BARNSLEY
Metropolitan Borough Council

Barnsley Metropolitan Borough Council
Preliminary Flood Risk Assessment Report



Final Report ***(July 2011)***

Revision Schedule

Preliminary Flood Risk Assessment
May 2011

Revision	Date	Details	Prepared by	Reviewed by	Approved by
01	May 2011	Draft Report (for Internal Distribution)	***Derek Bell*** Principal Network Resilience Officer ***Wayne Atkins*** Senior Drainage Engineer	***Stephen Gibbons*** Group Leader - Network Resilience	
02	June 2011	Final Report	***Derek Bell*** Principal Network Resilience Officer ***Wayne Atkins*** Senior Drainage Engineer	***Dave Pownall*** Chief Engineer - Network Management	***Darren Richardson*** Assistant Director - Operations

Contents

Executive Summary

This report has been prepared to assist Barnsley MBC meet their duties to manage local flood risk and deliver the requirements of the Flood Risk Regulations (2009) and within the new legislative framework Barnsley MBC is defined as a Lead Local Flood Authority (LLFA). This Preliminary Flood Risk Assessment (PFRA) Report along with the supporting spreadsheet and GIS layer represents the first stage of the reporting requirements which is set out in the Regulations.

The PFRA process is aimed at providing a high level overview of flood risk from local flood sources, including surface water, groundwater, ordinary watercourses and canals. As the LLFA, Barnsley MBC must submit their PFRA to the Environment Agency for review by 22nd June 2011. The methodology for producing this PFRA has been based on the Environment Agency's Final PFRA Guidance and also Defra Guidance on selecting Flood Risk Areas, both of which were published in December 2010.

The Environment Agency has used national methodology, set out by Defra, to identify indicative Flood Risk Areas across England. Ten Flood Risk Areas were identified across the country; however none of these sites are located within Barnsley MBC's administrative area.

Information relating to 989 incidents of flooding, caused by flooding from local sources was collated and analysed. The details on these incidents of flooding were drawn from summarised Past flood data, therefore specific information regarding the extent and consequences of the events were largely unavailable from use in this report.

Based on the evidence that was collated for the Barnsley area, none of the past flooding events were considered to have had 'significant harmful consequences' as defined in the Regulations.

Glossary

Term	Definition
Act	A Bill approved by both the House of Commons and the House of Lords and formally agreed to by the reigning monarch (known as Royal Assent)
Aquifer	A source of groundwater comprising water bearing rock, sand or gravel capable of yielding significant quantities of water.
Assets	Structures, or a system of structures used to manage flood risk.
Asset Management	A plan for managing water and sewerage company (WaSC) infrastructure and other assets in order to deliver an agreed standard of service
AStSWF	Areas Susceptible to Surface Water Flooding
BMBC	Barnsley Metropolitan Borough Council
Catchments	An area that serves a river with rainwater. Every part of land where the rainfall drains to a single watercourse is in the same catchment.
Catchment Flood Management Plan	A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
CFMP	Catchment Flood Management Plan
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions.
COMAH	Control of Major Accident Hazards.
Cultural heritage	Buildings, structures and landscape features that have an historic value. These are also known as heritage assets.
Culvert	A channel or pipe that carries water below the level of the ground.
Defences	A structure that is used to reduce the probability of floodwater or coastal erosion affecting a particular area (for example a raised embankment or sea wall)
Defra	Department for Environment, Food and Rural Affairs
DEM	Digital Elevation Model
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years (on average) i.e. flooding with a 1 in 20 chance of occurring each year.
DTM	Digital Terrain Model
EA	Environment Agency
FCERM	Flood and coastal erosion risk management
FEO	Flood Event Outline.
Flood	The temporary covering by water of land not normally covered with water
Flood Defence	Infrastructure used to protect an area against floods such as floodwalls and embankments; they are designed to a specific standard of protection (design standard).

Term	Definition
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG.
Flood Risk Regulations ("the Regulations")	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Union (EU) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.
Flood & Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which (partly) is to clarify the legislative framework for managing surface water flood risk in England.
FMfSW	Flood Map for Surface Water
Fluvial flooding	Flooding resulting from water levels exceeding the bank level of a river.
Groundwater	Water which is below the surface of the ground and in direct contact with the ground or subsoil.
HSWGW	Historic Surface Water and Groundwater.
IDB	Internal Drainage Board
IPCC	Intergovernmental Panel on Climate Change
Indicative Flood Risk Areas	Areas determined by the Environment Agency as indicatively having a significant flood risk, based on guidance published by Defra and WAG and the use of certain national datasets. These indicative areas are intended to provide a starting point for the determination of Flood Risk Areas by LLFAs.
ISWMG	Integrated Surface Water Management Group.
LDF	Local Development Framework
LLFA / Lead Local Flood Authority.	Local Authority responsible for taking the lead on local flood risk management
LiDAR	Light Detection and Ranging
Local flood risk	Flood risk from sources other than main rivers, the sea and reservoirs, principally meaning surface runoff, groundwater and ordinary watercourses.
Local Resilience Forum	A multi-agency forum, bringing together all the organisations that have a duty to cooperate under the Civil Contingencies Act, and those involved in responding to emergencies. They prepare emergency plans in a co-ordinated manner.
LPA	Local Planning Authority
LRF	Local Resilience Forum
MAFP	Multi-Agency Flood Plan
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
NRD	National Receptor Dataset – a collection of risk receptors produced by the Environment Agency.
Ordinary watercourses	All watercourses that are not designated Main River, and which are the responsibility of Local Authorities or,
Partner	A person or organisation with responsibility for the decision or actions that need to be taken.
PFRA	Preliminary Flood Risk Assessment
Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.

