

Coventry City Council Preliminary Flood Risk Assessment




**Final Report
June 2011**


LLFA
Document
Title:

Coventry City Council
Preliminary Flood Risk
Assessment

Date **June 2011**

Originator Checked by Reviewed by Approved by

ORIGINAL 01	NAME Manoj Mistry / Victor Hau	NAME Neil Cowper	NAME Colin /Knight	NAME Colin Knight
DATE March 2011	SIGNATURE 	SIGNATURE	SIGNATURE	SIGNATURE
Document Status FIRST DRAFT for discussion purposes/peer review				

REVISION 02	NAME Manoj Mistry	NAME Neil Cowper	NAME Colin Knight	NAME Cllr. L. Harvard
DATE June 2011	SIGNATURE 	SIGNATURE	SIGNATURE	SIGNATURE
Document Status:				

REVISION	NAME	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE	SIGNATURE
Document Status				

REVISION	NAME	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE	SIGNATURE
Document Status				

Executive Summary

As a Lead Local Flood Authority, defined under the Flood Risk Regulations 2009, Coventry City Council (CCC) has produced this report to meet its duty to manage local flood risk and to begin to deliver the requirements of the Regulations. This PFRA represents the first stage on the road to better management of surface water, and contains a Preliminary Assessment Report Spreadsheet and GIS Map layers.

During 2009/10 CCC has jointly worked with Coventry University on a project to research suitability of Sustainable Urban Drainage systems (SUDS) in Coventry. As part of this work, information on over 800 flooding events has been collected from numerous sources, including the Environment Agency's (EA) flood data, Severn Trent DG5's (Director General register of sewer flooding), emergency services, local archives, media, local press and the Council's operations department. The flood data dates back to the early 1900's, with some information on cause and source of flooding. CCC undertook screening of flood spots by examining severity and frequency of flooding at each location visited. Flooding which occurred was pre 1980 screened out to a greater extent, as much of the City Centre had been culverted by that time. The flood spots were mapped in MapInfo GIS database and data further scrutinised in order to filter out blocked gullies, one off incidents and issues where remedial works were completed after flooding. After this screening process numerous issues were discounted, where as, the remaining were identified for further detailed assessment.

Council engineers visited 128 flood sites and carried out a preliminary risk assessment at each of these locations. The data collected were analysed using a scoring matrix for preliminary Risk Assessment from pluvial flooding developed for use with the Surface Water Management Plan (SWMP). These inspections have been used for verification of the mapping and gathering further local surface water management information, including undertaking remedial works at external sites in the City including, Potters Green Road, Kirby Corner Road and Parry Road to reduce the risk of future flooding. All information gathered has been recorded in a Detailed Assessment Spreadsheet. This has enabled prioritisation of the areas on the basis of risk and it is now possible to identify areas of particularly high surface water flood risk.

These results broadly indicate a moderately high risk associated with surface water flooding in Coventry. Over 5% of the locations visited were assessed as being in the high risk category. Six sites were identified as high risks from surface water flooding are: and as highlighted in Figure 5-4

- City Centre
- Kingfield Road/Springfield Culvert
- Duggins Lane
- Hen Lane/Ricoh Arena
- Springfield School
- Bennetts Road

Overall, this level of risk justifies more detailed study with priority being given to those areas which include locations in the High category and/or with a risk to properties. On further interrogations the following high risk area were put forward for hydraulic analyses:

- **City Centre,**
- **Kingfield Road/Springfield Culvert**
- **Duggins Lane.**

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Abbreviations

Acronym	Definitions
AStSWF	Areas Susceptible to Surface Water Flooding
BW	British Waterways
BAP	Biodiversity Action Plan
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
CCC	Coventry City Council
DG5	Director General register of sewer flooding
EC	European Commission
FMfSW	Flood Map for Surface Water
FRMG	Flood Risk Management Group
Ftp	File transport protocol
FWMA	Flood & Water Management Act 2010
FRR	Flood Risk Regulations
LLFA	Lead Local Flood Authority
MoU	Memorandums of Understanding
PPS25	Planning and Policy Statement 25: Development and Flood Risk
PFRA	Preliminary Flood Risk Assessment
RFDC	Regional Flood Defence Committee
RFCC	Regional Flood Coastal Committee
SAB	SUDS Approving Body
SACs	Special Areas of Conservations
STW	Seven Trent Water
SFRA	Strategic Flood Risk Assessment
SSSi	Site of Special Scientific Interest
SUDS	Sustainable Urban Drainage Systems
SWMP	Surface Water Management Plan
ToR	Terms of Reference
WAG	Welsh Assembly Government
WwTWs	Waste water Treatment Works

1. Introduction

The Flood Risk Regulations 2009, which implement the EU Floods Directive in England and Wales, require Lead Local Flood Authorities (LLFAs) to prepare Preliminary Flood Risk Assessments (PFRA) and identify flood risk areas by the end of June 2011. The PFRA will be reviewed by the Environment Agency for finalising before the end of 2011. This report will include maps showing historical and potential future flood risk.

The PFRA and identification of flood risk areas are the first two steps (highlighted in lighter shade of blue) of four in developing a plan for management of local flood risk. The Flood Risk Regulations identify two further steps:

Table 1-1. - Flood Risk Regulations 2009 Timetable (for local flood risk sources)

2009	22 nd June 2011	22 nd June 2011	22 nd June 2013	22 nd June 2015
Flood Risk Regulations Method for selecting and reviewing Flood Risk Areas for local sources	Prepare Flood Risk Assessment Report The PFRA should focus on local flood risk from surface water, ground water, ordinary watercourses and canals	Identify Flood Risk Areas Flood Risk Area are 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	Preparation of Flood Hazard and Flood Risk Maps Identify the level of hazard and risk of flooding within each Flood Risk Area to inform Flood Risk Management Plans	Preparation of Flood Risk Management Plans Plans setting out risk management objectives and strategies for each Flood Risk Area

The first two elements of work, highlighted in lighter shade of blue, are covered by the preparation of this PFRA report. The PFRA process then starts again with refinements to the PFRA maps, and iterates on a six-yearly cycle.

