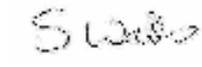
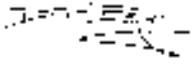
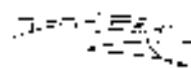


Warrington Borough Council
Preliminary Flood Risk Assessment

June 2011

Revision Schedule

Preliminary Flood Risk Assessment

	Originator	Checked by	Reviewed by	Approved by
ORIGINAL	NAME Jonathan Parry	NAME Sharon Walls	NAME David Boyer	NAME David Boyer
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Document Status				

Warrington Borough Council
 Environment & Regeneration
 New Town House
 Buttermarket Street
 Warrington
 WA1 2NH

Tel: 01925 44 33 22
 Fax: 01925 44 3255

www.warrington.gov.uk

Executive Summary

This Preliminary Flood Risk Assessment has been prepared by Warrington Borough Council (WBC) as Lead Local Flood Authority (LLFA) in order to meet the duties to manage local flood risk and deliver the requirements of the Flood Risk Regulations (2009) and the Floods and Water Management Act (2010).

The Preliminary Flood Risk Assessment (PFRA) includes this assessment report and supporting annexes, maps and spreadsheets and represents the first stage of the requirements of 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 Lead Local Flood Authority Warrington Borough Council 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 Defra's Guidance on selecting Flood Risk Areas, both published in December 2010.

The Environment Agency has used a national methodology that has been applied to assess significant flood risk for the European Community as a whole. This has been set out by Defra in order to identify indicative Flood Risk Areas across England.

Of the ten indicative Flood Risk Areas that have been identified nationally, none are located within Warrington's administrative area. An indicative Flood Risk Area is a defined term when there are areas of nationally significant risk affecting 30,000 people or more. The PFRA is also required to record "locally significant risk areas" which are flood areas above a locally determined threshold of affected people that can have significant harmful consequences

The Flood Risk Regulations therefore require WBC to:

- Collate and review existing data relating to historic and predicted future flood risk;
- Confirm areas across Warrington where local flood risk exceeds a locally determined threshold (in this case, where more than 80 houses are affected, 5 non-residential properties or one piece of Critical Infrastructure).

The Environment Agency require Warrington to agree and confirm a surface water mapping dataset that best represents the risks from surface water flooding within Warrington's administrative area.

In order to develop a clear overall understanding of the flood risk across Warrington flood risk data and records of historic flooding were collected from several different local and national sources. This included the Environment Agency, water and sewerage companies, emergency services and other risk management authorities.

Information relating to a number of historic flood events caused by flooding from local sources was collected and analysed. However, comprehensive details on flood extents and consequences of these events were largely unavailable.

From the information received no events were identified that had 'significant harmful consequences'. Other data collected is recorded in the mapping provided as part of this

PFRA document. This data indicates that historic flood risk within the area is mainly from rivers, surface water runoff and sewers. There appears to be little risk from groundwater flooding.

An assessment of future flood risk (flood risk that it is predicted may occur in the future) has found that there is a risk of flooding from local sources across Warrington in some areas, particularly from fluvial and surface water sources. Based on national surface water modelling undertaken by the Environment Agency (for a flood event with a 1 in 200 chance of flooding in any given year), it has been assessed that there are 8,785 properties, including 6,571 residential properties potentially at risk from surface water flooding in the future. There is further more detailed mapping which has been conducted as part of the Warrington Surface Water Management Plan however it does not cover the whole of the administrative area.

To progress WBC's approach to flood risk management including ongoing work post-PRFA submission will be designed to meet its objectives under the recent legislation and include:

- Continuing to develop links with adjacent LLFAs and other bodies responsible for flood risk management;
- Using data collected to produce a manageable GIS database, controlled centrally, for use on future development control queries, investigation, planning etc;
- Assessments to identify the flood risk management prioritisations over the entire WBC area;
- Development of a Local Flood Risk Strategy;
- Development of an Asset Register that will be linked into WBC's existing Highways database;
- Setting up arrangements to record and (where appropriate) investigate future floods.
- Adopting and approving Sustainable Urban Drainage Systems (SUDS)

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Abbreviations

AOD: Above Ordinance Datum;
AStSWF: Areas Susceptible to Surface Water Flooding;
AStGwF: Areas Susceptible to Groundwater Flooding;
BGS: British Geological Survey;
CFMP: Catchment Flood Management Plan;
COW: Critical Ordinary Watercourse
Defra: Department for Environment, Food and Rural Affairs;
DG5: OFWAT Directive Guidelines No. 5 (for Water Companies) for annual level of service indicators for properties at risk of sewer flooding;
EA: Environment Agency;
EC: European Community;
EU: European Union;
FMfSW: Flood Map for Surface Water;
FWMA: Flood and Water Management Act;
GIS: Geographical Information Systems;
IPCC: Intergovernmental Panel on Climate Change;
LGF: Local Government Forum;
LLFA: Lead Local Flood Authority;
NRD: National Receptor Dataset;
OEF RPG: Operational Emergency Flood Response Plan Groups;
OFWAT: Water Services Regulation Authority;
OS: Ordinance Survey;
PFRA: Preliminary Flood Risk Assessment;
PPS25: Planning Policy Statement 25: Development and Flood Risk;
RFDC: Regional Flood Defence Committee;
SAB: SuDS Approving Body;
SFRA: Strategic Flood Risk Assessment;
SuDS: Sustainable Urban Drainage System;
SWMP: Surface Water Management Plan;
UKCP09: United Kingdom Climate Projections 2009;
WAG: Welsh Assembly Government;
WBC: Warrington Borough Council.

1.0 Introduction

1.1 Background

Warrington Borough Council is a Lead Local Flood Authority (LLFA) and is required by the Flood Risk Regulations 2009 to produce a Preliminary Flood Risk Assessment (PFRA). The Flood Risk Regulations require LLFA's to consider flood risk from local sources. Flood risk from the following sources has been considered:

- Surface water
- Groundwater
- Ordinary Watercourses (Fluvial)
- Canals

Note for the purpose of the PFRA the LLFA does not have to report on flood risk from Main Rivers and the sea, unless it has an impact on the above, as flood risk from these sources is the responsibility of the Environment Agency.

