

Swindon Borough Council
Preliminary Flood Risk Assessment
August 2011



Halcrow Group Limited

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Halcrow Group Limited
Burderop Park Swindon Wiltshire SN4 0QD
Tel +44 (0)1793 812479 Fax +44 (0)1793 812089
www.halcrow.com

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Author

Name	Organisation and Role
Ian Ford	Halcrow Project Manager
Susannah Hardwick	Halcrow Scientist

Approvals

Name	Title	Signature	Date
	Halcrow Project Director		

Distribution

Name	Organisation and Role
Rachel Ind	Swindon Borough Council
Liz Baldwin	Swindon Borough Council
Simon Masters	Swindon Borough Council

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Executive summary

This report summarises the Preliminary Flood Risk Assessment undertaken for Swindon Borough Council. The study forms part of the wider study, which involves the delivery of both a Preliminary Flood Risk Assessment (PFRA) and draft Surface Water Management Plan (SWMP) for Swindon Borough. The PFRA has been undertaken to assist Swindon Borough Council meet its duties as a Lead Local Flood Authority (LLFA), with the delivery of the first stage of the Flood Risk Regulations (2009). These regulations implement the EU Floods Directive in the UK.

The PFRA is a high level screening exercise that compiles information on significant local flood risk (any flood risk that does not originate from main rivers, the sea or large reservoirs) from past and predicted future floods, based on readily available and derivable information.

The Flood Risk Regulations require PFRAs to report detailed information on past flood events that had 'significant harmful consequences'. There is no national definition of what constitutes 'significant harmful consequences', it is a matter for local decision based on local information collected through the PFRA process. For the purpose of this PFRA and in its capacity as LLFA, Swindon Borough Council has adopted the definition set out by the South West Flood Risk Managers Group. The rationale for adopting this definition is in order to achieve consistency in all Preliminary Flood Risk Assessments developed in the South West.

This study identified several past floods that are considered to have had significant harmful consequences (flooding incidents where five or more residential properties have been flooded). Future flood risk is estimated to be high in some parts of the Borough.

The indicative flood risk areas provided by the Environment Agency have been reviewed based on the local knowledge of past and future floods. The outcome of this review is that the indicative flood risk areas can be used as the flood risk areas for the undertaking of stages three and four of the Flood Risk Regulations.

As the LLFA, it is the role of Swindon Borough Council to take a leading and co-ordinating role on flood management and to forge partnerships with the adjacent flood authorities, the Environment Agency and other key stakeholders such as Thames Water. Aside from the aforementioned, as the LLFA, Swindon Borough Council are also responsible for:

- Investigating flood incidents.
- Maintaining a register of structures or features which are considered to have an effect on flood risk.
- Act as the SUDS approving body.
- Developing, maintaining, applying and monitoring a local strategy for flood risk management.
- Undertaking works to manage local flood risk, consistent with the local flood risk management strategy for the area and catchments.

Swindon Borough Council has also taken over the Environment Agency's role in deciding whether to allow works by third parties that may affect water flows to take place. This consenting role allows the Council to enforce particular conditions on third parties to ensure that betterment of surface water drainage is achieved where deemed necessary.

Glossary

Term	Definition
Aquifer	A source of groundwater comprising water bearing rock, sand or gravel capable of yielding significant quantities of water.
AMP	Asset Management Plan
Asset Management Plan	A plan for managing water and sewerage company (WaSC) infrastructure and other assets in order to deliver an agreed standard of service.
AStSWF	Areas Susceptible to Surface Water Flooding
BGS	British Geological Survey
Catchment Flood Management Plan	A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
CDA	Catchment Critical Drainage Area.
Critical Drainage Area	A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure.
CFMP	Catchment Flood Management Plan.
CIRIA	Construction Industry Research and Information Association.
Civil Contingencies Act	This Act delivers a single framework for civil protection in the UK. As part of the Act, Local Resilience Forums must put into place emergency plans for a range of circumstances including flooding.
CLG	Government Department for Communities and Local Government.
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions.
Culvert	A channel or pipe that carries water below the level of the ground.
Defra	Department for Environment, Food and Rural Affairs.
DEM	Digital Elevation Model.
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years.
DTM	Digital Terrain Model.
EA	Environment Agency.

Term	Definition
Indicative Flood Risk Areas	Areas determined by the Environment Agency as indicatively having a significant flood risk, based on guidance published by Defra and WAG and the use of certain national datasets. These indicative areas are intended to provide a starting point for the determination of Flood Risk Areas by LLFAs.
FMfSW	Flood Map for Surface Water.
Flood defence	Infrastructure used to protect an area against floods such as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG.
Flood Risk Regulations	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.
Floods and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface and groundwater flood risk in England.
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a main river.
FRR	Flood Risk Regulations.
IDB	Internal Drainage Board.
IUD	Integrated Urban Drainage.
LDF	Local Development Framework.
Lead Local Flood Authority (LLFA)	Local Authority responsible for taking the lead on local flood risk management.
Local Flood Risk Zone (LFRZ)	Local Flood Risk Zones are defined as discrete areas of flooding that do not exceed the national criteria for a 'Flood Risk Area' but still affect houses, businesses or infrastructure. A LFRZ is defined as the actual spatial extent of predicted flooding in a single location
LIDAR	Light Detection and Ranging.
Local Resilience Forum	A multi-agency forum, bringing together all the organisations that have a duty to cooperate under the Civil Contingencies Act, and those involved in responding to emergencies. They prepare emergency plans in a co-ordinated manner.
LPA	Local Planning Authority.
LRF	Local Resilience Forum.
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers.