A PFRA is a high level assessment of flood risk, based on collecting existing information on both historical floods and future flood risk. For LLFAs, the focus of the PFRA should be on sources of flood risk for which they have responsibility, specifically surface water, groundwater and ordinary (non Main) watercourses.

1.1. Scope of the Report

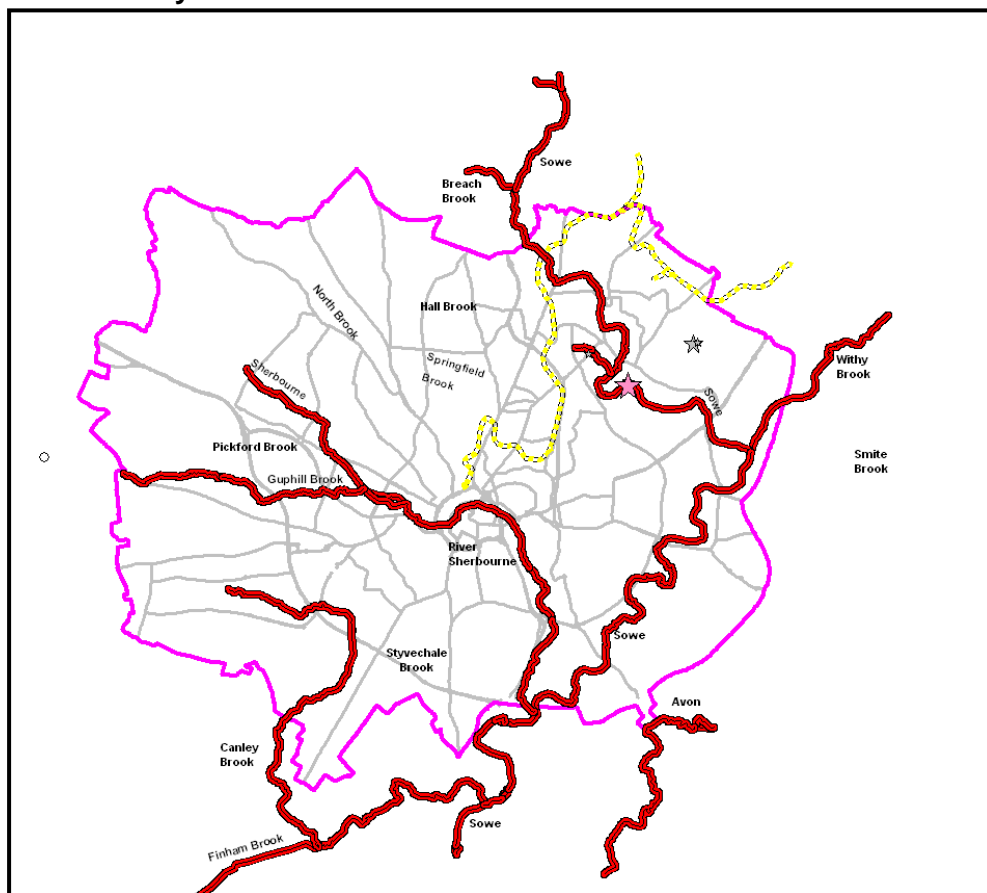
The aim of this document is to report the finding of detail assessment works undertaken for the preparation of a Preliminary Flood Risk Assessment (PFRA) for Coventry City. The scope of this PFRA is to consider past flooding and possible future flooding from the following local flood sources:

- Surface Water;
- Groundwater;
- Ordinary Watercourse;
- Canals.

This also considers floods which have significant harmful consequences for human health, economic activity and the environment. The flooding associated with the sea, main rivers and reservoirs is the responsibilities of the Environment Agency and does not need to be considered by the LLFA in this PFRA, unless it is considered that it may affect flooding from one of the sources as mentioned above.

1.2. Study Area

Figure 1-1 – Coventry Council administrative Area



Coventry City's administrative area covers approximately 99km², served by River Sherbourne passing through the City and River Sowe flowing from northeast to southwest to the east of the City with Canley Brook and other tributaries feeding into the two main rivers in south of the City.

The majority of the Coventry study area is flat or undulating and there are few areas in which very high velocity flows of surface water are likely to be found. The area is dissected by River Sherbourne and River Sowe watercourses of which considerable lengths are in culverts. Extreme rainfall may exceed design parameters for some culverts and small bridges – in such cases pluvial flooding (as a primary element of surface water flooding) is considered to exacerbate fluvial flood risk. As many of the watercourses have been culverted, particularly those in the centre of Coventry, the channels of these watercourses have been extensively developed. In many cases, infrastructure has been constructed across the natural flow paths creating barriers which will increase the risk of potential deep ponding. This could cause significant damage to property and possibly a risk to livelihood.

The flat nature of the terrain in many areas also means that such areas can be susceptible to widespread shallow ponding as the surface runoff cannot drain away easily. Whilst unlikely to pose a serious risk, these areas have the potential to cause minor flooding to very large numbers of properties, if doorway threshold levels are low. Flooding in these areas is also often exacerbated by sewer flooding due to the flat gradients of the sewer systems which reduce the capacity of the system to deal with rainfall events.

1.3. Aims and Objectives

The PFRA involves undertaking a high level screening process to identify areas within Coventry which are most susceptible to surface and groundwater flooding and which are significant and warrant further examination through the production of maps and management plans.

The aim of this PFRA is to provide high level assessment of local flood risk in Coventry, including existing 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 historic 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 historic flood risk information, which will be built up in the future and used to support and inform the preparation of Coventry'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.

