

# Wiltshire Council

## Department of Neighbourhood and Planning

### Flood Risk Regulations 2009

### Preliminary Flood Risk Assessment for Wiltshire Council

### DRAFT DOCUMENT

Wiltshire Council  
Bythesea Road  
Trowbridge  
Wiltshire BA14 8JN

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## **Executive Summary**

This report has been prepared by Wiltshire Council as part its requirements under the Flood Risk Regulations (2009) and to enable the council to meet its duties in managing local flood risk.

Wiltshire Council is defined as the Lead Local Flood Authority (LLFA) under the Regulations, and is a large unitary authority covering the county of Wiltshire.

The Preliminary Flood Risk Assessment (PFRA) provides a high level view of flood risk from local sources which include groundwater, surface water, ordinary watercourses and canals. As the LLFA the council are required to submit their PRFA to the Environment Agency for review by 22<sup>nd</sup> June 2011. The methodology for producing this report has been based on the Environment Agency's Final Guidance and Defra's Guidance on selecting Flood Risk Areas published in December 2010.

The national methodology used by the Environment Agency has been set out by Defra to identify Flood Risk Areas (FRA's) across England. There are ten indicative FRA's identified nationally, but none of these are located within the Wiltshire Council administrative area.

The regulations require two subsequent key stages within an identified FRA, which are to prepare flood risk hazard maps and flood risk maps, and then to prepare flood risk management plans.

Wiltshire has no significant flood risk areas as defined in accordance with the regulations and published guidance, and therefore the subsequent stages will not be required.

In order to develop the understanding of flood risk within Wiltshire, flood risk data, and historic records of flooding were collected from local and national data including the Environment Agency, stakeholder partners, and other risk management authorities.

This information will help the council develop proposals to reduce flood risk and improve the resilience of local communities.

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# **Preliminary Flood Risk Assessment for Wiltshire Council**

## **Introduction**

### **Scope**

Wiltshire council has carried out an initial screening exercise of historic records and future flood risk within the county to determine the locations at serious risk of flooding. The analysis included consideration of localised flooding from surface water, ordinary watercourses, canals, groundwater and other sources, such as lakes and reservoirs. Flood risk from main rivers, the sea or large raised reservoirs are the responsibility of the Environment Agency and is not considered in this report.

Information on historic floods is limited both in scope and detail. The information available has been used in the assessment to identify flooding which is locally significant.

Wiltshire Council requested information from all local town and parish councils in order to understand the flood risk within the county. This information has been used to create a database of flood risk events, which will be updated regularly and used to assess flood risk to communities.

Wiltshire Council works closely with the town and parish councils, the Environment Agency, water companies and other utilities and agencies to understand the risks and implication of flooding. There have been two Operational Flood Working Groups (OFWG) established in the county to manage local flood risk.

This Preliminary Flood Risk Assessment (PFRA) has been prepared to provide a high level view of flood risk from local sources which includes groundwater, surface water, ordinary watercourses and canals. The methodology for producing this report has been based on the Environment Agency's PFRA Final Guidance and Defra's Guidance on Selecting Flood Risk Areas published in December 2010.

### **Aims & objectives**

This report has been prepared by Wiltshire Council as part its requirements under the Flood Risk Regulations (2009) to enable them to meet their duties in managing local flood risk.

The PRFA is a high level exercise to identify areas where the risk of groundwater and surface water flooding is significant and requires further investigation.

The objective of Wiltshire's PFRA is to assess local flood risk across the study area, which is defined as being the administrative boundary of Wiltshire, and to consider historical and possible future consequences of flooding.

## Key objectives

The key objectives are:

- Assessment of past floods. This involves consideration of past floods which have had harmful consequences for human health, economic activity or the environment.
- Assessment of future floods. Consideration of the possible harmful effects of potential future flooding, taking into account topography, geology, watercourses, floodplains, population and economic centres.
- Identification of 'Flood Risk Areas'. The identification of 'Flood Risk Areas' where there is considered to be those areas most significantly at risk of flooding nationally, taking into account the 'indicative flood risk areas' prepared by the Environment Agency.
- Preliminary Assessment Report. The preparation of a report containing the above information which will be sent to the Environment Agency for review and publication.