Term	Definition
NRD	National Receptor Dataset – a collection of risk receptors produced by the Environment Agency.
Ordinary Watercourse	All watercourses that are not designated a Main River, and which are the responsibility of Local Authorities or, where they exist, IDBs
Partner	A person or organisation with responsibility for the decision or actions that need to be taken.
PFRA	Preliminary Flood Risk Assessment
Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.
Pluvial Flooding	Flooding from water flowing over the surface of the ground; often occurs when the soil is saturated and natural drainage channels or artificial drainage systems have insufficient capacity to cope with additional flow.
PPS25	Planning and Policy Statement 25: Development and Flood Risk
PA	Policy Area
Policy Area	One or more Critical Drainage Areas linked together to provide a planning policy tool for the end users. Primarily defined on a hydrological basis, but can also accommodate geological concerns where these significantly influence the implementation of SUDS
Pluvial Flooding	Flooding from water flowing over the surface of the ground; often occurs when the soil is saturated and natural drainage channels or artificial drainage systems have.
PPS25	Planning and Policy Statement 25: Development and Flood Risk.
Receptor	In flood risk management, receptor is defined as anything that is affected by flooding such as people, property, transport links and habitats.
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.

Term	Definition
Risk Management Authority (RMA)	As defined by the Floods and Water Management Act; (a) the Environment Agency, (b) a lead local flood authority, (c) a district council for an area for which there is no unitary authority, (d) an internal drainage board, (e) a water company, and (f) a highway authority.
SBC	Swindon borough Council
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SFRA	Strategic Flood Risk Assessment.
Significant harmful consequences	Memorable past floods or otherwise registered on a national scale (such as the summer 2007 event) even if only occurring over a relatively small area
Stakeholder	A person or organisation affected by the problem or solution, or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
Sustainable Drainage Systems (SUDS)	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Surface water	Rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving), and has not entered a watercourse, drainage system or public sewer.
TW	Thames Water Ltd.
SWMP	Surface Water Management Plan
WAG	Welsh Assembly Government
WaSC	Water and Sewerage Company.

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1 Introduction

1.1 What is a preliminary flood risk assessment?

This report summarises the Preliminary Flood Risk Assessment (PFRA) undertaken to assist Swindon Borough Council meet its duties as a Lead Local Flood Authority, with the delivery of the first stage of the Flood Risk Regulations (2009). These regulations implement the EU Floods Directive in the UK.

The PFRA is a high level screening exercise that compiles information on significant local flood risk from past and future floods, based on readily available and derivable information. The PFRA also includes the identification of flood risk areas where the subsequent two stages of the Flood Risk Regulations apply; stage two delivers Flood Risk Maps and stage three delivers Flood Risk Management Plans.

Local flood risk is defined as flood risk originating from sources other than main rivers, the sea and large reservoirs and principally meaning flood risk from surface runoff, groundwater and ordinary watercourses. This main definition of local flood risk requires further clarification:

- a) It includes lakes and ponds
- b) It does not consider flooding from sewers unless this is wholly or partly caused by rainwater or other precipitation entering or otherwise affecting the system
- c) It does not include flooding from water supply systems (for example burst water mains)
- d) It considers the interaction with flooding from main rivers, the sea and sewers.

The main scope of this report is to summarise the work undertaken to comply with Part 2 of the Flood Risk Regulations 2009 (see Table 1 in Section 1.3 below and the following link:

<http://www.legislation.gov.uk/ukxi/2009/3042/contents/made>).

1.2 Background

This study for Swindon Borough Council forms part of a wider project, during which a Surface Water Management Plan and Preliminary Flood Risk Assessment was undertaken for the Borough.

1.3 Objectives

The main aim of this study was to undertake stage one of the Flood Risk Regulations 2009, Part 2 (the PFRA).

The timescales for undertaking the three stages of the flood risk regulations are summarised in Table 1 below.

Table 1 – Main requirements of the Flood Risk Regulations 2009 for LLFAs

FRR2009 ref.	Task	Description
Part 2	1	LLFAs to undertake PFRAs on local flood risk by 22 June 2011, within their administrative boundaries. LLFAs or groups of LLFAs to confirm or to propose alternative Flood Risk Areas from indicative flood risk areas already identified in national datasets by 22 June 2011.
Part 3	2	LLFAs to prepare Flood Hazard and Flood Risk Maps by 22 June 2013 for the flood risk areas and in relation to local flood risk.
Part 4	3	LLFAs to prepare Flood Risk Management Plans of the identified flood risk areas by 22 June 2015.
<p>Notes:</p> <p>1. This table does not cover the tasks undertaken by the Environment Agency to comply with the Flood Risk Regulations in relation to flooding from main rivers, the sea and large reservoirs.</p> <p>2. Tasks 2 and 3 have not been undertaken as part of this study.</p>		