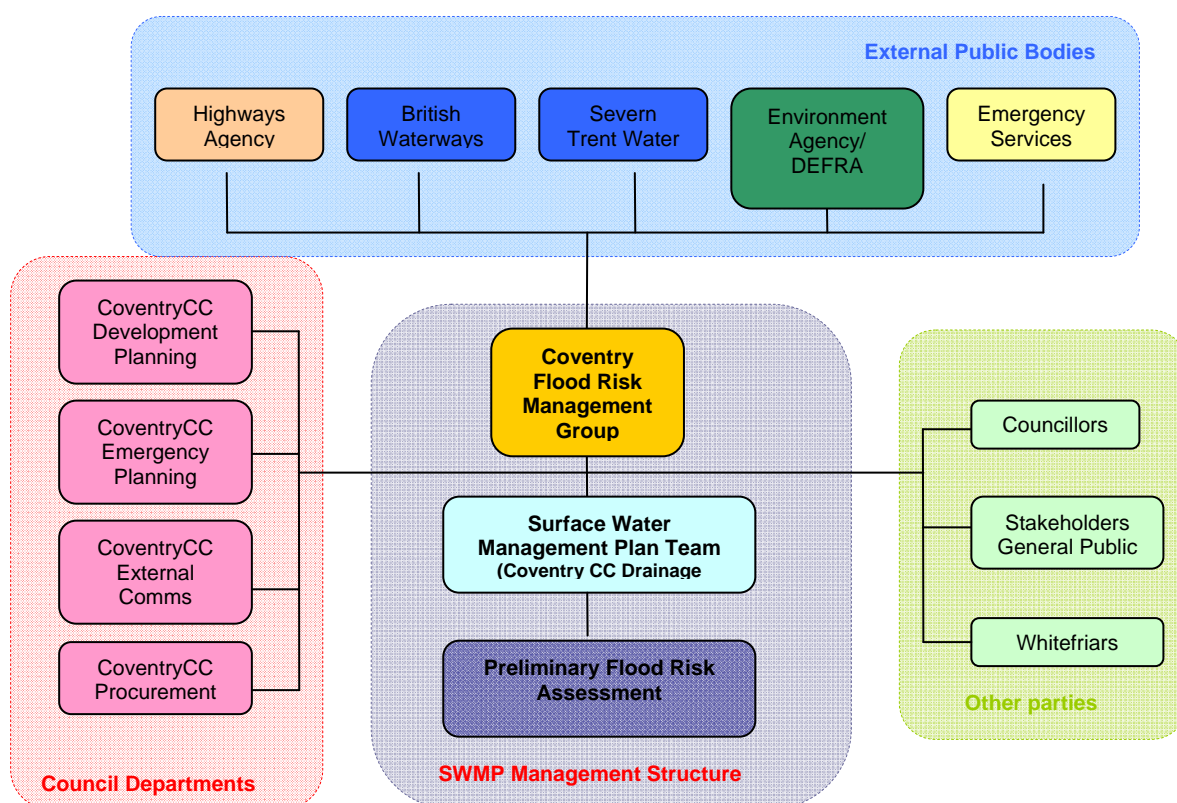
2. Lead Local Flood Authority Responsibilities

2.1. Governance and Partnership Arrangements

Coventry Flood Risk Management Group

The group led by Colin Knight (Assistant Director of Planning Transportation and Highways) comprises a Highways Technical Services Manager and representatives from the Environment Agency, Severn Trent Water, Emergency Planning, Development Control and external consultants to input their knowledge towards the subject. The group focuses on an overall Flood Risk Management strategy, management of funding and external communications. Meeting is held quarterly updating progresses and findings in SWMP.

Figure 2-1: Coventry Flood Risk Management Group Structure



Severn Trent Water

Severn Trent Water (STW) has ownership on all public sewerage networks within the city. They periodically carry out inspections and maintenance on their sewerage networks to ensure they function satisfactory during rainfall events. Some of the flood spot identified by the Council were related to STW - they are highlighted as DG5 flooding incidents.

Environment Agency/ DEFRA

The Environment Agency has provided support and guidance throughout the process and preparation of the PFRA and continues to support Coventry with their SWMP. The regular updates and guidance notes from Defra enable Coventry to meet its obligations under the Flood Risk Regulations and Flood & Water Management Act 2010.

ENGAGEMENT TARGET GROUPS, STRATEGY AND ACTION PLAN

Table 2-1

(1) PARTNERS

Target Group Identified	Purpose of Engagement	Method of Engagement	Benefit to SWMP	Target Date	Outcome of actions
Environment Agency	To obtain baseline information; provide technical guidance and support in developing SWMP, mapping data, achieving NI189 targets.	Invite representatives to sit in Multi-Agency Flood Risk Management Group meetings	Increase availability and volume of flood data record; assist in clarifying and delegating responsibilities	Before July 2010	
Highways Agency	Additional source of information in regards to flooding.			Before July 2010	
Severn Trent Water	To obtain STW flood register and known flooding problems; Pass on DG5 sites location to STW for them to action.			Before July 2010	
British Waterways	Concerns of canal break scenario			Before July 2010	
Coventry University	Gather flood history and provision of data collection			Before July 2010	
Emergency Planning	Coventry flood plan/ emergency policies			Before July 2010	

(2) STAKEHOLDERS

Target Group Identified	Purpose of Engagement	Method of Engagement	Benefit to SWMP	Target Date	Outcome of actions
Coventry Councillors	To obtain local historical information on flooding; comment on proposals/ input in advance to finalising option.	Set up sub-meetings with involvement of Emergency Planning	Ensure appropriate councillors are aware SWMP process and assist when the team engage with residents	Before July 2010	
Residents/ Local businesses (at flood risk areas)	To obtain local historical information on flooding; comment on proposals/ input in advance to finalising option.	Meet local residents/ businesses on site to review flood problem	Increase availability and volume of flood data record	Before July 2010	
Fire Service, Police and Ambulance etc	To discuss evacuation procedures during flood event, methods of flood prevention	Set up sub-meetings with involvement of Emergency Planning	Ensure engagement with services is adequate against flooding	Before July 2010	
Whitefriars	Identify council owned properties with drainage issues.			Before July 2010	

2.2. Communication with Partners and the Public

A series of communication activities were undertaken from the start of the review to ensure that all key stakeholders were engaged early in the process. This provided an opportunity for the Council to communicate key messages widely.

CCC has developed an Engagement Plan which underpins how the engagement with stakeholders can be achieved through a range of methods, i.e. distribution of newsletters to the community, exhibition stands, holding public evening meetings, or the use of websites. At present Coventry is debating how to engage the public without causing alarm. Obtaining public and partners engagement early in the process is vital – this helps to develop Council's vision of SWMP and transform flood risk management options into reality. This section highlights key factors to achieve full engagement with other parties and adequate method of approach maximising efficiency.