## Study area

Wiltshire is a predominantly rural county in the south west of England, which is landlocked with no coast. It covers an area of 3,485 square kilometres, and is the 14<sup>th</sup> largest county in England. The population is 613,024 based on the 2001 census, with an average density of 178 inhabitants per sq kilometre.

There are 230,000 dwellings in the county which are mainly in the principal settlements of:

Community	Population	Community	Population
Amesbury	8,907	Bradford on Avon	9,326
Calne	13,606	Chippenham	28,065
Corsham	10,780	Cricklade	4,132
Devizes	11,296	Ludgershall	3,775
Malmesbury	4,631	Marlborough	8,009
Melksham	21,000	Mere	2,633
Salisbury	39,726	Tidworth	9,500
Tisbury	2,056	Trowbridge	28,163
Warminster	17,379	Westbury	11,1379
Wilton	3,873	Wootton Bassett	11,043

Wiltshire has been a unitary authority since 1<sup>st</sup> April 2009, when the former Wiltshire County Council and the four District Councils of West Wiltshire, North Wiltshire, Kennet and Salisbury were combined to form a new unitary authority.

The study area is in the south east and south west regions of the Environment Agency.

## Geology within Wiltshire

There are two main geological areas that have an influence on flooding in Wiltshire, with each covering approximately half of the county. The northern area is predominately clay, and the southern area is mainly chalk. Each area has different characteristics and different flooding mechanisms can operate.

The clay in the northern half of the county results in potentially high runoff because of the impermeable clay surface, which can often be similar to those experienced in large paved areas. This can give rise to rapid property inundation and flooding in some circumstances.

The southern area is predominately on a chalk aquifer. The aquifers can act as underground reservoirs storing water. When these reservoirs reach capacity groundwater flooding can occur. Overland flow can also occur, filling watercourses and ditches, and property can be affected by water flooding upwards from below ground. When the aquifer's storage capacity is full further rainfall will become surface water runoff, often causing further flooding.

It should be noted that in Wiltshire there can often be combinations of surface water runoff, groundwater flooding and flooding from main rivers.

## Other studies

Wiltshire Council's Strategic Flood Risk Assessment (SFRA) and the Environment Agency's Catchment Flood Management Plans (CFMPs) indicate that there are areas in Wiltshire which flood regularly but without significant risk to life or property. However, the SFRA and CFMPs identify flooding from rivers as being a risk in the urban areas of Bradford on Avon, Chippenham, Malmesbury, Marlborough, Melksham and Warminster.

## River catchments within the study area

There are five main river systems within Wiltshire:

The **Salisbury Avon**, including the Nadder, Wylde, Till, Bourne, Ebbles and Nine Mile River tributaries within Wiltshire. This catchment is 96km long and includes most of the south of the county (all of Salisbury and parts of the former West Wiltshire and Kennet District Council area). Much of this system has a typical chalk stream character, with winterbournes in the upper reaches. The Nadder and some of the upper reaches of the Avon are fed from clay catchments and can rise and fall quickly in response to rainfall. Communities within Wiltshire alongside the river include Upavon, Durrington, Amesbury and Salisbury all of which have been affected by flooding in the past to varying degrees.

The **Bristol Avon**, including the Biss, By, Semington and Brinkworth Brooks and River Marden in Wiltshire. This catchment is 2,308 km<sup>2</sup> and covers the north west of the county (parts of the former District Council areas of North Wiltshire, West Wiltshire and Kennet). It is a typical lowland clay river, sinuous and generally slow moving, flowing through pastoral countryside. Although fed by calcareous water from its tributaries, it flows through impervious clays, leading to silty but good quality water that rises quickly after rainfall. It has rich plant and animal communities and a nationally important coarse fishery. Communities within Wiltshire affected by flooding

from the Bristol Avon include Malmesbury, Chippenham, Melksham and Bradford on Avon.

The **Thames**, which includes the Upper River Kennet, and the Ray, Cole, Key, Churn, Bydemill Brook, Swill Brook and the Thames within Wiltshire. This catchment is 9,948 km<sup>2</sup> part of which covers the north-east part of the county (including Swindon Borough and parts of former Kennet and North Wiltshire District Council areas). The Kennet within Wiltshire has a typical chalk stream character. The remaining rivers are spring-fed from the Cotswold limestone and are lowland clay rivers influenced by calcareous clays. Although only a small part of the Thames flows through Wiltshire, Cricklade has been badly affected by flooding from this river in recent years.