The key objectives for the PFRA are summarised as follows:

- a) Identify relevant partner organisations involved in future assessment of flood risk; and summarise means of future and ongoing stakeholder engagement;
- b) Describe arrangements for ongoing collection, assessment and storage of flood risk data and information (see Section 8.3);
- c) Summarise the methodology adopted for the PFRA with respect to data sources, availability and review procedures;
- d) 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;
- e) Assess the potential harmful consequences of future flood events within the study area;
- f) 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;
- g) Provide a summary of the systems used for data sharing and storing, and provision for quality assurance, security and data licensing arrangements;
- h) Provide advice on the next steps required to ensure that Swindon Borough Council complies with its role as the LLFA.

1.4 Study area

The study area is 230 km² and encompasses the whole of the Borough of Swindon (see Figure 1.1). Land use in the Borough is a combination of urban (approximately 20%) and rural (approximately 80%).

The Borough is located to the north-east of the UK South West region and adjoins the counties of Wiltshire, Gloucestershire and Oxfordshire.

Swindon is situated within the M4 corridor and is on the mainline railway between London and Bristol.

The Borough has a population of about 192,900, the vast majority of which are in the town of Swindon (approximately 81% of total population).

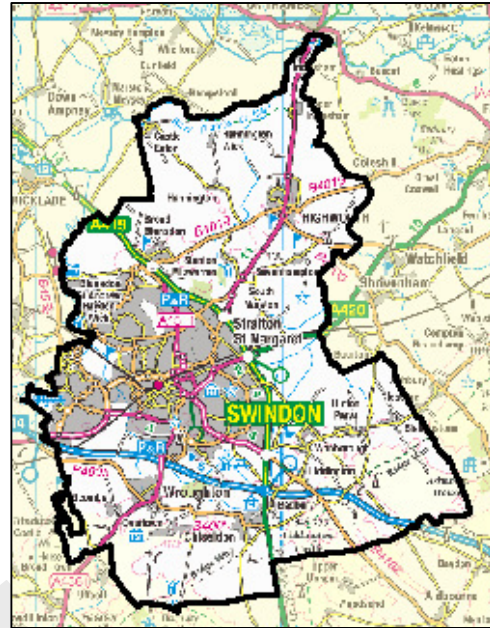


Figure 1.1 - Study Area