2.2.1 Partner

External partners are the Environment Agency, Highways Agency, British Waterways, Severn Trent Water and Coventry University; internal partners are Coventry City Council Emergency Planning team, Communications team, Building Control, Planners, Parks and Legal Services.

At Coventry we are working together for a common objective, based on a culture of partnering, trust and openly sharing of ideas and methods. Each partner will have different level of responsibilities towards the development of Local Flood Risk Strategy.

Our good partnering culture aims to achieve the following:

- Proactive engagement in the process;
- Actively cooperate with each other;
- Open and transparent in our participation;
- Share openly with other partners;
- Respect data confidentiality at all stages in the process.

2.2.2 Stakeholders

The Council is committed to communicate and engage with all members of the community. Consequently, the Council will take proactive steps to anticipate the factors that could impair communication with stakeholder groups. We will take appropriate actions to reduce and mitigate potential communication barriers. A successful strategy will reach all sections of the community, including groups who have not previously been engaged with the Council regarding flooding in the close proximity to their homes. Stakeholders will vary depending on drainage areas being studied but will generally include groups as stated in Table 2-1.

3. Methodology and Data Review

3.1. Information Gathered

Coventry City Council has been working in partnership with other academic and public bodies such as the Environment Agency, Severn Trent Water, British Waterways and Coventry University, to collate and map out historical flood events within Coventry City. Types of flood recorded were pluvial, sewer flooding and surcharging drainage systems.

Our flood data record aims to capture the following:

- Geographical location of flood events;
- Detailed notes on the nature of the flooding issue;
- The body responsible for attending to the problem.

Coventry City Council's call centre receives and records all flooding issues reported through public complaints. Recorded events can be highway flooding such as puddles/ ponding at public footway or carriageway, blocked gullies, overland flooding that has affected the properties. Data are logged into our system and updated on weekly basis - Table 3-1.

Table 3-1 – Sample spreadsheet – Flood Data recording system

enquiry_number	Enquiry_time	service_code	subject_code	site_name	site_class_name	ward_code	ward_name	officer_name	officer_code	enq_stat_us_code	subject_name
11601530	17/12/2010 16:06:03	HMTC	SCG	Russell Street North	NSG Publicly Maintainable	FOLE	Foleshill	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601534	18/12/2010 09:37:57	HMTC	SCG	Barker Butts Lane	NSG Publicly Maintainable	SHBN	Sherbourne	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601894	30/12/2010 16:15:01	HMTC	SCG	Northfield Road	NSG Publicly Maintainable	STML	St. Michaels	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601895	30/12/2010 16:16:09	HMTC	SCG	Northfield Road	NSG Publicly Maintainable	STML	St. Michaels	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601767	29/12/2010 09:45:49	HMTC	SCG	Chace Avenue	NSG Publicly Maintainable	BINL	Binley & Willenhall	Stephen Thorley	STH2	CLSE	Blocked Gullys
11601377	15/12/2010 11:28:02	HMTC	SCG	Cheveral Avenue	NSG Publicly Maintainable	RADF	Radford	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601125	08/12/2010 19:31:54	HMTC	SCG	Swanswell Street	NSG Publicly Maintainable	FOLE	Foleshill	Coventry Direct	COV	INSP	Blocked Gullys
11601097	08/12/2010 13:21:03	HMTC	SCG	Rotherham Road	NSG Publicly Maintainable	HOLB	Holbrooks	Coventry Direct	COV	INSP	Blocked Gullys
11601411	15/12/2010 18:27:22	HMTC	SCG	Northumberland Road	NSG Publicly Maintainable	SHBN	Sherbourne	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601447	16/12/2010 14:21:04	HMTC	SCG	Harefield Road	NSG Publicly Maintainable	UPST	Upper Stoke	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601663	21/12/2010 13:27:38	HMTC	SCG	Drapers Fields	NSG Publicly Maintainable	RADF	Radford	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601417	16/12/2010 09:22:42	HMTC	SCG	Gulson Road	NSG Publicly Maintainable	STML	St. Michaels	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601449	16/12/2010 14:23:22	HMTC	SCG	Harefield Road	NSG Publicly Maintainable	UPST	Upper Stoke	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601352	15/12/2010 08:21:57	HMTC	SCG	Beake Avenue	NSG Publicly Maintainable	HOLB	Holbrooks	Coventry Direct	COV	INSP	Blocked Gullys
11601457	16/12/2010 16:34:07	HMTC	SCG	Far Gosford Street	NSG Publicly Maintainable	STML	St. Michaels	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601460	16/12/2010 16:38:11	HMTC	SCG	Walsgrave Road	NSG Publicly Maintainable	STML	St. Michaels	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601847	30/12/2010 11:11:40	HMTC	SCG	Canterbury Street	NSG Publicly Maintainable	STML	St. Michaels	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601849	30/12/2010 11:17:35	HMTC	SCG	Gulson Road	NSG Publicly Maintainable	STML	St. Michaels	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601842	30/12/2010 10:58:20	HMTC	SCG	Stockton Road	NSG Publicly Maintainable	STML	St. Michaels	Stephen Thorley	STH2	ORPL	Blocked Gullys
11601843	30/12/2010 10:59:47	HMTC	SCG	Stockton Road	NSG Publicly Maintainable	STML	St. Michaels	Stephen Thorley	STH2	ORPL	Blocked Gullys

The Environment Agency has historical flood records on main rivers such as River Sherbourne and River Sowe and is responsible to protect against floods from by main rivers. The EA has supplied copies of the relevant National Mapping of Areas Susceptible to Surface Water Flooding (November 2010) and the latest 1 in 30 year (shallow & deep) and 1 in 200 years (shallow & deep) through their dataset warehouse. We also have access to Areas Susceptible to Ground Water Flooding, Historic Flood Map, National Receptor Database, Area above Flood Risk Threshold and Historic Landfill Sites.