The **River Dun** is a very small part of the upper catchment of the Test and lies in the south-east corner of the county. The river has a chalk stream character in Wiltshire. The major settlement affected by flooding from the Dun within Wiltshire is the market town of Marlborough.

Some of the headwaters of the **Dorset Stour**, the Shreen and Ashfield waters, also rise in the south-west of the county. Its source lies within the Stourhead Estate where it forms part of a series of artificial lakes and reservoirs before flowing south into Dorset.

## **Lead Local Flood Authority responsibility**

### **Introduction**

Wiltshire council is the LLFA for the county, and the preparation of a PFRA is one of several responsibilities of LLFA's under the new legislation. This section provides a brief overview of other responsibilities which the council is obliged to fulfil in its role as an LLFA.

In his Review of the summer 2007 flooding, Sir Michael Pitt stated that *"the role of local authorities should be enhanced so that they take on responsibility for leading the coordination of flood risk management in their areas"*. This recommendation was taken forward into the Flood Risk Regulations and the Flood and Water Management Act and as the designated LLFA, Wiltshire council is therefore responsible for leading local flood risk management across the county.

The council has established recognised methods of working with local communities through the Area Boards, and with other stakeholders involved in flood risk management through the Operational Flood Working Groups (OFWG).

### **Coordination of flood risk management**

Wiltshire as the LLFA has the responsibility to establish effective partnerships with key stakeholders, including the Environment Agency, Wessex, Thames and South West Water, Highways Agency, Network Rail and other stakeholders and risk management authorities.

In order to fulfil this responsibility Wiltshire Council has set up a Flood Risk Management Governance Structure, with the overall governance of flood risk management reviewed by the Overview and Scrutiny Environment Select Committee.

Wiltshire council's flood risk management group is chaired by a cabinet member, who works closely with the chairs of OFWG. The council's land drainage team has close links with county's emergency planning officers, and with the local LRF Flooding group.

The OFWG groups (North & South) are chaired by elected members and attended by officers from the council and others. The area of Wiltshire covered by each group is based on the river catchments and broadly aligns with the Environment Agency areas.