Term	Definition
Pluvial Flooding	Flooding from water flowing over the surface of the ground or ponding before it has reached a watercourse or drainage system; often occurs when the soil is saturated and natural drainage channels or artificial drainage systems have insufficient capacity to cope with additional flow.
PPS25	Planning and Policy Statement 25: Development and Flood Risk
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.
Risk Management Authority	As defined by the Flood and Water Management Act
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SFRA	Strategic Flood Risk Assessment
Stakeholder	A person or organisation affected by the problem or solution, or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
SuDS / Sustainable Drainage System	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Surface Water	Rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving), and has not entered a watercourse, drainage system or public sewer.
SWMP	Surface Water Management Plan
WaSC	Water and Sewerage Company
YW	Yorkshire Water Services Ltd

1 Introduction

1.1 Preliminary Flood Risk Assessment

This document reports the findings of research by Barnsley MBC towards the preparation of a Preliminary Flood Risk Assessment (PFRA) for their administrative area.

The chief drivers behind this research and preparation of the PFRA report are two sets of new legislation: the Flood Risk Regulations (The Regulations), which came into force on the 10th December 2009, and the Flood & Water Management Act (FWMA) which gained Royal Assent on the 8th April 2010. Under these pieces of legislation, all Unitary Authorities, and in two-tier systems, all County Councils, including Barnsley MBC, are designated a Local Lead Flood Authority (LLFA) and have formally been allocated a number of key responsibilities with respect to local flood risk management. A full description of these responsibilities is provided in Chapter 2.

The purpose of the Flood Risk Regulations was to transpose the EC Floods Directive (Directive 2007/60/EC on the assessment and management of flood risk) into domestic law in England and Wales and to implement its provisions. In particular it places duties on the Environment Agency and LLFAs to prepare a number of documents including:

- Preliminary Flood Risk Assessments;
- Flood hazard and flood risk maps;
- Flood Risk Management Plans.

An excerpt from the Flood Risk Regulations 2009 regarding the duty to prepare PFRAs is shown in Figure 1-1; the section highlighted in red shows the responsibilities of LLFAs to produce PFRAs.

Figure 1-1: Excerpt from Flood Risk Regulations 2009 relating to the production of PFRAs

PART 2

PRELIMINARY FLOOD RISK ASSESSMENTS

Duty to prepare preliminary assessment maps and reports: Environment Agency

9.—(1) The Environment Agency must prepare in relation to each river basin district—

(a) a preliminary assessment map, and

(b) a preliminary assessment report in relation to flooding from—

(i) the sea,

(ii) main rivers, and

(iii) reservoirs.

(2) This regulation is subject to regulations 31 and 32.

Duty to prepare preliminary assessment reports: lead local flood authorities

10.—(1) A lead local flood authority must prepare a preliminary assessment report in relation to flooding in its area.

(2) A lead local authority is not required to include in its report information about flooding from a source mentioned in regulation 9(1)(b) unless the authority thinks that it may affect flooding from another source.

(3) The Environment Agency—

(a) must review a preliminary assessment report prepared under this regulation, and

(b) may recommend modifications.

(4) Following a review, a lead local flood authority may revise its preliminary assessment report.

(5) The Agency's power to require information under regulation 36 includes power to require a lead local flood authority to provide a preliminary assessment report by a specified date.

(6) This regulation is subject to regulations 33 and 34.

Table 1-1 shows the elements of work required from Barnsley MBC under the Flood Risk Regulations 2009, along with the timescales of their respective delivery. The first two elements of work, highlighted in black, are covered by the preparation of this PFRA report.

Table 1-1: Elements of Work required under the Flood Risk Regulations 2009

22nd June 2011	**Prepare Preliminary Assessment Report.**	*The PFRA should focus on local flood risk from surface water, groundwater, ordinary watercourses and canals.*
22nd June 2011	On the basis of the PFRA, identify **Flood Risk Areas.**	*Flood Risk Areas are areas of significant risk identified on the basis of the findings of the PFRA, national criteria set by the UK Government Secretary of State and guidance provided by the Environment Agency.*
22nd June 2013	Prepare **Flood Hazard Maps** and **Flood Risk Maps** for each Flood Risk Area.	*Used to identify the level of hazard and risk of flooding within each Flood Risk Area to inform Flood Risk Management Plans.*
22nd June 2015	Prepare **Flood Risk Management Plans** for each Flood Risk Area.	*Plans setting out risk management objectives and strategies for each Flood Risk Area.*

It is noted that the scope of this PFRA is to consider past flooding and possible future flooding from the following local flood sources:

- Surface water;
- Groundwater;
- Ordinary watercourses; and
- Canals.

It is also noted that the PFRA report must consider floods which have significant harmful consequences for human health, economic activity and the environment.

As described in Figure 1-1, flooding associated with the sea, main rivers and reservoirs is the responsibility of the Environment Agency and does not need to be considered by the LLFA as part of the PFRA, unless it is considered that it may affect flooding from one of the sources listed above.

1.2 Study Area

The study area for this PFRA is defined by the administrative boundary of Barnsley MBC; the geographical extent of the study area is illustrated in Figure 1-2 which also highlights the rivers Dearne, Don, and Dove which are the key 3 rivers within the borough.

Figure 1-2: Barnsley MBC administrative area

The administrative area of Barnsley MBC covers approximately 330km^2 and the whole of the study area falls within the Humber River Basin District and is served by Yorkshire Water.

The study area is currently served by Environment Agency's North East region which is split into two areas (North East, and Yorkshire) each has separate Regional Flood and Coastal Committees (RFCC). The RFCC is made up of 14 members with 8 from local authorities; Barnsley MBC jointly represents the metropolitan boroughs of Doncaster and Rotherham at the RFCC.

Barnsley MBC is bordered to the east by Doncaster MBC and Rotherham MBC, Sheffield City Council in the south, Wakefield MDC and Kirklees MBC in the north and the councils of Greater Manchester and North East Derbyshire to the west.