CCC has had various meetings with British Waterways (BW) who have a duty to maintain all canal channels and their flow control assets within Coventry, including a dam at Coombe Abbey Lake located near the border of Coventry. BW has assured CCC that they carry out regular maintenance in Coventry, particularly around the site, formally known as the Central Depot where previously the canal breached and caused a major flood in the surrounding area. This incident occurred in the late 1970s and affected several residential properties. BW undertook major reconstruction works to the retaining wall and now actively monitors condition of the canal banks.

Severn Trent Water supplied their sewage records in GIS layers showing locations of their sewerage in full network, i.e. sewers; Waste Water Treatment Works (WwTWs); pumping station; and detention tanks. Their data contains sewer related flooding issues dating back approximately 10 years and provides basic attributes of network elements such as dimension and depth of pipes etc. The data was provided under a "Confidentiality Agreement" between Coventry Council and Severn Trent Water only.

3.2. Availability and Limitations

Some flooding issues reported were not accurately described by the public, i.e. observed cause and impact not stated clearly, no photos. Lack of details in cause, frequency and severity within flood record would increase difficulty for council teams to investigate and address local flood issues. Further information on past flooding needed to be sought by sending out questionnaires to residents living within high risk flood zone. This was a method considered during the planning of SWMP but with the overwhelming concerns about concerning the communities, the questionnaires were not sent out. The Flood Risk Management Group (FRMG) is actively working with partners and stakeholders to resolve this issue.

3.3. Storage System

Historical flood records are converted into Coventry City Council's Mapinfo GiS (Geographical Information System) which are then transposed electronically onto an ordnance survey map with other asset datasets. This assists the drainage team to identify and assess frequency, severity and locations of flood risks at different areas, as well as undertaking desktop studies to investigate causes of flood events.

3.4. Information Sharing

Internally CCC has a GIS Data Warehouse where the flood data has been uploaded for other departments to use. The CCC has now established a Ftp site (File Transfer Protocol) and is currently finalising a Memorandum of Understanding (MoU) for the Sharing of STW-Asset and DG5 information between STW, the EA and Stakeholders. The Ftp site will have access restrictions for data protection purposes.

3.5. Quality assurance, security, data licensing and restrictions

All data gathered has been subjected 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 SWMP Technical Guidance document (March 2010). This system is explained in Table 3-2.

The use of this system provides a basis for analysing and monitoring the quality of data that is being collected and used in the preparation of the PFRA.





Table 3-2: Data Quality System from SWMP Technical Guidance

Data Quality Score	Description	Explanations	Examples
1	Best Value	No better available; not possible to improve in the near future	High resolution LiDAR River flow data Rain gauge data
2	Data with known deficiencies	Best replaced as soon as new data is available	Typical sewer or river model is a few years old
3	Gross assumptions	Not invented but based on experience and judgement	Location, extent and depth of surface water flooding Operation of un-modelled highway drainage Future risk input e.g. rainfall, population
4	Heroic assumptions	An educated guess	Ground roughness for 2D models

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 (GIS Data Warehouse). Coventry Council must adhere to these data security measures to ensure that sensitive data is held in a secure manner. This represents information sharing.

A summary table illustrating the restrictions on the use of this data is included in Table 3-3 below.

Table 3-3: Summary of data restrictions and licensing details

Organisations	Description
	The use of some data is available from EA web site Geostore for Coventry Council and their consultants for the preparation of its Preliminary Flood Risk Assessment. The use of other data is unrestricted.
	The use of provided data is restricted to only to Coventry City Council and their consultants for the preparation of its preliminary flood risk assessment. The information must not be used for anything other than the purpose stated in the agreement. No information may be copied, reproduced or reduced to writing, other than what is necessary for the purpose stated in the agreement.
	The use of provided data to Coventry City Council and their consultants for the preparation of its preliminary flood risk assessment.
	CCC has set up Ftp site for all their flood data to share with their partners and stakeholders. The site is password protected, STW will have their unique username and password, which only CCC will have as they have signed a "Confidentially Agreement"

3.6. Data Sources

Table 3-4 catalogues the relevant information and datasets held by partner organisations and provides a description of each of the datasets.

Table 3-4: Relevant Information and Datasets

	Dataset	Description
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 (less than 0.3m and greater than 0.3m).
	Flood Map (Rivers and the Sea)	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.
	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.
Coventry City Council	Strategic Flood Risk Assessments (SFRA)	SFRAs may contain useful information on historic 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.
	Enquiries from member of public, Councillors/Engineers records/works records	Reported/recorded flooding of gullies, roads, gardens from surface water.
Coventry Fire & Rescue	Historic flooding records	Records of historic 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 hotspots in their areas.
Coventry Police	Anecdotal information	Anecdotal information from a officer who attends Coventry Flood Plan meetings.
STW	DG5 Register for Coventry	DG5 Register logs and records of sewer flooding incidents in Coventry.

Coventry University	Coventry University research student amassed considerable data of flooding incidents in Coventry	Data gathered were from all of the above sources that were published in local media, news papers,
British Waterways	British Waterway's canal network Records of canal breaches and overtopping events	Detailed GIS information on the British Waterway's canal network, including the location of canal centrelines, sluices, locks, culverts, etc. Records of historical canal breaches and canal overtopping events in Coventry.

4. Past Flood Risk

4.1. Historic Flooding in Coventry

The data collected Coventry University dated back to 1900s and the majority were one off incidents, i.e. blocked gullies. CCC has collected 874 historical flood incident records. A summary map highlighting the locations of these past flood sources is shown in Figure 4-1; in many cases the source of flooding was unknown, unclear or unrecorded.

4.2. Analysis of Historic Flooding in Coventry

As part of SWMP study we carried out Preliminary Risk Assessments by visiting 128 flood 'hotspot' sites to understand accuracy and attain confidence in the recorded data. The assessment was recorded on a spreadsheet as detailed in Table 4-1.

The Preliminary risk assessments were based on a simple scoring system to rate a perceived overall level of surface water flood risk at each of the locations visited. This resulted in prioritisation of locations and areas for more detailed assessment including a review of Severn Trent's sewerage and surface water drainage systems; and proposals for more detailed assessment. Assessment would include review of Severn Trent's public sewerage, groundwater, local brooks/watercourses and other surface water drainage systems.