2 LLFA Responsibilities

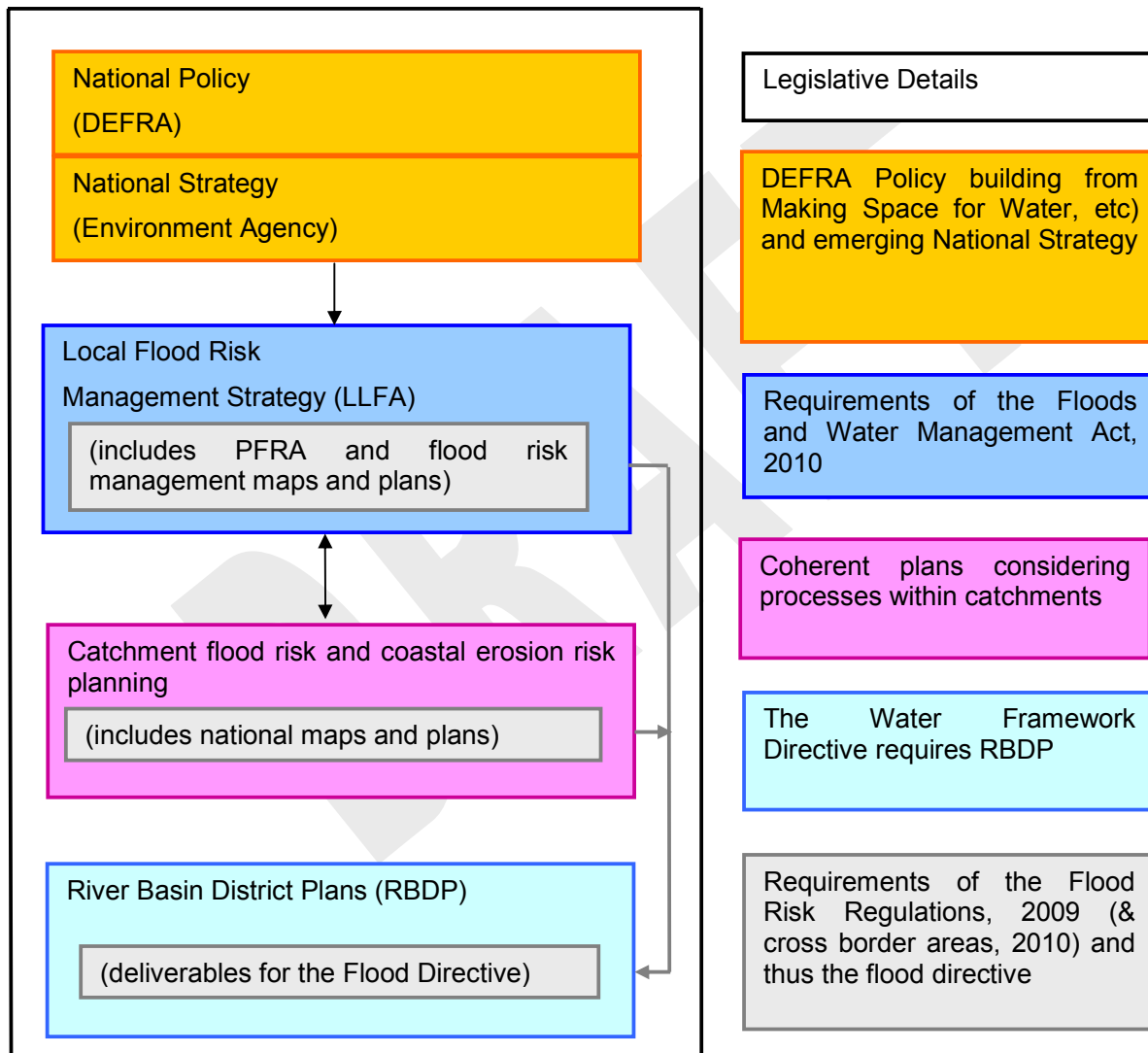
2.1 Context

This chapter sets out Swindon Borough Council's role as a Lead Local Flood Authority and the legislative background for the provision of a Preliminary Flood Risk Assessment.

2.2 Legislative background

The legislative background showing how the PFRA fits within this context is summarised in Figure 2.1 below:

Figure 2.1 – Legislative Background



The Floods and Water Management Act was brought into UK law in 2010 to improve flood risk management and support continuity of water supply. A key feature of the Act is the implementation of recommendations from the Pitt Review into the summer 2007 flooding, thus increasing the emphasis on sources of flooding other than fluvial and tidal, in particular surface water which featured heavily in the 2007 flooding.

The Act gives a number of responsibilities and powers to both the Environment Agency and the Lead Local Flood Authorities. As mentioned in Section 1.1, the LLFA are made responsible for local flood risk and main rivers, the sea and large reservoirs are the responsibility of the Environment Agency.

The PFRA and draft SWMP for Swindon Borough will inform the future Local Flood Risk Management Strategy and future update of the Strategic Flood Risk Assessment (SFRA) and other high level documents.

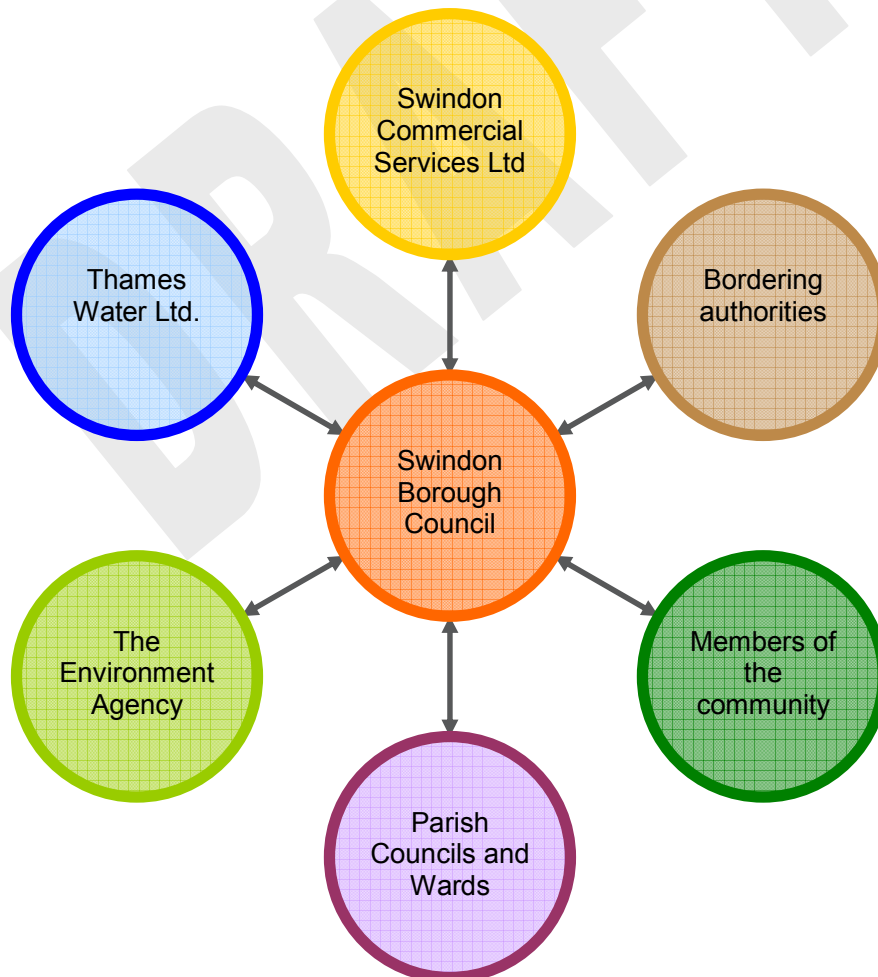
2.3 Leadership and partnership

As a Lead Local Flood Authority, it is the role of Swindon Borough Council to forge effective partnerships with the adjacent LLFA and the Environment as well as other key stakeholders - Thames Water.

