way through multiple channels including a refreshed www.gov.uk service.
- Support to partners to help them plan and respond to flooding from all sources more effectively. This includes planning for deployment of temporary defences which was a major learning point from the Winter Floods of 2013/14.
- Improving their own response resilience through capability assessment and accreditation for some duty roles.
- Replacing their flood incident IT systems to reduce operating costs and facilitate the six customer focused outcomes they have set.



Appendix 16 MONITORING AND REVIEW

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
National FCERM Strategy	X						X				
River Basin Flood Risk man Strat					X						X
PFRA review	Initial issue						1st review				
Flood risk mapping			Initial issue						1st review		
LFRMS review						Initial issue		Tri-annual report			1st reissue
Core Strategy					Strategy adopted						
<b>Monitoring</b>											
% of river length assessed as fairly good or very good for chemical quality and biological quality, by river						X	X	X	X	X	X
Number of planning permissions granted contrary to Environment Agency advice on grounds of flood risk or water quality						X	X	X	X	X	X
Number and proportion of completed new development which will be at risk from fluvial, tidal, surface water and sewer flooding indicated by the SFRA						X	X	X	X	X	X

Completed new development which <ul style="list-style-type: none"> <li>Discharge surface water to a watercourse</li> <li>Discharge surface water to sewers and combined sewers</li> <li>Incorporate suds</li> </ul>						X	X	X	X	X	X
Infrastructure Delivery plan						X	X	X	X	X	X
Mayors Adapt reporting						X		X		X	
National Adaptation Programme report					X					X	
NWL Asset Management Programme					AMP6 2015-2020 starts			Preparati on starts for AMP7 2020-2025		AMP7 2020-2025 starts	

Appendix 19 Investment Strategy

Insert FDGiA projects and Cabinet Report

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## Figures

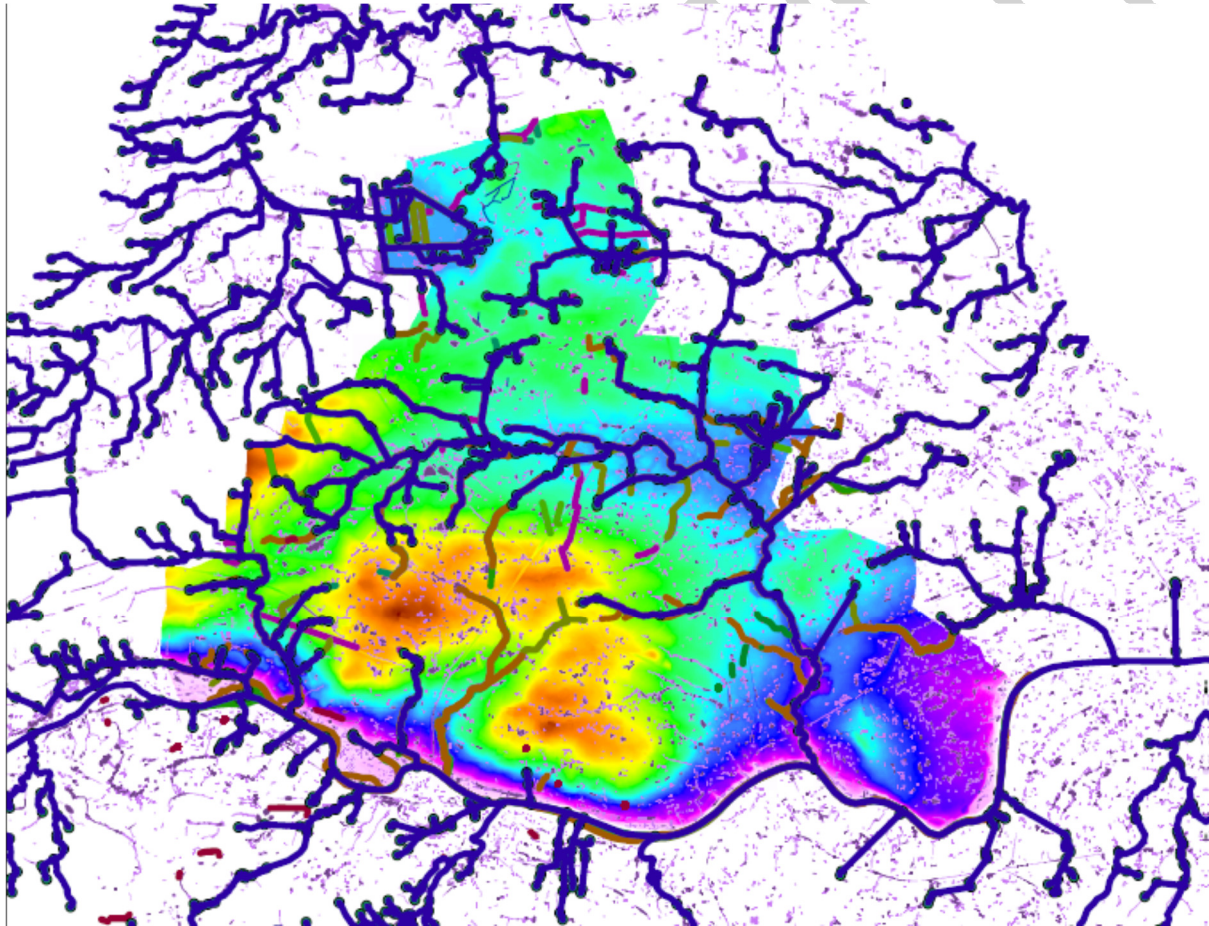
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### Figure 1 Topography, detailed and historic rivers and flood risk areas

Topography – Purple shows the lowest levels in the City around the river bank. It rises to high ground in the west of the city along the line of what was Hadrians Wall and the modern West Road towards the A69 and Carlisle.