1.3 Aims and Objectives

The PFRA is a high level screening exercise to locate areas in which the risk of surface water and groundwater flooding is significant and warrants further examination through the production of maps and management plans.

The aim of this PFRA is to provide an assessment of local flood risk across the study area, including information on past floods and the potential consequences of future floods.

The key objectives can be summarised as follows:

- Identify relevant partner organisations involved in future assessment of flood risk; and summarise means of future and ongoing stakeholder engagement;
- Describe arrangements for partnership and collaboration for ongoing collection, assessment and storage of flood risk data and information;
- Provide a summary of the systems used for data sharing and storing, and provision for quality assurance, security and data licensing arrangements;
- Summarise the methodology adopted for the PFRA with respect to data sources, availability and review procedures;
- Assess past flood events within the study area from local sources of flooding (including flooding from surface water, groundwater and ordinary watercourses), and the consequences and impacts of these events;
- Establish an evidence base of past flood risk information, which will be built up on in the future and used to support and inform the preparation of Barnsley's Local Flood Risk Strategy;
- Assess the potential harmful consequences of future flood events within the study area;
- Review the provisional national assessment of indicative Flood Risk Areas provided by the Environment Agency and provide explanation and justification for any amendments required to the Flood Risk Areas.

1.4 Sources of Flooding

This PFRA focuses on flooding from surface water, ordinary watercourses and groundwater. Consideration is also given to flooding from sewers and canals which are not designated as Main River. A brief description of these flood sources is given here.

Surface Water

Surface water flooding can be caused by rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving), and which has not entered a watercourse, drainage system or public sewer. Although flooding from surface water and combined sewers can be considered a form of surface water flooding, sewer flooding for this PFRA has been considered separately where there is sufficient information available to indicate that the flooding was caused wholly or partly by rainwater entering the system.

Groundwater

Groundwater flooding can occur when groundwater rises up from the underlying aquifer to flood sub-surface infrastructure or to emerge at the ground surface. The two forms of groundwater flooding which are most prevalent include the:

- Rise of groundwater levels to extreme high levels in permeable consolidated aquifers (primarily Chalk) in response to prolonged above average rainfall; and
- Rise of groundwater levels in permeable superficial deposits which are in hydraulic continuity with high water levels in adjacent rivers.

Ordinary Watercourses

An Ordinary Watercourse is any watercourse (river, stream, ditch, cut, sluice, dyke or non-public sewer) that is not identified as a Main River on maps held by the Environment Agency.

2 Lead Local Authority Responsibilities

2.1 Introduction

The preparation of a PFRA is just one of several responsibilities Barnsley MBC is required to undertake as part of its role as the Lead Local Flood Authority (LLFA) under the new legislation.

As a LLFA, Barnsley MBC is obliged to develop, maintain and put in place a local flood risk strategy for the borough. It is therefore responsible for local flood risk and has already formed effective partnerships with other relevant authorities as outlined in Section 2.2 below.

2.2 Barnsley Multi-Agency Strategic Flood Group

Following the events of June 2007 Barnsley MBC recognised that there was a wide range of disparate organisations responsible for individual aspects of flooding and the management of water generally.

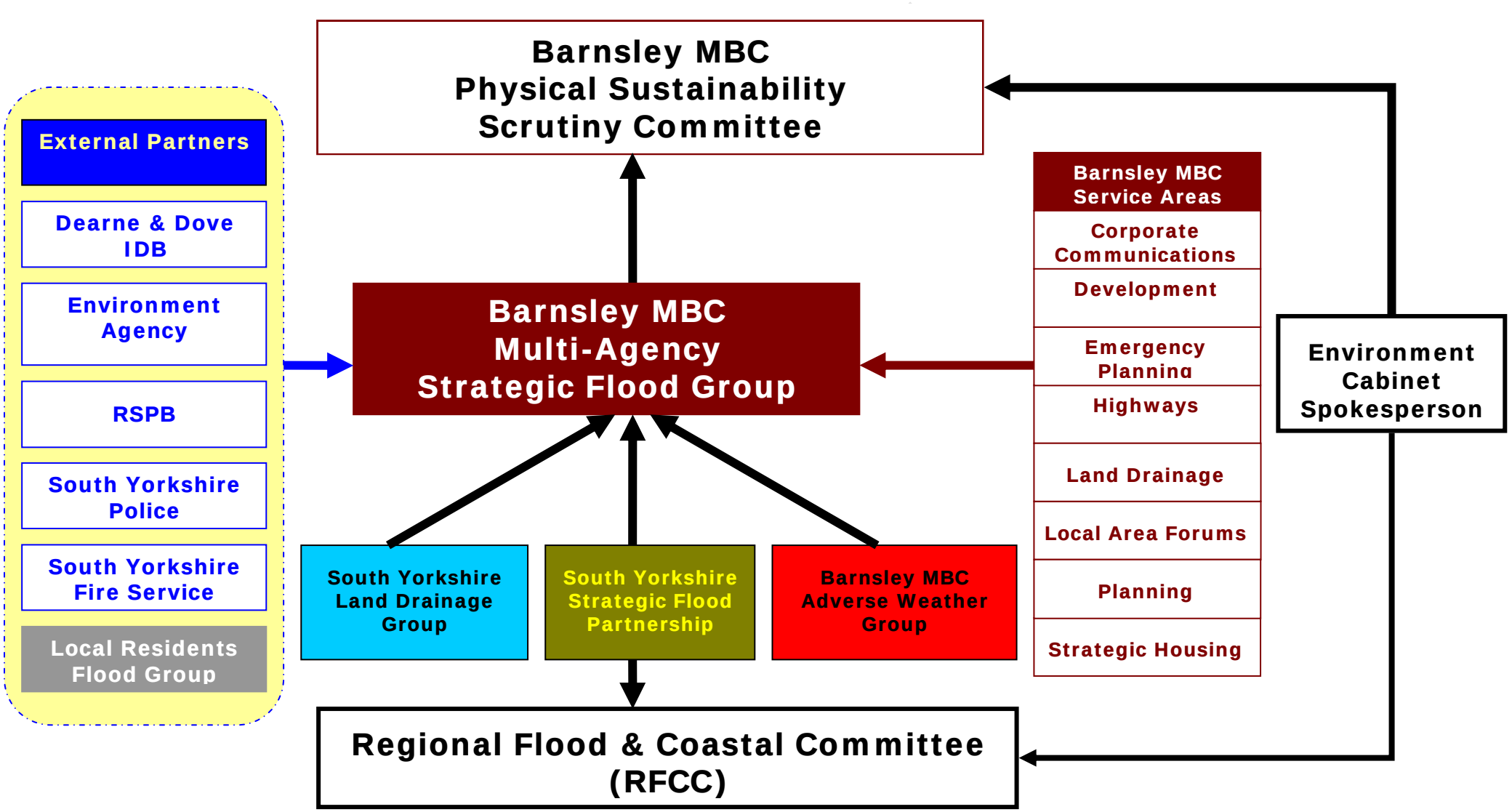
With this in mind the authority set about establishing a strategic group of these agencies, along with members from the blue light services and representatives from the key affected areas across the borough to form the Barnsley Multi-Agency Strategic Flood Group (BMASFG) in 2008. The following are members of the BMASFG:

- Barnsley MBC
- Dearne & Dove Internal Drainage Board
- Environment Agency
- Representatives from Residents' Local Flood Groups
- RSPB
- SY Fire Service
- SY Police
- Yorkshire Water

This forum allows the membership to discuss the strategic nature of their individual work programs and allows the coordination of these programs, and where appropriate these are collated and form a single coherent approach to dealing with flooding and water management issues within the borough. The meetings are held on a quarterly basis meeting.

An organogram of the BMASFG is provided in Figure 2-1 overleaf.

Figure 2-1: The organogram of the Barnsley Multi-Agency Strategic Flood Group



2.3 Stakeholder Engagement

As part of the PFRA, Barnsley MBC has sought to engage stakeholders which include the membership of the BMASFG.

In addition, engagement has been sought with representatives of the following organisations and authorities:

- British Waterways (who provided a short list of overtopping and structural failure events);
- Network Rail (who had not provided any data at the time of writing).

It is important to note that we have communicated with and collated data from various service areas within the authority including Emergency Planning, Strategic Planning, Highways, Land Drainage and Neighbourhood Pride.

2.4 Public Engagement

It is recognised that members of the public may also have valuable information to contribute to the PFRA and to local flood risk management more generally throughout the borough. Stakeholder engagement can provide significant benefits to local flood risk management including building trust, gaining access to additional local knowledge and increasing the chances of stakeholder acceptance of options and decisions proposed in future flood risk management plans.

In short, engagement with the public and other stakeholders is at the centre of ensuring a sustainable and integrated approach to management of local flood risk is developed and delivered.

3 Methodology and Data Review

3.1 Introduction

The PFRA is a high-level screening exercise used to identify areas where the risk of flooding is considered to be significant and warrants further examination and management through the production of flood risk and flood hazard maps and flood risk management plans. The approach for producing this PFRA was based upon the Environment Agency's PFRA Final Guidance, which was released in December 2010. The PFRA is based on readily available or derivable data and with this in mind; the following methodology has been used to undertake the PFRA.

3.2 Methodology

Data Collection from Partner Organisations

Partner agencies and other organisations were identified and contacted to share data for the preparation of the PFRA including British Waterways, the Dearne & Dove IDB, Yorkshire Water and the Environment Agency.

It was anticipated that information would be provided in a geo-referenced format. However, where this was not the case for some datasets, this data was geo-referenced where possible. This made it possible to display this information using GIS software and overlay layers to identify the spatial distribution of past flood events and relate these datasets to receptor information, in order to assess the overall flood risk.

Assessing Future Flood Risk

The identification of Flood Risk Areas through the PFRA should also take into account future floods, defined as any flood that could potentially occur in the future. This definition includes predicted floods extrapolated from current conditions in addition to those with an allowance for climate change. The assessment of future flood risk will primarily rely on a technical review of the Environment Agency's Flood Map for Surface Water which has been recently circulated to all Lead Local Flood Authorities. The Flood Map for Surface Water uses a numerical hydraulic model to predict the extent of flood risk from two rainfall events (1 in 30 annual chance and 1 in 200 annual chance).

The following factors were considered when assessing future flood risk across the Barnsley metropolitan borough area study area; topography, location of ordinary watercourses, location of flood plains that retain water, characteristics of watercourses (lengths, modifications), effectiveness of any works constructed for the purpose of flood risk management, location of populated areas, areas in which economic activity is concentrated, the current and predicted impact of climate change and the predicted impact of any long-term developments that might affect the occurrence or significance of flooding, such as proposals for future development.

Identifying Flood Risk Areas

Information regarding past and future flood risk will be used to formally identify Flood Risk Areas. To achieve this, flood risk indicators will be used to determine the impacts of flooding on human health, economic activity, cultural heritage and the environment. The use of flood risk indicators helps to develop understanding of the impacts and consequences of flooding. Key flood risk indicators are summarised in Table 3-1.