The Borough Council will continue to work with Key Partners and stakeholders. Ideally working arrangements should now be formalised by the LLFA to ensure clear lines of communication, mutual cooperation and to seek opportunities to work collaboratively to manage surface water flood risk in the future. -operation and management through the provision of Level of Service Agreements (LoSA) or Memorandums of Understanding (MoU).

Figure 2.2 provides a schematic of the recommended partnership and stakeholder arrangements.

Figure 2.2 - Recommended partnership and stakeholder arrangements



2.4 Other responsibilities

2.4.1 General responsibilities

Aside from 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 and Water Management Act and the Flood Risk Regulations. These responsibilities include:

- a) Investigating flood incidents – LLFAs have a duty to investigate and record details of significant flood events within their area (Flood Risk Regulations 2009, Part 2, Section 12).
- b) 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 formulate regulations about the content of the register and records.
- c) SUDS Approving Body – The Floods and Water Management Act, 2010 requires that a SUDS Approval Body be established at county or unitary local authority level (in this case Swindon Borough) to ensure national standards of sustainable drainage are enforced. Developers will be required to gain approval for proposed SUDS before they can begin construction. Where more than one property is served the SUDS Approving Body will be responsible for adopting and maintaining SUDS (other than on public roads which are the responsibility of the Highways authorities). Defra will be releasing further guidance on the SUDS Approving Body at the end of 2011.
- d) 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.
- e) Works powers – LLFAs have powers to undertake works to manage local flood risk, consistent with the local flood risk management strategy for the area.
- f) Designation powers – LLFAs, as well as the Environment Agency have powers to designate structures and features that affect flooding or coastal erosion in order to safeguard assets that are relied upon for flood or coastal erosion risk management.

2.4.2 Specific responsibilities

Swindon Borough Council has taken over the Environment Agency's role in deciding whether to allow works by third parties (usually developers) that may affect water flows to take place. Developers must therefore gain consent from Swindon Borough Council for the following:

- a) The volume of surface water that can be discharged from a new development.
- b) The location(s) at which surface water that can be discharged from a new development.
- c) The rate at which surface water that can be discharged from a new development.

This consenting role allows the Council to enforce particular conditions on developers to ensure that betterment of surface water drainage is achieved where deemed necessary.

2.5 Key partner engagement

2.5.1 1st key partner meeting

A Key Partner meeting hosted by Halcrow Group Ltd took place in 10th August 2010 to clarify roles and responsibilities and to initiate discussions on the way forward for:

- a) data sharing
- b) communication with partners
- c) SUDS approval (see Section 2.5)
- d) Future approaches to local flood risk and e) public engagement.

Of the main partners Swindon Borough Council and the Environment Agency attended. Thames Water was unable to attend and were provided with details of the outcomes of the workshop and included in subsequent discussions.

Swindon Borough Council will continue to work with LLFAs and other key stakeholders and the community to ensure flood risk issues are managed appropriately within the borough and opportunities will be sought to manage flood risk in the future.

2.5.2 2nd key partner meeting

A further Key Partner meeting hosted by Halcrow Group Ltd took place in 28th April 2011 to review the preliminary findings of the Surface Water Master Plan.

2.6 Public engagement

Managing flood risk is an integral part of assessing emerging policy and development proposals; thereby ensuring a co-ordinated, sustainable approach within the Borough.

It is recognised that members of the public may also have valuable information to contribute to future cycles of the PFRA by way of flood incident reporting in the interim period, and to local flood risk management in the Borough. Stakeholder engagement can be of significant benefit 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.

It is recommended that Swindon Borough Council follow the Environment Agency's Guidelines on Building Trust with Communities 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.

3 Methodology and Data Review

3.1 Data sources

The information gathered to facilitate preparation of the PFRA is detailed in Table 3.1.

Table 3.1 - Data Sources

Ref.	Data gathered	Source
1	Strategic Flood Risk Assessment - Level 1 SFRA - Final Report (August 2008)	SBC
2	LIDAR surveys	EA
3	Historic surface water and groundwater flood records	Halcrow
4	Design model outlines	EA
5	High frequency rainfall records for the Swindon area for the period of the summer 2007 floods. If high frequency records are not available in Swindon there is a Meteorological Office station at Lyneham which would provide an alternative.	EA
6	Historic flood maps	EA
7	Areas susceptible to surface water flooding	EA
8	Surface water FEO's	EA
9	Flood storage areas	EA
10	Thames Water sewerage networks (DigDat)	TW
11	Current, recently delivered and proposed maintenance regimes and capital works.	TW
12	Environment Agency Flood Warning Areas	EA
13	River Thames Catchment Flood Management Plan	EA
14	Flooded property database for all flood sources.	EA
15	Detailed river network	EA
16	National property dataset	EA
17	Natural receptor dataset	EA
18	Plan showing surface water flood routes in July 2007	Halcrow
19	Flood Map for Surface Water	EA
20	Parish and Town council Questionnaires	EA
21	Ward Councillor Questionnaires	EA

3.2 Licensing and restrictions

Issues associated with licensing and restriction of the information gathered to facilitate preparation of the PFRA is detailed in Table 3.2.