1.2 Preliminary Flood Risk Assessments (PFRA)

The Pitt Report in 2008¹ was the catalyst for Local Authorities and partner agencies to become more responsible for flood risk. The Flood and Water Management Act 2010 (FWMA) gained royal ascent in 2010 and contains a number of new responsibilities, powers and duties that are being rolled out in phases that will help manage flood risk in a more holistic way.

The Flood and Water Management Act 2010 defines a lead role for local authorities and Warrington Borough Council is designated as a Lead Local Flood Authority (LLFA) responsible for the management of local sources of flooding such as surface water. An overview of these duties is provided in Section 3. The Environment Agency retains its role in managing flood risk from main rivers and coastal sources.

In addition to the Flood and Water Management Act 2010 the Government also introduced the Flood Risk Regulations in 2009. These regulations were introduced as a result of being a member state of the EU and transposed the EC Floods Directive (Directive 2007/60/EC) into domestic UK law under the European Communities Act 1972. Warrington as a LLFA is required to implement its provisions.

The purpose of the EC Floods Directive that is now referred to as the Flood Risk Regulations 2009 is to establish a framework for assessing and managing flood risk across the European Community.

As a result of the Flood Risk Regulations, the LLFA has a duty to prepare a number of documents, including:

- Preliminary Flood Risk Assessment (PFRA);
- Flood hazard and flood risk maps;
- Flood Risk Management Plans.

¹ Pitt Review (2008) Learning lessons from the 2007 flood

Table 1-A indicates the work required to meet the requirements of the Flood Risk Regulations. This PFRA aims to meet the first two requirements.

22 nd June 2011	Prepare Preliminary Flood Risk Assessment Report	The PFRA should focus on local flood risk arising from surface water, groundwater, ordinary watercourses, and canals.
22 nd June 2011	On the basis of the PFRA, identify Indicative Flood Risk Areas	Indicative Flood Risk Areas are a defined term, and are areas of nationally significant risk affecting 30,000 people or more. The PFRA is also required to record "locally significant risk areas" which are flood areas, above a locally determined threshold of affected people, and having significant harmful consequences.
22 nd June 2013	Prepare Flood Hazard Maps and Flood Risk Maps for each Flood Risk Area	Used to determine the level of hazard and risk within each Indicative Flood Risk Area (affecting 30,000 or more people).
22 nd June 2015	Prepare Flood Risk Management Plans for each Flood Risk Area	These are Plans setting out how the flood risk and hazard, identified by the Hazard and flood maps, are to be managed.

**Table 1-A:
Elements of Work required under the Flood Risk Regulations, 2009.**

2.0 Aims and Objectives of the PFRA

2.1 Aims

The primary aim of this PFRA is to provide an assessment of potential local flood risk by applying a high level screening exercise across the administrative area of Warrington Borough Council referred to as the Study Area:

The risk of local flooding is defined as significant by European Standards for the PFRA if the flooding is affecting a cluster of more than 30,000 people. These local flooding risks are grouped in areas and are deemed Indicative Flood Risk Areas. If these areas are found to exist within the Local Authority Boundary then they may warrant further examination at a later stage through the production of Flood Risk and Hazard maps and Flood Management plans.

2.2 Objectives

The objectives of this PFRA are to:

- Identify relevant partner organisations involved in future assessment of flood risk and summarise the 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 including provisions 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 historic flood events within the study area from local sources of flooding (including flooding from surface water, groundwater and Ordinary Watercourses) and where possible, the consequences and impacts of these events.
- Establish an evidence base of historic flood risk information which will be built upon in the future and will to support and inform the preparation of Warrington Borough Council'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 an explanation and justification for any amendments required to the Flood Risk Areas.

2.3 Warrington's PFRA Study Area

The study area for Warrington Borough Council's PFRA is the administrative boundary of the Borough.

The Borough of Warrington covers some 176km² (68mi²) and is situated in the North West of England between Manchester and Liverpool. At mid-2005, it had an estimated population of 194,700, with the town of Warrington being by far the largest settlement in the Borough, with a population of over 160,000 and providing jobs for some 80,000 people.

This in part reflects over 20 years of planned growth following its designation as a new town in 1968. The PFRA study area is shown in Figure 1 of Appendix A and covers the whole of Warrington, from Winwick in the north to Appleton in the south and from the outskirts of Lymm in the east to Fiddler's Ferry in the west.

The Borough has extensive areas of high-grade agricultural land, a varied landscape character and important areas of nature conservation value, mostly within the relatively narrow gaps of open land separating Warrington from urban areas to the west, north and east. The area is generally flat and below 20mAOD with low-lying land within the Mersey floodplain.

The average annual rainfall in the WBC area is approximately 600mm which is reasonably distributed throughout the year with an average low of 40mm in May and an average peak of 69mm in October.

Two significant waterways cross the main urban area; the River Mersey which passes close to the town centre and further south, the Manchester Ship Canal. Various small urban watercourses drain to the River Mersey in a roughly north south direction.

The River Mersey is tidal with the normal tidal limit being at Howley weir in the centre of the town of Warrington (see Figure 1, Appendix A). The Manchester Ship Canal runs through Warrington having split off from the River Mersey at Bollin Point. Upstream from Warrington the Manchester Ship Canal receives flows from the River Mersey at Irlam and the Rivers Irwell, Irk and Medlock in Manchester. The total catchment area draining into the Manchester Ship Canal upstream of Bollin Point covers an area of approximately 1,965 km².

There are three other canals present within the study area, in addition to the Manchester Ship Canal. These are the Bridgwater Canal and the New Cut Canal, owned by the Manchester Ship Canal Company, and the St Helens Canal, owned by Warrington Borough Council.

The water company that serves the administrative area is United Utilities.

3.0 Lead Local Flood Authority (LLFA) Responsibilities

3.1 Introduction

The preparation of a PFRA is just one of several responsibilities of LLFAs under the new legislation. This section provides an overview of other responsibilities Warrington Borough Council are obliged to fulfil under their role as a LLFA.

3.2 Coordination of Flood Risk Management

In his Review of the summer 2007 flooding, Sir Michael Pitt stated that “the role of local authorities should be enhanced so that they take on responsibility for leading the coordination of flood risk management in their areas”. As the designated LLFA, Warrington is therefore responsible for leading local flood risk management across the area.