Table 4-2 – Scoring Matrix for Preliminary Risk Assessment of Pluvial Flooding

Scoring Matrix for Preliminary Risk Assessment of Pluvial Flooding						
Attribute	Hazard Level	Very Low	Low	Moderate	High	Very High
Depth of Flooding	Description	<0.2m	0.2m to 0.5m	0.5m to 1m	1m to 2m	>2m
	Score	0	1	2	3	4
Extent of Flooded Area and Properties at Risk	Description	Localised <0.1ha No properties potentially at risk	Localised <0.1ha 1 property potentially at risk	Moderate (up to 1ha) Up to 10 properties potentially at risk	Extensive (up to 10ha) Up to 100 properties potentially at risk	Widespread (>10ha) More than 100 properties potentially at risk.
	Score	0	0	1	2	3
Flowpath feeds topographic depression ?	Description	No or Flowpath only.	Yes. Depth <0.5m	Yes. Depth 0.5-1m	Yes. Depth 1-2m	Yes. Depth >2m
	Score	0	0	1	2	3
Velocity of Flow	Description	Still Water (generally flat terrain). Any depth.	Velocity up to 0.5m/s (generally gently sloping terrain) and Depth less than 0.5m.	Velocity 0.5 -1m/s (generally moderately sloping terrain) and Depth less than 0.5m.	Velocity more than 1m/s (generally steeply sloping terrain) and Depth less than 0.5m.	Velocity more than 1m/s (generally steeply sloping terrain) and Depth more than 0.5m.
	Score	0	1	2	3	4
Sensitivity of Land Use	Description	Open areas that can be flooded without significant consequence.	Parkland, open ground or farmland where flooding would have some consequence.	Suburban residential / commercial / retail / industrial areas where flooding would have moderate consequence.	Central urban or town centre residential / commercial / retail / industrial areas where flooding would have high consequence.	Critical infrastructure present. Critical transportation links present. Basement flats present.
	Score	0	1	2	3	4
Doorway Threshold Levels	Description	Most above 0.2m above ground level	Most above 0.2m but some 0m to 0.2m above ground level	Most 0m to 0.2m above ground level	Most at ground level. Some below ground level.	Most below ground level
	Score	0	1	2	3	4
Total Score		0 to 2	3 to 4	5 to 7	8 to 10	>10
Overall Preliminary Risk Rating		Not Significant	Low	Moderate	High	Severe

4.3. Consequences of Significant Harmful Flooding

As a result of the issues mentioned in Section 3.5, insufficient data were recorded to draw definitive conclusions on the impacts and consequences of significant historic flood events on people, the economy and the environment, as this information has not been effectively recorded in the past.

However, there are 2 locations in the city where significant consequences of flooding may occur, shown in Table 4-3:

Table 4-3 – Significant Harmful Flooding

Sites	Date	Location/Address	Descriptions
1	13/12/2008	Duggins Lane - 21, 23, 25, 27, 33, a critical infrastructure electrical sub-station and also no. 9 Nursery Home;	Severe flooding incident was recorded on Duggins Lane near Nailcote Avenue, following house numbers were affected:
		Nailcote Drive – 68, 70, 95 and 97 Station Road – 74 and 76	The flood event flooded substantial area in and around Duggins Lane. The Junction was closed off for several hours. Council report suggested over 50 sandbags delivered to the area and also flood signs delivered to ease problem in future. CCC carried out extensive Investigations to determine adequacy of drainage in the area and carried out extensive improvement works to existing culverts to release more flows through the culverts. CCC has undertaken improvements works to the watercourse to ensure the channel is free from any obstructions and continues to monitor situation.
2	10, 17 and 22 nd June 2003	Kingfield Road/Springfield Culvert (Marion Road in Foleshill) Kingfield Road, nos. 74, 76, 78, 80, 82 and 84 and further 5 houses opposite numbers 71-79 Kingfield Road.	Series of flash flooding recorded on the 10 th , 17 th and 22 nd June 2003, causing roads and properties on On each occasion sandbags were delivered to all the residents affected by flash flooding.

The above recorded flood events will be included in Annex 1 of the Preliminary Assessment Spreadsheet. Coventry continues to update records for future evidence base. This base will be built up in the future through ensuring full details of flood events are recorded; this will then be used to support and inform future PFRA cycles as well as Coventry's Local Flood Risk Management Strategy.

A selection of photographs has been included in Annex 6. These highlight the fact that there have been past floods in Coventry with significant harmful consequences based on the available evidence. Details of these flood events will be kept within the overall evidence base that Coventry is building up and will go towards informing future work.

5. Future Flood Risk

5.1. Climate change and long term developments

5.1.1. 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). These do not show the impact of climate change on local flood risk.

United Kingdom Climate Change Projections 2009 (UKCP09) provides the most up to date projections of future climate for the UK (<http://ukclimateprojections.defra.uk>).

In terms of precipitation, the key findings from UKCP09 are:

By 2080s, over most of lowland UK, central estimates are for heavy rain days (rainfall greater than 25mm) to increase by a factor of between 2 and 3.5 in winter, and 1 to 2 in summer;

By 2080s, across regions in England and Wales, the central estimate (50% probability) for winter mean precipitation percentage change ranges from +14 to +23 and the central estimate for summer mean precipitation percentage change ranges from -18 to -24.

Certain key processes such as localised convective rainfall are not represented within this modelling so there is still considerable uncertainty about rarer extreme rainfall events for the UK. We can be more certain that heavy rainfall will intensify in winter compared to summer. The proportion of summertime rainfall falling as heavy downpours may increase. The impact of these changes on local flood risk is not yet known.

5.1.2. Long Term developments

In England, Planning Policy Statement (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 high 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 their 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.

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 in Coventry. As there is no local information on future flooding available, the 'locally agreed surface water information' is the Flood Map for Surface Water dataset, which gives an overview of the future flood risk from surface water in Coventry and is considered to be the most appropriate source of information. This dataset is illustrated in Figures 5-1 and 5-2.