Table 3.2 – Data restrictions and licensing details for strategic data providers

Organisation	Restrictions on data and licensing agreements
Environment Agency	The use of some data is restricted to the Local Authorities and their Consultants. Specific data, such as the Indicative Surface Water Flood Risk Areas, are supplied to the consultants via the Borough, as per the Agency's licensing agreement. This data can only be used for surface water management plans, strategic flood risk assessments of preliminary flood risk assessments.
Thames Water	Specific data, such as the Thames Water's sewerage network records are supplied to the consultants via the Borough.

3.3 Quality assurance

Data collected were 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 SWMP Technical Guidance document (March 2010). This system is explained in Table 3.3.

Table 3.3: Data Quality System from SWMP Technical Guidance (March 2010)

Data Quality Score	Description	Explanations	Example
1	Best available	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 that is a few years old
3	Gross assumptions	Not invented but based on experience and judgement	Location, extent and depth of surface water flooding
4	Heroic assumptions	An educated guess	Ground roughness for 2d models

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. As mentioned in Section 3.3 the information provided lacked in level of detail and an average data quality score of 2 was given.

4 Past Flood Risk

4.1 Summary of past floods

This Chapter focuses on past floods that had significant harmful consequences to human health, the local economy, local environmental sensitive areas and cultural heritage. It also reports floods which had no significant harmful consequences.

4.2 Historical flood map

Map 4.1 provides a visual representation of past floods for different sources of flood risk. The information provided does not include dates when the flood events occurred, as many of these have happened more than once at the same location.

4.3 Public consultations

Questionnaires were sent to all Parish and Town Councils and selected wards in the town centre to determine incidence of flooding and readiness to deal with future floods. Of the 18 questionnaires issued, 14 complete questionnaires were received. The results of the questionnaires generally put the causes of flooding into one or more of the following categories:

- a) Flooding of highways where they cross inundated ordinary watercourses (and rivers).
- b) Sewer blockades.
- c) Surface water run-off and ponding of water in low lying areas.
- d) Highways as a result of ineffective highway drainage.

The consequences of flooding across the Borough varied significantly, partly due to topography and partly due to differences in population density (where major flooding would have low impact in terms of flooded properties per unit area).

4.4 Significant harmful consequences

The Regulations require consideration of significant harmful consequences on:

- a) Human health
- b) Economic activity
- c) Environment (including cultural heritage)

No definition is provided in the legislation on what 'significant' means. For the purpose of this PFRA and in its capacity as LLFA, Swindon Borough Council has adopted the definition set out by the South West Flood Risk Managers Group. The rationale for adopting this definition is in order to achieve consistency in all Preliminary Flood Risk Assessments developed in the South West. The South West Flood Risk Managers Group definition is as follows:

For the purpose of reporting a past flood, a flood is deemed significant if it:

- a) Caused internal flooding to five or more residential properties, or*
- b) Flooded two or more business premises, or*

- c) Flooded one or more items of critical infrastructure, or*
- d) Caused a transport link to be totally impassable for a significant period.*

The borough has identified five locations past floods are considered to have significant consequences to human health. These locations are detailed in Annex 1.

4.5 Interactions with other flooding sources

Understanding the flood risk resulting from interactions between more than one source of flooding is complex and no information is available nationally. To understand interactions requires a detailed local study including joint probabilities of the different sources of flooding.

Studies of interactions would be appropriate for the detailed flood hazard and flood risk mapping stage, and should not be undertaken for the preliminary assessment stage.

Of particular interest in the Borough is the interaction of surface water flooding and the main rivers (River Cole and river Ray).

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5 Future Flood Risks

5.1 Summary of future flood risk

Future flood risk for extreme events is estimated to be high in the Borough as it is in many highly urbanised areas throughout the country.

5.2 Locally agreed surface water information

Surface water model outputs from the two sources noted in Table 5.1 have been used to develop a map 5.1 which shows surface water depths (m) for a rainfall event occurring with a 1 in 200 chance of rainfall in any given year (0.5% AEP).

Table 5.1 - Surface Water Flooding Information

Ref.	Source
01	The Flood Map for Surface Water generated by the Environment Agency.
02	ISIS-FAST modelling undertaken as part of the Surface Water Master plan.

5.3 Recent flood risk mitigation projects

Swindon Borough Council and its key partners have recently undertaken some major projects across the Borough to mitigate future flood risks. Some of the projects are stand-alone project to address mitigation of specific flood risks whilst others are of a wider scale and address mitigation of general flood risks. Wherever possible and practicable, the key partners co-ordinate their efforts to promote an integrated approach to flood mitigation.