Local flooding comes from a number of sources.

- Surface water (runoff before it enters a sewer)
- Groundwater
- Ordinary watercourses
- Canals.

It is the responsibility of the LLFA to coordinate the response to flooding from these sources.

The Environment Agency remains the lead organisation responsible for managing flooding from Main Rivers and the sea. The water company remains responsible for flooding from sewers, except where it is wholly or partly caused by rainwater entering the system. Floods or raw sewage caused by blocking of a sewer for example are not covered by the regulations, neither is flooding from burst water mains. The Environment Agency, United Utilities and Warrington Borough Council are all classed as Risk Management Authorities.

It is crucial that the Council continues to forge successful partnerships with the Environment Agency and United Utilities as the water company and other Risk Management Authorities including the Manchester Ship Canal Company to ensure effective coordination and management of flood risk across the area.

In order to contribute to the provision of a co-ordinated and ‘common sense’ approach to flood risk management across the area, Warrington has developed a number of working groups and forums to liaise with stakeholders and representatives of the risk management authorities at the appropriate level. For example Warrington has set up a Flood Task Group which includes representatives from the Council, the Environment Agency, the Manchester Ship Canal Company and United Utilities.

As well as setting up the Task Group Warrington has also set up a Cheshire and mid Mersey Partnership that includes meeting with Cheshire West and Chester Council, Cheshire East Council, Halton BC and St Helens BC to ensure that lessons are learnt and knowledge is shared. The partnership also serves to ensure consistency amongst the councils and that data and practice can be shared in an effective manner.

Warrington Borough Council adheres to the guidelines outlined in the Environment Agency's 'Building Trust with Communities' document which provides a useful process of how to communicate risk including the causes, probability and consequences to the general public and professional forums such as local resilience forums.

It is recognised that members of the public may also have valuable information to contribute to local flood risk management more generally across the area. Stakeholder engagement can bring 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. As such plans for public engagement will form part of future flood management strategies.

3.3 Further Responsibilities

In addition to forging partnerships and coordinating and leading on local flood management there are a number of other key responsibilities that have arisen for Lead Local Flood Authorities from the Flood & Water Management Act 2010 and the Flood Risk Regulations 2009. These responsibilities include:

- **Investigating flood incidents** – LLFAs have a duty to investigate and record details of significant flood events within their area. This duty includes identifying which authorities have flood risk management functions and what they have done or intend to do with respect to the incident, notifying risk management authorities where necessary and publishing the results of any investigations carried out.
- **Asset Register** – LLFAs also have a duty to maintain a register of structures or features which are considered to have an effect on flood risk, including details on ownership and condition as a minimum. The register must be available for inspection and the Secretary of State will be able to make regulations about the content of the register and records.
- **SuDS Approving Body** – LLFAs are designated the SuDS Approving Body (SAB) for any new drainage system, and therefore must approve, adopt and maintain any new sustainable drainage systems (SuDS) within their area.
- **Local Strategy for Flood Risk Management** – LLFAs are required to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategy will build upon information such as national risk assessments and will use consistent risk based approaches across different local authority areas and catchments.
- **Works powers** – LLFAs have powers to undertake works to manage flood risk from surface runoff and groundwater, consistent with the local flood risk management strategy for the area.
- **Designation powers** – LLFAs, as well as district councils and the Environment Agency have powers to designate structures and features that affect flooding or coastal erosion in order to safeguard assets that are relied upon for flood or coastal erosion risk management.

- **Duty to Cooperate and Share information** – LLFAs, as well as other Flood Authorities (Environment Agency, Water Company, other LLFAs) have a duty to cooperate with each other, and also the power to request information, in connection with flooding, of any person or body.

As highlighted earlier in 3.2 Warrington Borough Council is addressing and progressing with the new duties in a pro-active manner. Governance arrangements in the form of a Flood Task Group and Internal flood risk review meetings have been in place since 2007. These forums engage and involve internal and external stakeholders including United Utilities, Environment Agency, Manchester Ship Canal, Planning and Highway Authority representatives. Capacity building officers is ongoing and Warrington took the opportunity to jointly support a Flood Risk management foundation degree student with support from the EA who is currently in the final year of study. The Cheshire and mid-Mersey local partnership has been formulated and has also been in place since 2010. This forum enables best practice and the response to the new duties to be developed in a consistent and efficient way across neighbouring flood authority areas.

4.0 Methodology and Data Review

4.1 Introduction

As described earlier the Preliminary flood Risk Assessment (PFRA) is a high-level screening exercise used to identify areas where the risk of flooding is considered to be significant based on EU national levels of risk. If areas of significant flood risk were identified then the areas would then warrant further examination and management through the production of flood risk and flood hazard maps and flood risk management plans.

It is worth noting that the Manchester Ship Canal is deemed a “principle watercourse” although privately owned and managed and not technically a main river. Flood risk management issues are currently being led via the Environment Agency (EA) due to the size and extent of the canal. Therefore this watercourse is not considered a local issue and is not currently considered by Warrington Borough Council or the EA to be a local flood risk management issue for the purposes of the PFRA.

The approach for producing this PFRA is 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.

4.2 Data Collection from Partner Organisations

Data from the following authorities and organisations has been used in the preparation of this PFRA:

- Environment Agency
- Water Company (United Utilities)
- Manchester Ship Canal Company
- Cheshire Fire and Rescue Service

Table 3-A catalogues the relevant information and datasets held and used by partner organisations and provides a description of each of the datasets together with a confidence rating for the data.

There are no canals or waterways in the borough under the jurisdiction of British Waterways hence no data was provided.

The Manchester Ship Canal Company has not had cause to record flood levels or flood events on the canal since there have been no recorded events linked to this system. Information is available on canal levels for the previous 12 months in any year. However, this data is contained and recorded in a graphical format and is unable at this time to be correlated and modelled into the other modelling systems used for flood risk assessment. Hence there is no data collected that is considered relevant for this PFRA but the canal level data will be collected and correlations investigated for future assessments.