Table 3-1: Key Flood Risk Indicators

Impacts of flooding on:	Flood Risk Indicators
Human Health	*Number of residential properties.* *Critical services (Hospitals, Police/Fire/Ambulance Stations, Schools, Nursing Homes, etc)*
Economic Activity	*Number of non-residential properties* *Length of road or rail* *Area of agricultural land*
Cultural Heritage	*Cultural heritage sites (World Heritage Sites).*
Environment	*Designated sites (SSSIs, SACs, SPAs, etc) and BAP habitat.*

The above indicators have been selected and analysed by Defra and the Environment Agency in order to identify areas where flood risk and potential consequences exceed a pre-determined threshold. The areas that have been identified using this methodology and exceed 30,000 people at risk have been mapped and identified as Indicative Flood Risk Areas. No areas of within the borough meet these criteria to warrant the designation as an Indicative Flood Risk Area. Further details can be found in Defra's Guidance for selecting and reviewing Flood Risk Areas for local sources of flooding (December 2010).

3.3 Data Sources

Table 3-2 catalogues the relevant information and datasets held by partner organisations and provides a description of each of the datasets.

Table 3-2: Relevant Information and Datasets

	Dataset	Flood Risk Indicators
Environment Agency	**Areas Susceptible to Surface Water Flooding**	*The first generation national mapping, outlining areas of risk from surface water flooding across the country with three susceptibility bandings (less, intermediate and more).*
	Flood Map for Surface Water	*The updated (second generation) national surface water flood mapping which was released at the end of 2010. This dataset includes two flood events (with a 1 in 30 and a 1 in 200 chance of occurring) and two depth bandings (greater than 0.1m and greater than 0.3m).*
	Flood Map (Rivers)	*Shows the extent of flooding from rivers with a catchment of more than 3km^2 and from the sea.*
	Areas Susceptible to Groundwater Flooding	*Coarse scale national mapping showing areas which are susceptible to groundwater flooding.*
	National Receptors Dataset	*A national dataset of social, economic, environmental and cultural receptors including residential properties, schools, hospitals, transport infrastructure and electricity substations.*

	Dataset	Flood Risk Indicators
	Indicative Flood Risk Areas	*Nationally identified flood risk areas, based on the definition of 'significant' flood risk described by Defra and WAG.*
	Historic Flood Map	*Attributed spatial flood extent data for flooding from all sources.*
	Don Catchment Flood Management Plan (CFMP)	*CFMPs consider all types of inland flooding, from rivers, groundwater, surface water and tidal flooding and are used to plan and agree the most effective way to manage flood risk in the future.*
Barnsley MBC	**Strategic Flood Risk Assessment (SFRA)**	*SFRAs may contain useful information on past flooding, including local sources of flooding from surface water, groundwater and flooding from canals.*
	Historical flooding records	*Historical records of flooding from surface water, groundwater and ordinary watercourses.*
	Anecdotal information relating to local flood history and flood risk areas	*Anecdotal information from authority members regarding areas known to be susceptible to flooding from excessive surface water, groundwater or flooding from ordinary watercourses.*
SY Fire & Rescue	**Historic flooding records**	*Records of past flooding events from the Fire Service's call out history records including location, incident type and response given.*
	Anecdotal information	*Anecdotal information from each of the Station Managers regarding local flood risk areas within the borough.*
SY Police	**Anecdotal information**	*Information obtained during flood event affecting the borough.*
Yorkshire Water	**DG5 Register for Yorkshire Water Services areas**	*DG5 Register logs and records of sewer flooding incidents in each area.*
British Waterways	**British Waterway's canal network**	*Detailed GIS information on the British Waterway's canal network, including the location of canal centrelines, sluices, locks, culverts, etc.*
	Records of canal breaches and overtopping events	*Records of historical canal breaches and canal overtopping events across Barnsley.*

4 Past Flood Risk

4.1 Flooding Types

Flood records for Barnsley were collected from the data sources discussed in Table 3-2. Records of 5 historical flood events and flooding hotspots were collected across the Barnsley metropolitan borough administrative area. A summary map highlighting the locations of these past flood events is illustrated in Figure 4-2.

These flood events came from a range of flood sources, and in many cases the source of flooding was unknown or not recorded. A summary of information specific to each source of flooding considered as part of the PFRA is included below.

Surface Water Flooding

Surface water flooding occurs when heavy rainfall exceeds the capacity of local drainage networks and water flows across the ground. Information on surface water flooding incidents was obtained from a number of sources, as discussed in Table 3-2. Key sources of surface water records was the Highways department and the Don Catchment Flood Management Plan (CFMP), which is a high-level strategic plan published by the Environment Agency that focuses on flooding in major river catchments.

Groundwater Flooding

Groundwater flooding occurs as a result of water rising up from the underlying aquifer or from water flowing from abnormal springs. This tends to occur after long periods of sustained high rainfall, and the areas at most risk are often low-lying where the water table is more likely to be at shallow depth. Groundwater flooding is known to occur in areas underlain by aquifers.

Sewer Flooding

Sewer flooding is often caused by excess surface water entering the drainage network. DG5 registers from Yorkshire Water was analysed to investigate the occurrence of sewer flooding incidents in Barnsley. It was found that there were a total of 11 properties in the DG5 register as shown in Appendix 4. DG5 records were collected for the Barnsley SFRA, a map summarising incidents of sewer flooding which were recorded by Yorkshire Water for this PFRA and can be found in Appendix 4. It can be concluded that sewer flooding across Barnsley generally appears to be sporadic and infrequent.

Canal Flooding

Information was obtained from British Waterways which details the limited canal network in Barnsley, including the location of canals, weirs, sluices and locks. British Waterways also provided details of historic breaches or overtopping events that have occurred.

In June 2007 the Dearne and Dove Canal overtopped in Wombwell adjacent to the A635 Mitchel's Way, causing flooding on the highway and the temporary closure of the road. A separate section of the Dearne and Dove Canal (Elsecar Branch) overtopped in the Tingle Bridge Lane causing flooding to both commercial and residential properties in the immediate area.

Ordinary Watercourse Flooding

During the June 2007 flooding event many of the borough's watercourses overtopped which lead to the flooding of residential and commercial properties and also affected the local road network resulting in many road closures.