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

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

Coventry City Council is currently proceeding with our Surface Water Management Plan. The outputs from this will provide more accurate information on future flood risk identified in Coventry and will form part of the 'locally agreed surface water information' once completed.

5.2.1. Assessing Future Flood Risk

The identification of Flood Risk Areas through the PFRA will also take into account future floods, 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 further technical review by the CCC as LLFA and the Environment Agency. The EA's 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 probabilities and 1 in 200 annual probabilities).

The following factors were considered to assess future flood risk across the Coventry 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.

The EA have provided supporting information concerning Property count information for Preliminary assessment which shows counts for property footprints and these have been updated in Annex 2

5.2.2. Identifying Flood Risk Areas

Information regarding historic 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 development of SWMP included Preliminary Risk Assessment through which a plan entitled "Identification of Future Flood Risk Areas" was produced, shown in – Figure 5-4

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 5-2.

5.2.3. Potential Consequences of Future Flooding

The Regulations require consideration of the possible harmful consequences of floods on human health, economic activity and the environment (including cultural heritage).

The Environment Agency has used the Flood Map for Surface Water and National Receptor Database to identify the potential consequences of future flooding from surface water, this information has been included in Annex 2 of the Preliminary Assessment Report Spreadsheet.

Table 5-2: Key Flood Risk Indicators

Impact on Flooding	Flood Risk Indicators
Human Health sites	Number of residential properties, Critical services (Hospital, Police/Fire/Ambulance Stations, School, and 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 and BAP habitat.

6. Identification of Flood Risk Areas

6.1. Overview

This is a screening process to identify areas within Coventry which are most susceptible to surface water flooding, using the flood hot spots to ensure that any subsequent detailed assessment is only undertaken within the areas of greatest potential risk.

Site visits undertaken attempted to confirm the presence of flowpaths and depressions and assess their likely effects; for example the number of properties likely to be affected; the depth of flooding; and the velocity of flows. The results of the site assessments are shown in the Detailed Assessment Spreadsheet. The spreadsheets also include the results of the preliminary risk assessment which was undertaken for each site visited.

The following sites fall within high risk of flooding areas identified in the outline SWMP study:

Site 1 – City Centre

City Centre is the heart of Coventry City with high densities of businesses and offices. It generally has no major flow paths that could result in deep, fast flowing water but the existence of undulating terrain, basements, under story car park means that during intense rainfall, some shallow ponding at those underground zones might occur. Widespread flooding could result in significant damages to business and private properties.



Photograph 1: Local access road, a man made depression at city centre.

Site 2 - Sherbourne Fields



Sherbourne Fields School is located adjacent to a floodplain area of River Sherbourne. It is at the lower end of a gentle sloping hill within a residential area. Tiverton School and Kingsbury Road experience sewer flooding in 2001.

Photograph 2: Run-off drains into school parking area. School entrance has no surface water resilience.

Site 3 - Kingfield Road

Coventry City Council flood records shows that there have been more than 5 historical flood events at 74-86 Kingfield Road since 1980.

Water running down this flow path accumulates in the grassed area immediately adjacent to 74-86 Kingfield Road, continues south through Guild Road and Pridmore Road, towards Courtaulds Road industrial area. Flow path eventually arrives at Coventry Canal crossing Foleshill Road.



Photograph 3: General view of high risk flooding area, 74-86 Kingfield Road/ Marion Road junction.

Site 4 - Bennetts Road



Photograph 4: Water accumulates downstream end at main school access.

Coventry City Council flood record shows that there have been four historical flood events at Watery Lane and Penny Park Lane since 1980.

Penny Park Lane and the school are located within lower end catchment zone with flat gradient. At this area, relatively shallow depths of surface water are likely to cause traffic problems and pedestrian access for school children could become difficult.

Site 5 - Hen Lane

Coventry City Council flood record shows that there have been four historical highway flood events at Hen Lane since 1980. During site inspection it was observed that 3 out of 4 gullies were blocked underneath a railway bridge at lower end of Hen Lane.

Due to the moderate to steep gradient at Hen Lane, during intense rainfall events, surface water flowing through Hen Lane at high velocities towards the bridge and roundabout could be a risk factor. Any flood events at the bridge are likely because of traffic delays if vehicles have to slow down through standing water, which causes congestion and increase risk of Road Traffic Accidents (RTA)



Photograph 5: Lower catchment view of Hen Lane facing Railway Bridge and Rowley's Green roundabout

This potential safety concern should be further addressed and an action to be undertaken before Olympic Games 2012, as volume of traffic is likely to increase during the event.

Site 6 - Duggins Lane



Photograph 6: Poorly maintained drainage ditches

There was in 2008 a recorded flood event in which 25 properties were affected. Flood records shows surface water accumulated at the junction of Duggins Lane/ Station Avenue. Surface water is collected into two ditches laid on both sides of lane with few road gullies. There is an electricity substation is located between 31 and 33 Duggins Lane.

Whilst a substation is classified as critical infrastructure, increase of flood protection is required. More detailed surface water flooding analysis should be undertaken at this area to ensure the residential properties are protected and operation of the substation should not be affected during severe flood events.

Summary Comments on Flood Risk Areas

In summary, the key risk issues identified were:

- Some significant and deep ponding areas.
- Critical infrastructure and access routes.
- Basements and basement flats at some locations.
- Sewerage and surface water drainage problems at some areas

There are some moderate to steeply sloping areas where high surface flow velocities could be a risk factor. Variable doorway threshold levels with several locations where properties are at street or ground level including commercial and retail premises and schools. Some very flat areas where the lack of fall means that shallow surface water flooding could occur relatively quickly