Owner	Dataset	Description	Confidence Rating
Environment Agency	Areas Susceptible to Surface Water Flooding (ASStWF)	The first generation national mapping, outlining areas of risk from surface water flooding across the country with 3 susceptibility bandings.	2
	Flood Map for Surface Water (FMfSW)	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 1in 30 and a 1 in 200 chance of occurring in any given year) and two depth bandings.	2
	Flood Map (Rivers & Sea)	Shows the extent of flooding from rivers with a catchment of more than 3km ² and from the sea.	2
	Areas Susceptible to Groundwater Flooding (ASStGF)	Coarse scale national mapping showing areas which have a high probability of groundwater emergence.	3
	National Receptor Database (NRD)	A national dataset of social, economic, environmental and cultural receptors including residential properties, school, hospitals, transport infrastructure and electricity substations.	2
	Indicative Flood Risk Areas	Nationally identified flood risk areas, based on the definition of 'significant' flood risk described by DEFRA & WAG.	2
	Historic Flood Map (HFM)	Attributed spatial flood extent data for flooding from all sources.	3
	Mersey Estuary Catchment Flood Management Plan (CFMP)	CFMP's consider all types of inland current and future 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.	2
Warrington Borough Council	Historic Flooding Records	Historic records of flooding from surface water, groundwater and ordinary watercourses.	3
	Anecdotal information relating to local flood history	Anecdotal information from authority officers regarding areas known to be susceptible from all sources of flooding	4
	Strategic Flood Risk Assessment Level 1	The Stage 1 SFRA focuses on collecting information regarding all sources of flooding. This helps to identify the spatial distribution of flood risk sources in Warrington	3
	Strategic Flood Risk Assessment Level 2 Draft	The Stage 2 SFRA focuses on the details nature of flood hazard taking into account the presence of flood risk management measures such as flood defences and the location of key development and regeneration areas in Warrington.	2
	Critical Infrastructure dataset	Contains information of WBC critical infrastructure.	2
	Water Cycle Strategy	The Water Cycle Strategy identifies the water services infrastructure that is needed to support and enable sustainable development in the mid Mersey area.	2
	Surface Water Management Plan Flood Depth Mapping	Surface Water Flood Modelling conducted as part of the SWMP stage 2.	2
	Surface Water Management Plan Stage Interim Reports	Information on future surface water flood risk is outlined in these documents.	2
United Utilities	DG5 Register	DG5 Registers logs and records of sewer flooding incidents for each area.	2
Cheshire Fire & Rescue	Incident Response Register	Issue logs of all events recorded by Cheshire Fire and Rescue Service. This includes internal floods such as burst pipes and sewerage problems.	2

**Table 4- A:
Datasets collected**

4.3 Data Limitations

A brief assessment of the data collection processes and methods of assessment of available data and risks is included in this chapter to provide transparency with respect to the methodology. By flagging up the issues identified in the data collection phase it is hoped this could serve as a catalyst to improve the collection of flood risk data going forward. A number of issues arose during the data collection process, as described below:

4.3.1 Inconsistent Recording Systems

The lack of a consistent flood data being captured within one central recording system within Warrington Borough Council has led to inconsistencies in the recording of flood event data. This has resulted in incomplete or sometimes nonexistent flood record datasets that could be used as robust evidence for managing flood risk.

4.3.2 Incomplete Datasets

As a result of the lack of consistent flood data recording arrangements described above some of the datasets collated are not exhaustive and it is felt that they are unlikely to accurately represent the complete flood risk issues in a particular area. The corresponding gaps in flood data will hinder the identification of accurate flood risk areas.

4.3.3 Varied Quality of Data

Based upon the data collected from all sources described above there the quality of historic flood records and information varied greatly. However under section 21 of the Flood and Water Management Act 2010 lead local authorities will have a duty to investigate and maintain a register of flooding incidents. At present Warrington Borough Council are working with the neighbouring authorities of Cheshire West and Chester, Cheshire East, St Helens and Halton to produce consistent recording of flood incidents and information across the area that should improve the quality of the data collected for future assessments.

4.3.4 Records of Consequences of Flooding

Very few data providers were able to provide comprehensive details of the consequences of specific past flood events. The lack of detailed information has made the consequences of historic flooding difficult to assess.

4.3.5 Quality Assurance

Data collected was subject to quality assurance measures to monitor and record the quality and accuracy of acquired information and datasets. A data quality score was given, which is a qualitative assessment based on the Data Quality System provided in the Surface Water Management Plans (SWMP) Technical Guidance document (March 2010). This system is explained in Table 4-B. A confidence rating for the dataset was then determined as summarised in Table 4-A

The security of data is also a key consideration when it comes to collecting, collating and storing sensitive data. All data collected is stored on local servers which are password protected. Warrington will adhere to these data security measures to ensure that sensitive data is held in a secure manner.

Data Quality Score	Description	Explanations	Example
1	Best Possible	No better available, not possible to improve in the near future	High resolution LIDAR River/ sewer flow data Rain gauge data
2	Data with known deficiencies	Best replaced as soon as possible	Typical sewer or river model that is a few years old
3	Gross Assumptions	Based on experience and judgement	Location, extent and depth of much surface water flooding Operation of unmodelled highway drainage Future risk inputs e.g. rainfall, population
4	Heroic Assumptions	An educated guess	Ground roughness for 2d models

**Table 4-B:
Data Quality Assessment**

4.4 Data Security and Licensing Restrictions

The data collected during the PFRA process has been stored on Warrington Borough Councils secure ICT network:

A majority of the data has been specifically provided for this PFRA study and is not publicly available due to data protection requirements and therefore there are restrictions on data use. A number of specific agreements have been put in place for the PFRA and Surface Water Management Plan (SWMP) development to facilitate the sharing of data between partners:

- GIS licences for mapping and data supplied by OS to Warrington Borough Council.
- British Geological Society (BGS) licence for geological data supplied by GIS
- Environment Agency Standard data licence
- Environment Agency surface water susceptibility maps licence
- Environment Agency LIDAR licence.

4.5 Assessing Historic Flood Risk

Existing datasets, reports and anecdotal information from the stakeholders listed above have been collated and reviewed to identify details of major past flood events which had locally significant harmful consequences. The analysis included an assessment of economic damage, environmental and cultural consequences and impact on the local population.