4.2 Overview of Past Flooding in Barnsley

All available records of past flood incidences, in addition to records obtained from partner organisation as detail in Section 3, have been collated and mapped.

The recorded events originate from a range of flood sources. This PFRA focuses on flooding from surface water, Ordinary Watercourses and groundwater, as defined in Section 4.1. However, flooding from sewers and canals which are not Main River has also been considered.

Water companies are required to record incidences of flooding from their sewers, and this data is collected in the DG5 records.

Table 4-2 Summary of recent flood events in Barnsley

Flooding Event	Source	Significant Consequences?	Included in the PFRA Spreadsheet?	Likely to reoccur?
January 2008: A period of intense rain fall resulted in a small number of properties within the Darton area of the borough being affected by internal flooding of basements within their properties.	*Surface water*	*No*	*Yes*	*Yes*
June 2007: Intense rainfall for a prolonged period culminated in severe flooding on 15th June throughout the whole of the borough. The continuation of the intense rainfall lead to repeat a 2nd , and more significant flooding event on 25th June.	*Surface water Main river Ground water*	*Yes*	*Yes*	*Yes*
Autumn 2000: Heavy rainfall caused the overtopping of the river Dearne at Darton and resulted in the properties and businesses being inundated.	*Surface water Main river*	*No*	*No*	*Yes*
Spring 1970: Anecdotal reports confirm that the properties flooded in the Darton area.	*Main river*	*No*	*No*	*Yes*
Flooding during 1950's 1960's: Anecdotal reports confirm that the properties flooded in Barnsley.	*Main river*	*No*	*No*	*Yes*

4.3 Consequences of Flooding in Barnsley

Past flood events with 'significant harmful consequences' are required to be recorded in a standard spreadsheet provided by the Environment Agency (the Preliminary Report Spreadsheet) and is included in Appendix 5. The definition for 'significant harmful consequences' can be defined locally by each LLFA and will be considered further by Barnsley MBC as the local flood risk strategy is developed.

Historically there had been a few small scale flooding events within the borough, usually these affected the Darton village which is known to be the first community to be affected by high water levels in the river Dearne and acts as an informal 'barometer' for flooding across the borough. This area is known to have flooded during the 1950's, 1960's 1970's and also in the autumn of 2000. The impact of these events was relatively small scale. A handful of properties in the upper Don catchment were flooded during flooding events in the 1950's and 1960's.

Apart from fluvial and pluvial flooding events during 2007-8, other flooding events were documented over the past few decades, however very few records were kept and much of the information about these were anecdotal reports from those affected at the time.

Barnsley was affected by heavy and sustained rainfall which continued for a 10-day period leading up to the first flood which started early in the morning of Friday 15th June 2007. In total there were 352 properties flooded and many of these neighbourhoods which had not experienced flooding before and were poorly prepared for responding to flooding. During the two flooding events of 15th and 25th June 2007 approximately four times the seasonal average rainfall for the area was experienced. During a 24 hour period between June 14th and 15th a total of 118mm was recorded at a local weather station, with 68mm recorded in the north-west of the borough at Cannon Hall, Cawthorne. The intense rainfall continued during the days leading up to the 25th June when a further 80mm was recorded at Cannon Hall, this additional rain fell onto ground which was already saturated.

A total of 48 separate localities in the Barnsley were affected by the flood where many properties were flooded twice in quick succession. In addition to entire neighbourhoods being inundated, but many of these areas comprised of single properties or small clusters of residential properties. Even so 6 distinct communities were severely affected, these being Darton, Lundwood, Darfield Bridge and Bolton-on-Dearne on the river Dearne, and also Low Valley and Aldham Bridge areas on the river Dove. The impact ranged from just a few inches to several feet of water flowing into properties. In many cases properties were affected by diluted untreated sewage which had contaminated the flood waters, when waste water treatment installations and combined sewers were overwhelmed.

5 Future Flood Risk

5.1 Overview of Future Flood Risk

The Environment Agency (EA) identified a list of receptor types for use in flood risk management. The types that the EA considers relevant for PFRAs are:

- Properties (residential and non-residential)
- Critical services
- Infrastructure network (length of roads and rail)
- Areas of agricultural land
- Pollution Prevention and Control (PPC) sites
- Control of Major Accident Hazards (COMAH) sites
- National and International Designated Sites:
  - Special Areas of Conservation (SAC)
  - Special Protection Areas (SPA)
  - Ramsar Sites
  - Sites of Special Scientific Interest (SSSI)
- National and International Designated Heritage Assets:
  - World Heritage Sites
  - Scheduled Monuments
  - Listed Buildings
  - Registered Parks and Gardens

A full spatial dataset containing all relevant flood receptors in England and Wales, the National Receptor Dataset (Version 1.1), is considered appropriate for the production of PFRAs and has been designed with this use in mind.

Surface Water Flooding

The Environment Agency has produced a national assessment of surface water flood risk in the form of two national mapping datasets. The first generation national mapping, Areas Susceptible to Surface Water Flooding (AStSWF), contains three susceptibility bandings for a rainfall event with a 1 in 200 chance of occurring. The national methodology has since been updated to produce the Flood Map for Surface Water (FMfSW), a revised model containing two flood events (1 in 30 annual chance and 1 in 200 annual chance) and two depth bandings (greater than 0.1m and greater than 0.3m).

Using this dataset, the number of properties at risk of surface water flooding within Barnsley has been estimated. For a rainfall event with a 1 in 200 annual chance of occurring, 850 properties are at risk from flooding to a depth of 0.1m and 330 properties are at risk from flooding to a depth of 0.3m. Further details on the potential harmful consequences of future flooding are included in Annex 2 of the Preliminary Assessment Spreadsheet.