A project of particular note is the Drainage Asset Condition and Collection Survey (DACCS), which was initiated by Swindon Borough Council in 2010 and is currently on-going. This project comprises an extensive survey of highway drainage asset across the Borough and includes the following tasks:

- a) Cleaning of SBC drainage assets and strategic sections of Thames Water's surface water drainage network (grit and detritus removal).
- b) CCTV survey to assess the condition of the assets and identify assets in need of rehabilitation and to determine the location of blockages (e.g. intrusions, root ingress etc.).
- c) In connection with the above, the CCTV survey will also record the physical dimensions of pipework (diameter and length); this data can be used to identify hydraulic limitations and thereby assess possible improvement options (e.g. duelling o pipes, removal of constrictions).
- d) Checking for connectivity with TW's main drainage network.
- e) Digital mapping of all drainage assets.
- f) Establish a maintenance programme for the Council's drainage assets (this will be done using the software being used by SBC to map the drainage assets)

The results of the Drainage Asset Condition and Collection Survey will improve the operation of surface water drainage in Swindon (cleaning and rehabilitation), and improve the understanding of the highway drainage network (assessment of strategic augmentation options and maintenance programme). Given the localised nature of flooding in Swindon the potential benefits of this initiative are considerable.

5.4 Impact of climate change

Map 5.2 provides information of the 1 in 200 year rainfall event, with climate change. The map shows the baseline forecast and the additional effects of climate change.

5.4.1 The evidence

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

Over the past century around the UK we have seen sea level rise and more of our winter rain falling in intense wet spells. 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 2080s.

We have enough confidence in the large scale climate models to say that we must plan for change. There is more uncertainty at a local scale but model results can still help us plan to adapt. For example we understand rain storms may become more intense, even if we can't be sure 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%.

5.4.2 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 in both rural and heavily urbanised 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 we need to be prepared for the unexpected.

Rising sea or river levels may increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses.

There is a risk of flooding from groundwater-bearing chalk and limestone aquifers across the district. Recharge may increase in wetter winters, or decrease in drier summers.

Where appropriate, we need local studies to understand climate impacts in detail, including effects from other factors like land use. Sustainable development and

drainage will help us adapt to climate change and manage the risk of damaging floods in future.

5.4.3 Adapting to change

Past emissions means some climate change is inevitable. It is essential we respond by planning ahead. We can prepare by understanding our 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, we have to make local decisions against deeper uncertainty. We will therefore consider a range of measures and retain flexibility to adapt. This approach, embodied within flood risk appraisal guidance, will help to ensure that we do not increase our vulnerability to flooding.

5.5 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."

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

5.6 Nature of flooding in Swindon

Flooding in Swindon is characterised by multiple, localised events. Many of Parish Councils report that the prime reason for flooding is due to inadequately maintained highways drainage assets. It is recognised that budgetary constraints and restrictive spending plans have played a major role in decline of maintenance of drainage assets; where maintenance is carried out it has generally been reactive rather than proactive.

However, a Swindon Borough Council initiative to investigate known highway flooding problems is currently being undertaken. The investigation takes the form of jet cleaning gullies and sewers, CCTV surveys and digital mapping of assets. One of the outcomes of this process will be the development of a planned preventative maintenance programme.

With respect to the above, the method of preparation of the Flood Hazard maps and Flood Risk maps has been considered within the Swindon context. However, as the nature of flooding in the Borough does not lend itself to

6 Review of Indicative Flood risk Areas

6.1 Extent of indicative flood risk areas

The Environment Agency has produced a national map of areas susceptible to surface water flooding using the 'direct rainfall' method for a rainfall event with a 0.5% probability (1 in 200 chance of occurring in any given year). The map, which is countrywide, indicates flow pathways and locations where ponding could occur, and is particularly useful as a preliminary screening tool to identify the locations most susceptible to surface water flooding, when combined with other flood information and local knowledge.

6.2 Review comments

As the LLFA, these maps were made available to Swindon Borough Council and have been reviewed based on the local knowledge of past and future floods. The outcome of this review is that the indicative flood risk areas can be used as the flood risk areas for the undertaking of the next stages of the Flood Risk Regulations.

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7 Identification of Flood Risk Areas

7.1 Amendments to Flood Risk Areas

Based on the comments in Section 6 no changes are proposed to the Flood Risk Areas (FRA).

7.2 New Flood Risk Areas

The new FRA proposed is therefore the same as the Indicative FRA.

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8 Next Steps

8.1 Scrutiny and 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:

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 second part of the review procedure is through the Environment Agency. Under the Flood Risk Regulations, the Environment Agency has been given a role in reviewing, collating and publishing all of the PFRAs once submitted. The Environment Agency will undertake a technical review (area review and national review) of the PFRA, which will focus on instances where Flood Risk Areas have been amended and ensure the format of these areas meet the required national standard. If satisfied, they will recommend submission to the relevant Regional Flood Defence Committee (RFDC) for endorsement. 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, before all PFRAs are collated, published and submitted to the European Commission.

The first review cycle of the PFRA will be led Swindon Borough Council must be submitted to the Environment Agency by June 22-06-2011. They will then submit it to the European Commission by the December 22-12-2011 using the same review procedure described above.

8.2 Data collection and management

8.2.1 Data gaps

Data gaps that will require future collection activities are listed as follows:

- a) A systematic approach to recording local flood risk is recommended, in particular for locations where there are interactions with other sources of flooding.
- b) A better understanding of how the drainage system operates will be gained through the Drainage Asset Condition and Collection Survey (DACCS) programme.