4.6 Assessing Future Flood Risk

The identification of significant Flood Risk Areas for the purposes of the PFRA should also take into account the potential risk of floods that could potentially occur in the future. This includes identifying and predicting floods that can be extrapolated from current conditions in addition to those with an allowance for climate change.

The assessment of future flood risk has primarily relied on a technical review of surface water flood depth maps (1 in 200 annual chance of flood with 180 minute duration) produced for the Surface Water Management Plan (SWMP) as the best available information. For areas not covered by the SWMP modelling the Environment Agency's Flood Map for Surface Water was used. 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 of flood and 1 in 200 annual chance of flood). In rural areas the Flood Map for Surface Water was used as it gives a better representation of flooding on flatter topographies such as Warrington.

The following factors were considered when assessing the future flood risk across the Warrington study area;

- topography
- location of ordinary watercourses
- location of flood plains that retain water
- characteristics of watercourses (lengths, modifications)
- effectiveness of any works constructed or 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
- proposals for future development and their impact

4.7 Identifying Flood Risk Areas

Information regarding historic and future flood risk affecting 30,000 people or more has been used by defra to formally identify Flood Risk Areas. To achieve this flood risk indicators were 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 4-C.

Impact 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 Areas of agricultural land
Cultural Heritage	Cultural heritage sites (World Heritage Sites)
Environment	Designated Sites (SSSIs, SACs, SPAs, etc) and BAP habitat

**Table 4-C:
Key Flood Risk Indicators**

The above indicators have been selected and analysed by DEFRA and the Environment Agency in order to identify areas where significant 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 (Figure 13, Appendix A). For further information and details reference should be made to DEFRA's Guidance for selecting and reviewing Flood Risk Areas for local sources of flooding (December 2010).

5.0 Historic Flood Risk – Assessment of Past Flooding

5.1 Introduction

This section summarises the readily available and relevant information on historic floods. The PFRA guidance requires floods identified with significant harmful consequences to be reported in the spreadsheet in Annex 1 of this report. ‘Significant harmful consequences’ are considered to be impacts of flooding that may have negative consequences for human health, the social and economic welfare of individuals and communities, infrastructure, and the environment (including cultural heritage).

The definition of a past flood with “significant harmful consequences” is left to the LLFAs to determine. The level of significance should be chosen so that only relatively harmful flood events are included in the PFRA. Such flood events are those that would be deemed significant when considered from a national perspective.

However, all flood events affecting property or people are significant to Warrington Borough Council and justify being evaluated. The Local Flood Management Strategy, which will be produced following this PFRA will identify and seek to address these. For the purposes of this PFRA, the definition of “Significant” has been defined by Warrington (in common with the other LLFAs in the region) as a flood affecting:

- 80 houses (200 people using an average of 2.5 people per property) or more, or
- 20 non-residential properties;
- 1 piece of Critical Infrastructure.

Past floods that meet the above criteria are reported in the spreadsheet of Annex 1.

Other floods that do not meet the criteria, or for which the consequences are not known, are not included in the Annex, as per the PFRA guidance, but their locations are plotted on the relevant figures. The following sections discuss the “Significant” events, and other events that are known to have occurred.

5.2 Overview of Historic Flooding in Warrington Borough Council

Flood records across Warrington Borough Council were collected from the data sources discussed in Table 3-A.

These flood events resulted 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 within this section. Warrington Borough Council’s historic flood records are mapped in Figure 2 in Appendix A.

5.3 Surface Water Flooding

Surface water flooding is surface water runoff resulting from high intensity rainfall when water is ponding or flowing over the ground surface before entering the underground drainage network or watercourse or cannot enter it because the network is full or at capacity thus causing flooding. This is known as pluvial flooding. Pluvial flooding also includes overland flows from the urban and rural fringes entering the built up area.

Whilst pluvial flooding from heavy rainfall can occur anywhere in the borough there are certain locations in Warrington where these flooding mechanisms are more prominent due to the urban nature of the catchment and complex hydraulic interactions between the tidal River Mersey, urban watercourses, and surface water and combined sewer systems which outfall into them.

As part of the PFRA process historical flooding incidents were collected from a number of key flood risk authorities and stakeholders. These included the Environment Agency, Warrington BC, Highways Agency, Cheshire Fire Brigade and United Utilities. There are a total of 115 recorded historical surface water flooding events of varying significance and type.

Cheshire Fire Brigade provided a dataset of flooding incidents which the service responded to between August 2004 and January 2011; these are mapped and shown in Figure 3, Appendix A. This dataset was filtered to remove those incidents internal to the property such as burst drains, leaving only those sources relevant to this study. Table 5-A indicates the Cheshire Fire Brigade Recorded Incidents.

Date	Event
August 2004	6 Incidents of flooded properties due to surface water
January 2005	2 incidents of flooded properties and 2 flooded roadways due to surface water
November 2005	1 incident of a flooded property and 1 flooded roadway due to blocked drains and sever surface water flooding pooling underneath canal bridge respectively
March 2006	2 incidents of flooded properties due to tidal flooding
July 2007	3 incidents of flooded properties due to surface water flooding
October 2006	1 incident of a flooded property due to surface water flooded causing blocked drains
June 2007	7 incidents of roadways flooded due to surface water
January 2008	2 incidents of roadways flooded due to surface water
2009	No incidents
2010	No incidents

**Table 5-A:
Cheshire Fire Brigade Recorded Incidents**

Following a review of the information received and the maps and data available it is considered there are no incidents of surface water flooding that would result in 'significant harmful consequences' as defined by the PFRA threshold.

5.4 Ordinary Watercourse Flooding (Fluvial)

The Environment Agency has permissive powers to manage flood risk on watercourses designated as 'main' by the Secretary of State for Environment, Food and Rural Affairs under the Water Resources Act 1991 and local authorities have powers for managing flood risk on ordinary 'non-main' watercourses.

Warrington contains a number of ordinary 'non-main' watercourses. Ordinary watercourses are those that are not designated as Main River and therefore come under the control of Warrington Borough Council. These watercourses are often rural in nature and include drains and tributaries to large main rivers. All ordinary watercourses have been identified using the Environment Agency's Detailed River Network (DRN). The flood risk from main rivers is managed by the Environment Agency and is therefore outside the scope of this PFRA.