Groundwater Flooding

The Environment Agency's national dataset, Areas Susceptible to Groundwater Flooding, has been used to form the basis of the assessment of future flood risk from groundwater.

There is no local information available which provides evidence on future groundwater flood risk across Barnsley and groundwater rebound is not believed to be an issue within the borough.

Canals

There are no navigable canals or canal networks within Barnsley and British Waterways do not have any canals within the Barnsley metropolitan borough boundary. Therefore there is no perceived future flood risk from canals owned by British Waterways.

However, there are canals owned on land owned by Barnsley MBC that does pose a risk of future flooding these include the Barnsley Canal at Royston and also the Dearne & Dove Canal at Tingle Bridge and Wombwell.

Ordinary Watercourses

Since the floods of 2007 Barnsley MBC has instigation a capital works programme to carry out repairs on watercourses on its own land, this has been supplemented with a maintenance programme to ensure that these assets are kept in working order. Although this has dramatically reduced the risk of future flooding from these watercourses, it is recognised that the risk of flooding can never be eliminated totally.

5.2 Locally Agreed Surface Water Information

A definition of 'locally agreed surface water information' has been considered in conjunction with the Environment Agency and water companies in order to agree what surface water information best represents local conditions across Barnsley.

There is no current requirement for the development of a Surface Water Management Plan for the Barnsley area.

5.3 Potential Consequences of Future Flooding

The Environment Agency has used the Flood Map for Surface Water mapping and the National Receptors Database to identify a number of areas across the country that exceeds the thresholds described in Table 5-1 below.

Table 5-1: Flood risk threshold used to identify future consequences of flooding

'Significant harmful consequences' defined as greater than …	Description
200 people *or*	*Flooded to a depth of 0.3m during a rainfall event with a 1 in 200 chance of occurring (or 0.5%)*
20 businesses *or*	
1 critical service	

This assessment was carried out based on 1km^2 national grid squares, and the grid squares that exceed this criterion were identified. There are no areas with the Barnsley metropolitan area that exceed these criteria.

Areas of Locally Significant Flood Risk

The analysis carried out Barnsley MBC to identify the areas mostly likely to suffer flooding in the future indicates that all but 4 of the 18 identified locations would be significantly affected by flooding events in the future. The criteria used to determine the areas of locally significant flood risk is detailed in Table 5-2 below

Table 5-2: Flood risk threshold used to identify areas of significant local flooding

'Significant harmful consequences' defined by Barnsley MBC as greater than …	Description
30 people *or*	*Flooded to a depth of 0.3m during a rainfall event with a 1 in 200 chance of occurring (or 0.5%)*
2 businesses *or*	
1 critical service	

In many cases the identified locations met the criteria for numbers of residential properties affected and also one of the other criteria for either the number of commercial premises or the critical services e.g. Main Roads, Water Treatment Works or Residential Homes etc,.

5.4 Effect of Climate Change and Long Term Developments

The Impacts of Climate Change

The impact of climate change on local flood risk is relatively poorly understood. Several national flood maps have informed the preliminary assessment report - specifically the Flood Map for Surface Water (surface runoff), Areas Susceptible to Surface Water Flooding (surface runoff), Areas Susceptible to Groundwater Flooding (groundwater) and Flood Map (ordinary watercourses) which do not show the impact of climate change on local flood risk.

The common perception from climate model projections presented in the Intergovernmental Panel on Climate Change (IPCC) fourth assessment report for northern Europe suggesting that in winter high extremes of precipitation are very likely to increase in magnitude and frequency. There is clear scientific evidence that global climate change is happening now and it cannot be ignored.

Over the past century around the UK we have seen sea level rise and more of our winter rain falling in intense wet spells with seasonal rainfall becoming highly variable. It appears that rainfall have decreased in summer and increased in winter, although winter amounts have changed little in the last 50 years. Some of the changes might reflect natural variation; however the broad trends are in accordance with projections from climate models, suggesting partly anthropogenic causes.

Greenhouse gas levels in the atmosphere are likely to cause higher winter rainfall in future and past greenhouse gas emissions mean some climate change will be inevitable in the next 20–30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080s.

There is enough confidence in large scale climate models to say that we must plan for change. There is more uncertainty at a local scale but model results can still help us plan to adapt. For example we understand rain storms may become more intense, even if we cannot be sure about exactly where or when. By the 2080s, the latest UK Climate Projections (UKCP09) is that there could be around three times as many days in winter with heavy rainfall (defined as more than 25 mm in a day). It is plausible that the amount of rain in extreme storms (with a 1 in 5 annual chance or rarer) could increase locally by 40%.

The Environment Agency provided climate change projections from UKCP09 for Humber River Basin, an extract from the projections for the Humber River Basin are listed in Table 5-2 below.

Table 5-2: UKCP09 Projections for the Humber River Basin District 9 in the 2050's:

Parameter – Change in the ...	Humber River Basin
Winter Temperature (Mean)	Estimated increase - 2.1ºC (very unlikely to be <1.1ºC and is very unlikely >3.3ºC)
Winter Precipitation (Mean)	Change of 11% (very unlikely to be between 2% - 24%)
Summer Temperature (Mean)	Estimated increase - 2.3ºC (very unlikely to be <1.1ºC and is very unlikely > 3.9ºC)
Summer Precipitation (Mean)	Change of 17% (very unlikely to be <35% and is very unlikely to be >1%)

Appraisal guidance

Current project appraisal guidance (Defra, 2006) provides indicative sensitivity ranges for peak rainfall intensity, for use on small catchments and urban/local drainage sites. These are due to be updated following the UKCP09 projections above. They describe the following changes in peak rainfall intensity; +5% (1990-2025), +10% (2025-2055), +20% (2055-2085) and +30% (2085-2115). This was reviewed by the Met Office in 2008 using UKCP09 models. They suggest that, on the basis of our current understanding, these levels represent a pragmatic but not a precautionary response to uncertainty in future climate impacts. In particular for an event with a 1 in 5 chance of occurring, increases in precipitation intensity of 40% or more by the 2080s are plausible across the UK at the local scale.