8.2.2 Collecting data from communities and parishes

Flooding questionnaires were issued to parish and town councils and certain ward councillors as part of the Council's Surface Water Management Plan. This process was very successful and yielded a great deal of useful flood data. As re-issuing questionnaires on a regular basis would probably prove to be a less successful means of gathering data, Swindon Borough Council have developed a data collection plan.

Table 8.1 – Plan for collecting data from communities and parishes

Ref.	Action	Method
01	Maintain flooding awareness in the community to ensure complacency does not come prevalent. Information leaflets	Leaflets are to be prepared and sent to at-risk homes and businesses in the Borough to inform them about flood risk and to promote personal resilience. These leaflets would provide information on how to reduce surface water flood risk to individual properties and <u>how to inform the Council</u> of flooding incidents and risks.
02	Council meetings	As a means of improving the level engagement on flood related matters with parish and town councils, the Council will send a representative to selected parish and town council meetings to inform them on the status of flood risk mitigation in the Borough. These meetings will be a good forum for <u>gathering information</u> from the council members. It is intended that attendance for such meetings will be annually.
03	Volunteers	There is no statutory responsibility for community groups to respond to emergencies in their locality. However it is good practice for communities to identify hazards and make simple plans on how they may assist Swindon Borough Council or the Environment Agency should an emergency occur. Guidance on how individuals and communities can be prepared by starting voluntary flood warden schemes and developing their own community flood plans is provided by the Environment Agency. Parish and town councils are to be made aware of these voluntary schemes. The volunteers could be (energetic) members of the public or parish/town councillors and will become <u>good points of contact</u> for informing the Borough of flooding incidents and risks. The volunteers shall be contacted on four monthly basis to harvest information; it will also be a means to ensure that volunteers are aware of their value to the Council
04	Visibility	Where possible and practicable, the Council will take advantage suitable opportunities to meet and liaise with communities. As LLFA, Swindon Borough Council already works with the Environment Agency and Thames Water. When these stakeholders engage with communities on flood related issues the Council will send a representative promote the Council's commitment to flood mitigation and to <u>gather relevant information</u> (subject to Thames Water and/or Environment Agency

8.3 Incident recording

As part of their Surface Water Management Plan the Borough has developed a Flood Action Matrix which they will use as a tool to record and manage their surface water flooding responsibilities. The information recorded on the matrix is outlined in Table 8.2.

Table 8.2 - Information Recorded in the Flood Action matrix

Ref.	Field	
01	Flood Risk Area ID	A unique sequential number.
02	Name of Flood Risk Area	A geographical or topographical feature is included here.
03	Administrative body	The name of the Parish Council, Town Council or Ward Parish in which the flood risk area lies is included to facilitate reporting to particular bodies.
04	Summary description	Description of the flood.
05	Main source of flooding	The source from which the majority of flooding occurred. The classification of sources is generally in accordance with the PFRA guidance.
06	Flood Risk ownership	The purpose of this field is to identify which key partner(s) have responsibility for addressing the flood risk.
07	Main characteristic of flooding	The main characteristic of flooding in terms of what it impacts.
08	Brief description of actions required	A brief description of the remedial works should be detailed in this column.
09	Estimated cost of required actions	This will be an estimate based on historical rates. The rates used will need to be updated periodically and should be used as budgetary guidance only.
10	Priority index	A subjective assessment of how critical the affected
11	Status	A statement to indicate the status actions associated with mitigating the flood risk.

8.4 Other flood risk regulation requirements

Other planned actions that will be required to comply with Schedule 3 of the Flood & Risk Regulations 2009 and the Flood and Water Management Act 2010 are

9 References

Defra (2010) Surface Water Management Plan Technical Guidance

Environment Agency (2010) Preliminary Flood Risk Assessment - Final Guidance (Report – GEHO1210BTGH-E-E). Available from:

<http://publications.environment-agency.gov.uk/pdf/GEHO1210BTGHe-e.pdf>

Environment Agency (2010) Preliminary Flood Risk Assessment – Annexes to the Final Guidance (Report – GEHO1210BTHF-E-E). Available from:

<http://publications.environment-agency.gov.uk/pdf/GEHO1210BTHFe-e.pdf>

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

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Annex A

Records of past floods and their significant consequences

(Preliminary Assessment Spreadsheet)

Please refer to Annex A of the Preliminary Assessment Spreadsheet which has been supplied alongside this report

DRAFT

Annex B

Records of future floods and their significant consequences

(Preliminary Assessment Spreadsheet)

Please refer to Annex B of the Preliminary Assessment Spreadsheet which has been supplied alongside this report.

DRAFT

Annex C

Records of Flood Risk Area and its rationale

(Preliminary Assessment Spreadsheet)

Please refer to Annex C of the Preliminary Assessment Spreadsheet which has been supplied alongside this report.

DRAFT

Annex D

Review Checklist

Please refer to Annex D spreadsheet which has been supplied alongside this report.

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Annex E

GIS Layer of Flood Risk Area(s)

Please refer to Annex E GIS layer which has been supplied alongside this report. This GIS layer is the same as the Environment Agency Indicative Flood Risk Area layer.

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