Watercourses are designated as main (enmained) in general if they create significant flood risk. Any ordinary watercourses known to be problematic due to limited channel capacity, channel constrictions or a poor maintenance regime were previously designated as Critical Ordinary Watercourses (COWs). An exercise to establish which of the remaining ordinary watercourses created the greatest flood risk resulted in a number of watercourse lengths and all remaining COWs being enmained in 2006/7. These are now classified as main rivers and the Environment Agency have now taken over responsibility for their maintenance and management.

Although there are several recorded incidents of localised flood events related to ordinary watercourses that were not enmained, none of these have had 'significant harmful consequence'. In general, it is likely that the flood risk associated with ordinary watercourses is low through Warrington due to the location of the watercourses being mainly upstream rural areas which feed larger watercourses and due to the catchment size.

5.5 Sewer Flooding

Flooding from artificial or designed drainage systems such as an urban storm water drainage system occurs when flow entering a system exceeds its discharge capacity. The system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse or outfall or due to reduced capacity in the system itself due to silting or blockage.

Sewer flooding is often caused by surface water drains discharging into the combined sewer systems that are not designed for the water drainage volume thus exceeding the sewer capacity. In large rainfall events this often results in the backing up of flood waters within properties or discharging of excess water or sewage through manholes.

Some of the sewers across Warrington BC date back to Victorian times and includes the areas of Penketh and Great Sankey. The population and size of Warrington has grown as

the community around Warrington expanded. More houses and businesses mean an increase in the amount of drainage systems and discharges and less permeable surfaces for rainwater to drain into. Climate change is also leading to longer, heavier periods of rain. These two factors can result in the existing sewers and drains not being able to cope at certain times during heavy rainfall.

United Utilities have provided internal and external flooding records at a property level for use in the PFRA known as DG5 records. DG5 records are contained in a register and are United Utilities record of all properties flooded from the surface water or sewer drainage system with internal records being those where sewer flooding has occurred within the property and external records relating to areas flooded outside the property.

Figure 4 in Appendix A presents the historic sewer flooding information provided by United Utilities. There have been a total of 157 flooding incidents (91 external and 66 internal) across the Warrington area. Areas where the historic data suggests that sewer flooding is a particular issue are Penketh and Sankey within the wider Warrington urban area.

It is not possible to determine from the DG5 records whether the source of flooding is solely as a result of a failure of United Utilities assets i.e. a failure in the sewer (and therefore UU's responsibility) or influenced by other sources of flooding. It is not always possible to determine the source of flooding at the time of recording the incident.

Following a review of the information received and data available it is considered there are no incidents of surface water flooding that would result in 'significant harmful consequences' as defined by the PFRA threshold.

5.6 Groundwater Flooding

Groundwater flooding is caused by the emergence of water from underground, either at point or can be as a result of water diffusion. The occurrence of groundwater flooding is usually very local and unlike flooding from rivers and the sea does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability. There are several mechanisms which produce groundwater flooding including:

- Prolonged rainfall
- High in bank river levels
- Artificial structures
- Groundwater rebound
- Mine water rebound

There are known locations with high groundwater within Warrington however, there are no specific records or reported incidents of groundwater flooding. Therefore it is considered currently that there are no groundwater flood incidents that would result in 'significant harmful consequences' as defined by the PFRA threshold.

5.7 Canals

There are three canals owned by the Manchester Ship Canal Company and managed by its subsidiary company Peel Holdings in Warrington:

- Bridgewater Canal,
- Manchester Ship Canal
- New Cut Canal.

Warrington Borough Council owns and maintains parts of the St Helens Canal within the Warrington BC boundaries.

There are no recorded incidents of flooding from these sources therefore there it is concluded that there are no events that would result in 'significant harmful consequences' as defined by the PFRA threshold.

There are no British Waterways assets in the Warrington administrative area.

5.8 Interaction with Main Rivers and the Sea

It is identified in the Mersey Estuary Catchment Flood Management Plan (CFMP) and the Environment Agency Warrington Flood Risk Management Strategy there is a long history of fluvial and tidal flooding in central Warrington dating back to 1767.

Fluvial flooding is associated more within the Mersey tributaries and main watercourses, such as Dallam, Sankey, and Whittle Brooks, rather than the Mersey itself all of which are the responsibility of the EA to manage. Warrington has benefited from the Manchester Ship Canal which transfers a significant flow of water past Warrington and reduces the risk of fluvial flooding along the Mersey.

High water levels in the River Mersey are common due to tidal and fluvial events. Although flooding from main rivers does not need to be included in the PFRA, it is thought that there is a strong link between surface water flooding, sewer flooding incidents and flooding from ordinary watercourses and water levels on the Mersey and its tributaries such as Dallam Brook and Sankey Brook. There is evidence to suggest that surface water flooding is exacerbated in some areas, such as Densham Avenue etc, during high tidal cycles when gravity drains and outfalls are blocked with high tidal waters. However, due to the incomplete nature of the information available at present, the degree of influence on local flood risks cannot be determined.

Date	Event
1697	Fluvial event along Dallam Brook.
April 1967	Fluvial flooding along Whittle Brook where 50 properties were flooded
February 1990	Tidal flooding along the River Mersey where 17 properties, 8000m ³ of commercial floor space and a public school were flooded
October 2000	Fluvial flooding along Dallam Brook where 15 houses in the Dallam area were flooded

Table 5-B
Warrington BC Significant Fluvial & Tidal Flooding Incidents

6.0 Future Flood Risk

6.1 Overview of Future Flood Risk – Assessment of Future Flooding

Whilst analysis of past flooding provides valuable information on the nature and extents of flooding that have occurred in Warrington in the past, it does not necessarily inform us about how and where flooding may occur in the future.

Predictions of future flood risk are produced using combinations of hydrological and hydraulic modelling and analysis of past hydrological records to make future predictions. The following sources of flooding have been considered in subsequent sections of this report:

- Ordinary watercourses (fluvial);
- Surface water;
- Groundwater;
- Canals.