Long Term Developments

It is possible that long term developments might affect the occurrence and significance of flooding. However current planning policy aims to prevent new development from increasing flood risk.

In England, Planning Policy Statement 25 (PPS25) on development and flood risk aims to "ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall."

Adherence to Government policy ensures that new development does not increase local flood risk. However, in exceptional circumstances the Local Planning Authority may accept that flood risk can be increased contrary to Government policy, usually because of the wider benefits of a new or proposed major development. Any exceptions would not be expected to increase risk to levels which are "significant" (in terms of the Government's criteria), but should be recorded here so that they can be reviewed in the future.

6 Next Steps

6.1 Future Data Management Arrangements

In order to continue to fulfil their role as Local Lead Flood Authority, Barnsley MBC is required to investigate future flood events and ensure continued collection, assessment and storage of flood risk data and information.

It is crucial that all records of flood events are documented consistently and in accordance with the INSPIRE Directive (2007/2/EC). It is recommended that a centralised database will be kept up to date by Barnsley, who has the overall responsibility to manage flood data through the whole of its administrative area. This can be used as an evidence base to inform future assessments and reviews and for input into the mapping and planning stages.

The proposed method for collating data relating to flooding incidents will be to utilise the existing Highways asset recording system, Symology. This system will allow individual incidents to be geo-referenced and will provide the requirement information for flood event reporting which will be done using the spreadsheet below, see Figures 6.1 and 6.2. The spreadsheet has been developed to allow the details of flooding incidents to be collated and reported on consistently. The fields are colour coded to represent the details which are mandatory, and also those which would be useful to have but not essential for reporting.

Figure 6-1: Flood Event Data Recording System - Part One

BARNSLEY Metropolitan Borough Council

Flood Event Data Recording System

Records kept from - 01/04/2011

Records kept to - 31/03/2012

Compulsory
Preferred
Optional

Flood Event (Outline Name)	Event Date	Street Name	District	Location (Post Code)	Section 19 (duty under the FWMA)	Grid Reference	Event Duration (hours)	Estimated Return Period of Event	Depth of Flooding (metres)	Extent of Flooding (Area m2)	Source of Flooding
April 2011, High Street Bentley	*01/04/2011*	*High Street*	*Darton*	*S75 5QE*	*Yes*	*123456,789001*	*1*	*1/30*	*0.1*	*50*	*Surface run-off*

Figure 6-2: Flood Event Data Recording System - Part Two

Confidence in source of Flooding	Residential Properties Flooded (Nr)	Commercial Properties Flooded	Critical Infrastructure at Risk	Damage Caused	Photos of Flood Event	Photo File Location	Risk Management Authorities involved	Actions taken by Risk Management Authority	Additional Notes or Comments
Medium	*5*	*0*	*0*	*Internal Flooding*	*Yes*	*S:\Highways\Land Drainage\FWMA\Section 19 Investigate Flooding\photos*	*DMBC*	*All highway gullies cleaned in this area*	*None*

6.2 Scrutiny & Review Procedures

The scrutiny and review procedures that must be adopted when producing a PFRA are set out by the European Commission. Meeting quality standards is important in order to ensure that the appropriate sources of information have been used to understand flood risk and the most significant flood risk areas are identified.

Another important aspect of the review procedure is to ensure that the guidance is applied consistently; a consistent approach will allow all partners to understand the risk and manage it appropriately. The scrutiny and review procedure will comprise two key steps, which are set out below.

Local Authority Review

The first part of the review procedure is through an internal Local Authority review of the PFRA, in accordance with appropriate internal review procedures. Internal approval should be obtained to ensure the PFRA meets the required quality standards, before it is submitted to the Environment Agency.

The PFRA will be presented to the Barnsley Strategic Multi-Agency Flood Group for approval in principal; further approval will be sought from the Council Cabinet Spokesperson. The Barnsley MBC Physical Sustainability Scrutiny Commission will receive a briefing on the PFRA and the Flood and Water Management Act, which will provide an opportunity to discuss its content in general. A formal review will be incorporated into the Cabinet approval process, in particular when developing the detailed plans for the prioritised improvements, subject to the available resources being found.

Environment Agency Review

Under the Flood Risk Regulations, the Environment Agency has been given a role in reviewing, collating and publishing all of the PFRAs once submitted.

The Environment Agency will undertake a technical review (area review and national review) of the PFRA, which will focus on instances where Flood Risk Areas have been amended and ensure the format of these areas meets the provide standard. If satisfied, they will recommend submission to the relevant Regional Flood and Coastal Committee (RFCC) for endorsement. RFCCs will make effective use of their local expertise and ensure consistency at a regional scale. Once the RFCC has endorsed the PFRA, the relevant Environment Agency Regional Director will sign it off, before all PFRAs are collated, published and submitted to the European Commission.

The first review cycle of the PFRA will be led by Barnsley MBC and must be submitted to the Environment Agency by the 22nd of June 2011. They will then submit it to the European Commission by the 22nd of December 2017 using the same review procedure described above.

References

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Defra / WAG (2010) Selecting and reviewing Flood Risk Areas for local sources of flooding – Guidance to Lead Local Flood Authorities

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Environment Agency (2009) River Basin Management Plan - Humber River Basin District (Annex H: Adapting to climate change) (GENE0910BSQZ-E-E)

The Flood Risk Regulations (2009) (SI – 3042)

Flood and Water Management Act (2010)

JBA Consulting (2010) Barnsley Strategic Flood Risk Assessment

The Pitt Review (2008) Learning lessons from the 2007 floods

Appendices