7. Review of Indicative Flood Risk Areas

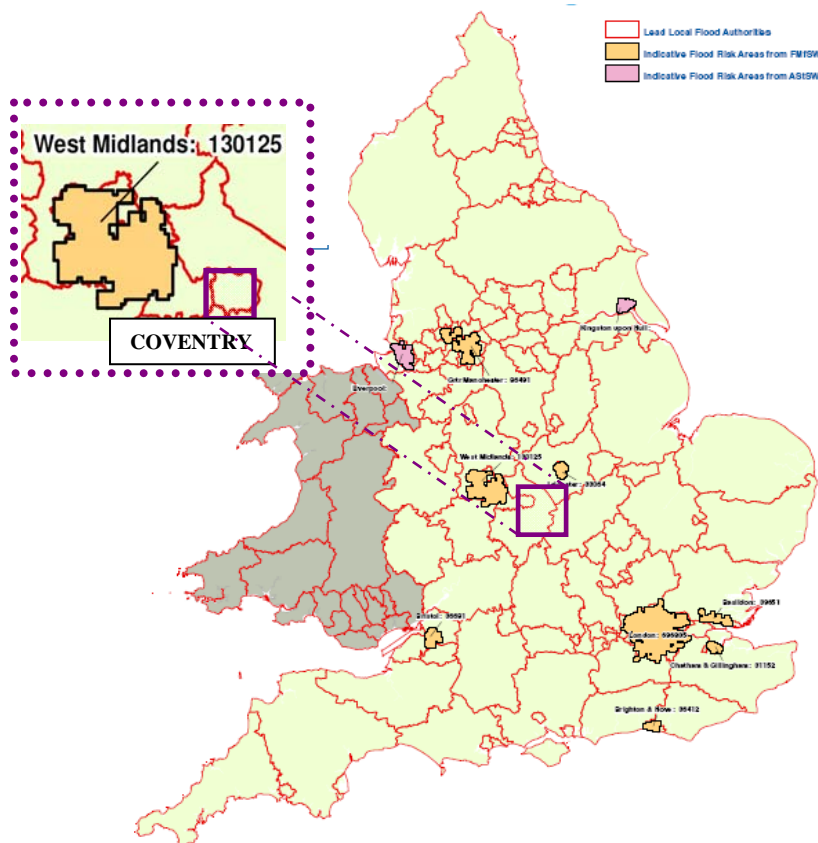
The Environment Agency have used their national datasets to identify Flood Risk Areas based on surface water flooding using the following thresholds identified by Defra:

- 30,000 people (based on 2.34 people per residential property)
- 150 critical services (nominal threshold)
- 3,000 non-residential properties (nominal threshold)

LLFAs must use local data to ensure that these Flood Risk Areas are appropriate and are representative of the flood risk in their administrative area.

Guidance on applying these thresholds has been released in Defra's document "Selecting and reviewing Flood Risk Areas for local sources of flooding". In this guidance document, Defra have set 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 squares where local flood risk exceeds a defined threshold. These areas within Coventry are illustrated in Figure 7-1

Figure 7-1: Indicative Flood Risk Area for Coventry



8. Next Steps

8.1. 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, as discussed 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 Coventry PFRA was taken to the Flood Risk Management Group for approval, this will be on 14th April 2011. It will then be taken for approval by the Coventry City Council Cabinet (Scrutiny Board) before being delivered to the Environment Agency. The first review cycle of the PFRA will be led by Coventry and must be submitted to the Environment Agency by the 22nd of June 2017

Environment Agency Review

The Environment Agency will undertake a technical review (area review and national review) of the PFRA, which will focus on ensuring the format of these assessments meets the provided standard. If satisfied, they will recommend submission to the relevant Regional Flood 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 and published.

8.2. Future Data Management Arrangements

In order to continue to fulfil their role as Local Lead Flood Authority Coventry City Council are required to investigate future flood events and ensure continued collection, assessment and storage of flood risk data and information. However, it is crucial that all records of flood events are documented consistently and in accordance with the INSPIRE Directive (2007/2/EC). A centralised database will be kept up to date by Coventry Council, and this can be used as a base to inform future assessments and preparation of appropriate option appraisals.

References

British Waterways (2010) email correspondence regarding canal network and overtopping events

Dave Terry (Severn Trent Water Ltd & Tim Smith (Hyder Consulting) for providing STW data

Frank Warwick – PhD student at Coventry University for collecting historic flood data.

Paul Lockhart & Peter Clarke of the Environment Agency for providing crucial support in developing PFRA

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Defra / WAG (2010) Selecting and reviewing Flood Risk Areas for local sources of flooding – Guidance to Lead Local Flood Authorities. Available from <http://www.defra.gov.uk/environment/flooding/documents/research/flood-risk-method.pdf>

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Defra (2008) Future Water, The Government's water strategy for England. Available at <http://www.defra.gov.uk/Environment/quality/water/strategy/pdf/future-water.pdf>

Defra (2008). Improving Surface Water Drainage – Consultation to accompany proposals set out in the Government's Water Strategy, Future Water, more information at <http://www.defra.gov.uk/environment/flooding/documents/manage/surfacewater/swmp-consult.pdf>

Defra (2008). The Government's response to Sir Michael Pitt's Review of the Summer 2007 floods, more information at <http://www.defra.gov.uk/environment/flooding/documents/risk/govtresptopitt.pdf>

In August 2009 Defra announced a list of 77 such locations and these will be the first to commence SWMPs. More information on the methodology to identify the 77 locations is available at <http://www.defra.gov.uk/environment/flooding/documents/manage/surfacewater/sw-methodology.pdf>

A level 2 SFRA is defined in Planning Policy Statement 25: Development and Flood Risk (2006) (page 31), which is available at: <http://www.communities.gov.uk/documents/planningandbuilding/pdf/planningpolycystatement25.pdf>

Preliminary Assessment Spreadsheet has been provided by the Environment Agency to complete as agreed required standards.

Annex 1:

Records of past floods and their significant consequences

Annex 1 of the Preliminary Assessment Spreadsheet attached with this report.

Annex 2:

Records of Preliminary assessment of future floods and their significant consequences

Annex 2 of the Preliminary Assessment Spreadsheet attached with this report.

Annex 3:

Records of Flood Risk Area and rationale

Annex 3 - Preliminary Assessment Spreadsheet is left black for Coventry area.

Annex 4:

Review Checklist

Annex 4 attached to this report - a checklist for reviewing PFRA submission.

Annex 5:

Selection of Flood Risk Maps

Annex 5 attached to this report Flood site visits data

Annex 1:

Annex 2:

Annex 3:

Annex 4:

Annex 5:

APPENDIX 1