6.2 Surface Water Flooding

To improve their understanding of the level of surface water flooding across the urban areas of Warrington, Warrington Borough Council is in the process of finalising its first edition Surface Water Management Plan (SWMP). Detailed modelling of the surface water flood risk in Warrington, Burtonwood and Culcheth has been carried out as part of the SWMP process. This assessment has used similar techniques to the Environment Agency national mapping but has incorporated local considerations, resulting in a better representation of the local flood risk in these areas.

Warrington Borough Council is required by the Environment Agency to agree an appropriate dataset that represents the risk from surface water in their area. As the SWMP modelling represents a better representation of flood risk within the main urban areas and therefore a combination of the modelling results from the SWMP with the most suitable national mapping dataset has been used in this PFRA.

A review of the Areas Susceptible to Surface Water Flooding (AStSWF) and Flood Map for Surface Water (FMfSW) datasets was carried out to determine which dataset best represented flood risk across the study area:

- The Areas Susceptible to Surface Water Flooding map is a broad assessment of flood risk which does not take any account of drainage systems. This assessment is therefore considered to be a conservative assessment of risk in urban areas and best representative of rural locations
- The Flood Map for Surface Water map is also a broad assessment of flood risk but incorporates a coarse assessment of the capacity of drainage systems. As this drainage system capacity is a national average it is likely that it represents an under-conservative estimate of risk in some areas. It is less well suited to considering risk in rural areas where there are no drainage systems

Given that the main urban areas have been considered through modelling as part of the SWMP the main areas of risk to be assessed through the national mapping are considered

to be rural areas. A combination of the SWMP modelling results with the Areas Susceptible to Surface Water Flooding map has therefore been used in this assessment. This combined dataset will represent the Locally Agreed Surface Water Flooding Information for the Warrington study area. It is considered to represent a conservative estimate of the potential risk of surface water flooding across the study area.

This dataset has been used to assess the potential surface water flood risk to properties across the study area, summarised in Table 6-A.

The Locally Agreed Surface Water Flood Risk dataset has been used to assess the potential future surface water flood risk to properties across the study area. As the dataset uses the Environment Agency AStSWF dataset it has been decided to retain the same 'susceptibility' bandings used in this dataset across the combined dataset as a whole.

Whilst it is recognised that due to future effects of climate change the overall susceptibility to surface water flooding will increase properties will still be banded as being 'less' through to 'more' susceptible to the future flood risk. This banding enables priorities for investigating flood risk to be managed.

Property Type	Susceptibility to surface water flooding banding		
	Less	Intermediate	More
All	42,397	14,333	1,926
Residential	34,952	11,470	1,402
Non-Residential	7,445	2,863	524

Table 6-A.
Numbers of Properties Potentially at Risk from
Surface Water Flooding in the Future

Property counts are derived from counts undertaken using GIS software and the National Receptor Database. The level of future flood risk and the estimated associated consequences are provided in the spreadsheet in Annex 2.

6.3 Sewer Flooding

As discussed in section 5.5, records of sewer flooding have been obtained from United Utilities. Based on information readily available on their website in their "Strategic Direction Statement" they are proposing to address a significant number of sewer flooding problems by 2015.

This is to be achieved through investment in the completion of a number of studies and capital works projects.

6.4 Groundwater Flooding

The Environment Agency's National Dataset provides an assessment of groundwater risk in terms of the percentage of a 1km² grid square susceptible to groundwater emergence. This is shown as the Areas Susceptible to Groundwater Flooding (AStGwF).

Figure 11 in Appendix A shows the AStGwF map and indicates that extensive areas in the eastern part of the borough are at risk from rising groundwater levels. However, it is not backed up by historical evidence and high groundwater levels are known to exist in other areas not highlighted by the dataset.

It is understood that groundwater levels may be rising after the cessation of mining activity in Warrington and surrounding areas. Consequently there is a risk that flooding may occur in the future in areas not previously thought to be at risk.

Further analysis and investigation is required to be undertaken in this area of risk.

6.5 Ordinary Watercourses

There is at present no specific modelling for ordinary watercourses however the Environment Agency have produced Flood Zone Maps which shows the results of coarse modelling of catchments over 3km² (Figure 10 in Appendix A).

This has been achieved through a comparison of the 1% (1in100) annual probability flood zone mapping, ordinary watercourse maps and urban areas maps. Areas with a potential flood risk of flooding from ordinary watercourses have been identified as Houghton Green and a small area in Birchwood.

Warrington Borough Council is currently in the process of completing the SFRA level 2; this will contain further modelling of ordinary watercourses and the information on the risks posed by them, this additional information will be included in the next PFRA cycle and also within Warrington's SWMP and Local Flood Strategy as they develop.

6.6 Canals

The Environment Agency's Flood Zone Mapping includes flood risk from the Manchester Ship Canal and is shown in Figure 10 in Appendix A. Due to the Ship Canal being such a large body of water which is fed directly by main rivers it is not considered to be a 'local' flood issue. Warrington has and continues to benefit from the Manchester Ship Canal which transfers a significant flow of water past Warrington and reduces the risk of fluvial flooding along the Mersey.

Despite the construction of the Manchester Ship Canal, the Mersey is at potential risk of tidal flooding, with the most significant recent flood events occurring in February 1990 and October/November 2000. Any mitigation for this risk and interactions between the canals and the main rivers is being managed by the Environment Agency.

The Environment Agency therefore provides a major role in management of the flood risks from the canals and its interactions with the River Mersey.

At present the Flood Mapping of the Manchester Ship Canal in Warrington may be subject to revision as a result of further work needed to establish the level of risk if any from the Manchester Ship Canal and this is being led by the EA.

7.0 Climate Change and Long Term Development

7.1 The Impacts of Climate Change - The Evidence

There is clear scientific evidence that global climate change is happening now. It cannot be ignored.

Over the past century around the UK sea level rises have occurred and more of our winter rain falling in intense wet spells. Seasonal rainfall is highly variable. It seems to have decreased in summer and increased in winter, although winter amounts changed little in the last 50 years. Some of the changes might reflect natural variation; however the broad trends are in line with projections from climate models.

Greenhouse gas (GHG) levels in the atmosphere are likely to cause higher winter rainfall in future. Past GHG emissions mean some climate change is 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 2080's.