The extent of watercourses that did exist prior to the development of the modern City have mostly disappeared. Sometimes into surface water sewer networks and sometimes they have been filled in and lost forever.

We need to mimic this drainage system in future so we have as natural drainage network as is possible in practical terms.



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## TABLES

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**Table 1 Definitions of types of flooding**

Type of Flood	Legal Definition	What happens?
Surface runoff	Rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving), and has not entered a watercourse, drainage system or public sewer.	Heavy rain overwhelms the sewer systems and flows over the ground surface
Groundwater	Water which is below the surface of the ground and in direct contact with the ground or subsoil	Normally stays below ground level but following heavy rain comes up out of the ground through rock, gravel or soil.
Ordinary Watercourses (including lakes and ponds attached to them)	A watercourse, lake or pond that does not form part of a main river.	The watercourse, lake or pond breaks its banks and flows over the ground surface. Private la

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## Glossary

Item	Explanation
Environment Agency	functions so to protect or enhance the environment, taken as a whole, as to make the contribution towards attaining the objective of achieving sustainable development
Flash Flooding	Flash flooding happens when <u>rain</u> falls so fast that the underlying ground cannot cope, or drain it away, fast enough. Roads can become like rivers and if there is a lot of water, it can flood buildings and carry cars away. So, if the rain is falling too fast for the ground or drains to cope, there is a risk of flash flooding.
Flood	where land not normally covered by water becomes covered by water. It does not matter whether a flood is caused by heavy rainfall, a river overflowing or its banks being breached, a dam overflowing or being breached, tidal waters, groundwater or anything else (including any combination of factors). But it does not include a flood from any part of a sewerage system, unless caused by an increase in the volume of rainwater (including snow and other precipitation) entering or otherwise affecting the system, or a flood caused by a burst water.
Flood and Water Management Act 2010	An Act to make provision about water, including provision about the management of risks in connection with flooding and coastal erosion
Fluvial Flooding	During times of heavy rainfall watercourses' capacity can be exceeded resulting in flooding to land, infrastructure and homes. - See more at: <a href="http://www.local.gov.uk/web/guest/flood-and-coastal-erosion-risk-management/-/journal_content/56/10180/3569695/ARTICLE#sthash.jOah0KEI.dpuf">http://www.local.gov.uk/web/guest/flood-and-coastal-erosion-risk-management/-/journal_content/56/10180/3569695/ARTICLE#sthash.jOah0KEI.dpuf</a>
Groundwater flooding	All water which is below the surface of the ground and in direct contact with the ground or subsoil. Flooding from this source is not always immediate and likely to occur a significant time after heavy or prolonged rain. Characterised by: <ol style="list-style-type: none"> <li>1. Occurring days or weeks after heavy rainfall.</li> <li>2. Usually lasts a long time.</li> <li>3. Does not always emerge where it is expected.</li> </ol>
Highway Authority	The section of the local authority responsible for managing the public highway network? See section 1 of the Highways Act 1980
Lead Local Flood Authority	The unitary authority for the area responsible for managing local flood risk.

Legal/Law/Legislation	See Appendix 1
Local flood risk	flood risk from surface runoff, groundwater and ordinary watercourses
Local Flood Risk Management Strategy	A lead local flood authority for an area in England must develop, maintain, apply and monitor a strategy for local flood risk management in its area
Main river	Watercourse shown as such on a main river map and includes any structure or appliance for controlling or regulating the flow of water into, in or out of the channel
National flood and coastal erosion risk management strategy	Section 7 fwma2010
Ordinary watercourse flooding	Watercourse that does not form part of a main river and can include ditches and streams. Flooding occurs when water over tops the banks.
Pitt Review	Wide-ranging and consider all available evidence on the flooding that occurred in England during June and July 2007, its impacts and what this means for the future.
Pluvial Flooding	Localised heavy rainfall on impermeable or already saturated surfaces can generate surface water run-off beyond the capacity of the drainage network. Surface water cannot then enter the sewerage system and the drainage network overflows, resulting in overland flow. - See more at: <a href="http://www.local.gov.uk/flood-and-coastal-erosion-risk-management/-/journal_content/56/10180/3491683/ARTICLE#river">http://www.local.gov.uk/flood-and-coastal-erosion-risk-management/-/journal_content/56/10180/3491683/ARTICLE#river</a>
Return period	An estimate of the likelihood of an event, such as a flood to occur.
Risk	In respect of an occurrence assessed and expressed as a combination of the probability of the occurrence with its potential consequences.
Risk management	anything done for the purpose of analysing a risk, assessing a risk, reducing a risk, reducing a component in the assessment of a risk, altering the balance of factors combined in assessing a risk, or otherwise taking action in respect of a risk or a factor relevant to the assessment of a risk (including action for the purpose of flood defence).
Surface water flooding	Main sources are from drainage systems, runoff from land, ordinary watercourses and ditches following heavy rain. It happens quickly especially in urban areas. Can also be the result of interactions between main rivers, ordinary watercourses and drainage outfalls of any type.

Surface run-off	means rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving), and has not entered a watercourse, drainage system or public sewer
Watercourse	section 72(1) of the Land Drainage Act 1991

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