There is enough confidence in large scale climate models to say that Warrington and the UK must plan for change. There is more uncertainty at a local scale but model results can still help to plan to adapt. For example it is now understood that rain storms may become more intense, even though there are still uncertainties about exactly where or when. By the 2080s, the latest UK climate projections (UKCP09) are that there could be around three times as many days in winter with heavy rainfall (defined as more than 25mm 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%

7.2 Key Projections for North West River Basin District

If emissions follow a medium future scenario, UKCP09 projected changes by the 2050s relative to the recent past in the North West are:

- Winter precipitation increases of around 14% (very likely to be between 4 and 28%)
- Precipitation on the wettest day in winter up by around 11% (very unlikely to be more than 25%)
- Relative sea level at Morecambe very likely to be up between 6 and 36cm from 1990 levels (not including extra potential rises from polar ice sheet loss)
- Peak river flows in a typical catchment likely to increase between 11 and 18%

Increases in rain are projected to be greater near the coast than inland.

7.3 Implications for Flood Risk

Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability.

Wetter winters and more of this rain falling in wet spells may increase river flooding especially in steep, rapidly responding catchments. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn, this may increase

pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers, so Warrington needs to be prepared for the unexpected.

Drainage systems in the district have been modified to manage water levels and could help in adapting locally to some impacts of future climate on flooding, but may also need to be managed differently. Rising sea or river levels may also increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses.

Where appropriate, Warrington will be involved in local studies to understand climate impacts in detail, including effects from other factors like land use. Sustainable development and drainage will help with adaptation to climate change and manage the risk of damaging floods in future.

7.4 Adapting to Change

Past emission means some climate change is inevitable. It is essential Warrington and the UK respond by planning ahead. Warrington can prepare by understanding current and future vulnerability to flooding, developing plans for increased resilience and building the capacity to adapt. Regular review and adherence to these plans is key to achieving long-term, sustainable benefits.

Although the broad climate change picture is clear, Warrington has had to make local decisions with less certainty. A range of measures therefore will need to be considered to retain the flexibility to adapt. This approach, embodied within flood risk appraisal guidance, will help to ensure that Warrington does not increase the vulnerability to flooding.

7.5 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."

In Wales, Technical Advice Note 15 (TAN15) on development and flood risk sets out a precautionary framework to guide planning decisions. The overarching aim of the precautionary framework is "to direct new development away from those areas which are at high risk of flooding."

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).

8.0 Review of Flood Risk Areas

8.1 Overview

As described in Section 1 in order to ensure a consistent national approach, Defra have identified significant criteria and thresholds to be used for defining flood risk areas.

Guidance on applying these thresholds has been released in Defra's document "Selecting and reviewing Flood Risk Areas for local sources of flooding". This guidance document sets out agreed key risk indicators and threshold values which must be used to determine Flood Risk Areas.

The methodology is based on using national flood risk information to identify 1km grid squares where local flood risk exceeds a defined threshold. Where a cluster of these grid squares leads to an area where flood risk is most concentrated and over 30,000 people are predicted to be at risk of flooding, this area has been identified as an Indicative Flood Risk Area.

Figure 12 in Appendix A shows the High Risk Areas identified by Defra.

None of the clusters shown affect more than 30,000 people across Warrington and therefore there are no Indicative Flood Risk Areas within the Warrington Borough Council boundary as defined by the PFRA criteria.

Warrington Borough Council has accepted the current proposed indicative significant flood risk areas. However, it is recognised that Warrington has many locally significant flood risk issues.

9.0 Next Steps

9.1 Future Data Management Arrangements

In order to continue to fulfil the role of Local Lead Flood Authority Warrington Borough Council 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 Warrington Borough Council, who has the overall responsibility to manage flood data throughout the 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.

At present the proposed method for flood event data collection and management is being prepared jointly by the Cheshire and mid Mersey partnership group to ensure consistency across the catchment areas.

9.2 Review

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, as discussed below.

9.3 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.

Within Warrington, the PFRA will be taken to the Flood Risk Management Task Group for approval. It will then be taken for approval by the Executive Member for Highways, Transportation and Climate Change. The findings will also be presented to the Environment and Regeneration Overview and Scrutiny Committee consisting of Elected Members for the administrative area with annual reviews of flood risk management in general proposed thereafter.

9.4 Environment Agency Review

Under the Flood Risk Regulations 2009 the Environment Agency has been given a role in reviewing, collating and publishing all of the PFRA's 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. The EA will then recommend submission of the PFRA to the relevant Regional Flood Defence Committee (RFDC) for endorsement if satisfied. RFDCs will make effective use of their local expertise and ensure consistency at a regional scale. Once the RFDC has endorsed the PFRA, the relevant Environment Agency Regional Director will sign it off. All PFRA's will then be collated, published and submitted to the European Commission.

9.5 PFRA Review Cycle

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

Appendix A: Figures

Figure 1:	Warrington Borough Boundary and PFRA Study Area
Figure 2:	Warrington Borough Council Spatial Distribution of Historic Flood Records
Figure 3:	Cheshire Fire and Rescue Historic Flood Locations up to January 2011
Figure 4:	United Utilities DG5 Register by Ward Spring 2011
Figure 5:	Environment Agency Flood Map for Surface Water Flooding: 30yr Return Period
Figure 6:	Environment Agency Flood Map for Surface Water Flooding: 200yr Return Period
Figure 7:	Environment Agency Areas Susceptible to Surface Water Flooding (Q200, 390min)
Figure 8:	Warrington SWMP Surface Water Flood Depth Map (Q200, 180min)
Figure 9:	Agreed Surface Water Mapping Dataset
Figure 10:	Environment Agency Fluvial Flood Mapping – April 2011
Figure 11:	Environment Agency Areas Susceptible to Groundwater Flooding Map
Figure 12:	DEFRA / EA Identified 1km ² High Surface Water Flood Risk Areas
Figure 13:	DEFRA / EA Identified North West England Indicative Flood Risk Area

Annexes

Annexe 1	Past Floods
Annexe 2	Future Floods
Annexe 3	Flood Risk Areas
Annexe 4	PFRA Checklist



Warrington Borough Council

**New Town House
Buttermarket Street
Warrington
WA1 2NH**

Tel: 01925 444400

www.warrington.gov.uk