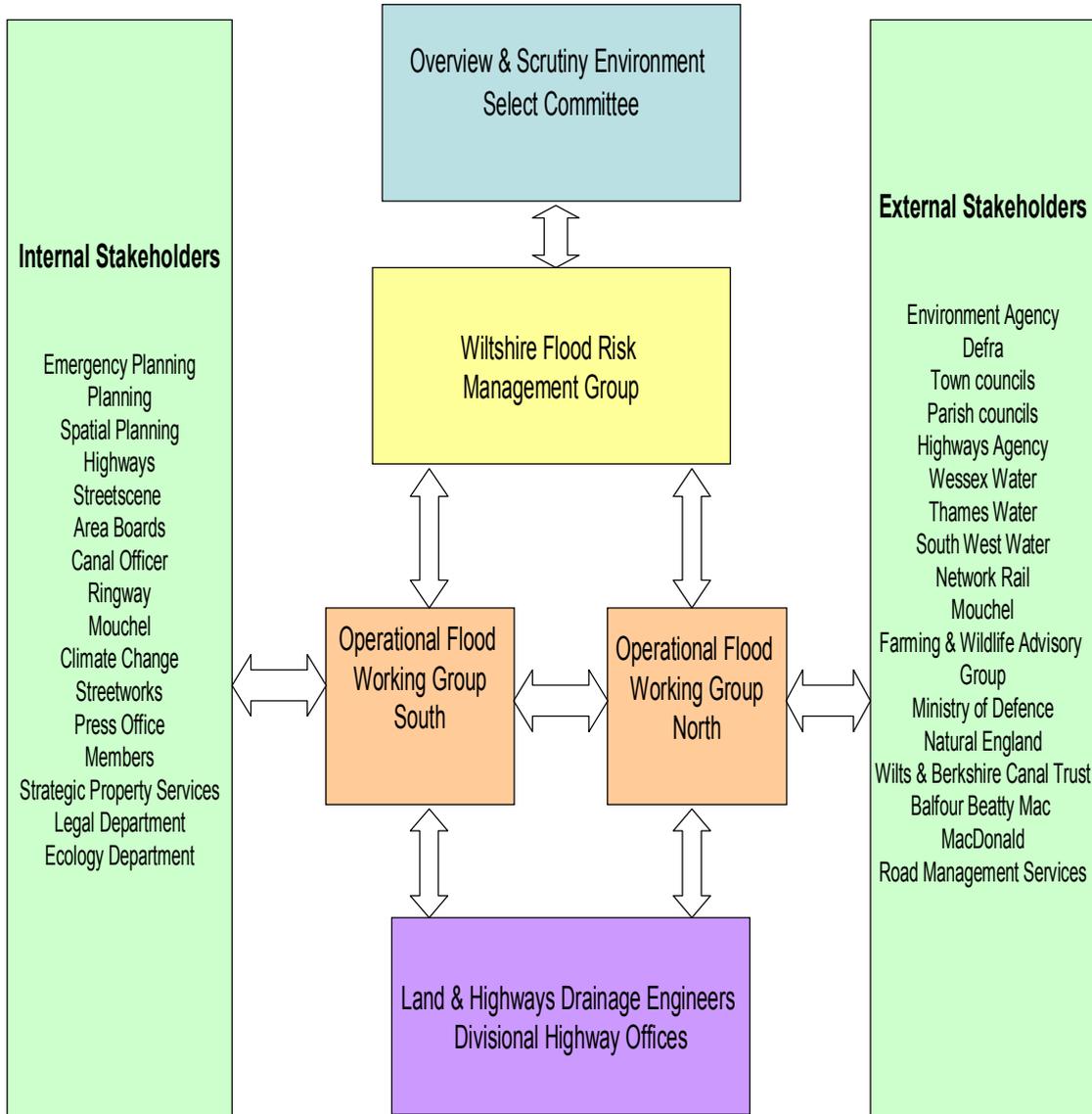
Each group generally meets every two months, and is often attended by representatives from the Environment Agency, Network Rail, Wessex Water, Thames Water, South West Water, Highways Agency, MoD and other statutory agencies. Town and Parish Councils are invited to attend and contribute to the meetings in connection with issues in their particular areas.

The council carries out a substantial programme of flood alleviation and drainage improvements with a budget of £500,000 annually in recent years. All drainage schemes carried out throughout the county are considered by OFWG and agreed with the partner organisations in order to prevent duplication and to co-ordinate work. The main benefit of these groups has been the commitment from all involved to remove barriers and promote collaborative working. The groups enable open discussions within a safe environment, and help identify and highlight areas of concern.

The day to day responsibility for dealing with flood and drainage issues in the council lies with the land and highways drainage engineers within the three divisional offices. The area highway engineers, technicians, rights of way wardens and streetscene officers attend highway and land drainage flooding incidents, and can call on specialist assistance from the land drainage team to deal with identified problems. The benefits of combining the highway and land drainage teams in a large unitary authority have become apparent, and will continue to be developed to reduce local flood risk.

Communication with the public is important for the council, and public engagement is managed through the council's 18 Area Boards covering the whole county. The public are encouraged to raise issues with their respective town and parish councils, who bring an issue to the meeting or to attend in person. Relevant issues raised through the area boards are brought to the attention of OFWG or may be directed to the drainage team to address.

# Flood Risk Management Governance Structure within Wiltshire



## **Other responsibilities**

Wiltshire Council is the LLFA for Wiltshire and the council has other responsibilities in connection with the Flood and Water Management Act and Flood Risk regulations, and further responsibilities will be introduced as the relevant legislation is enacted.

These include:-

**Development of local strategy for flood risk management** - to develop and maintain a local strategy for flood risk management within the county.

**Investigating flood incidents** - to investigate and record details of significant flooding events within the county, how it was managed and any recommendations for future flooding incidents.

**Maintaining an asset register** – to maintain a register of structures or features which have an effect on flooding risk which include details of ownership and condition and is available for inspection.

**SuDS approval** – the SuDs approving body for any new sustainable drainage system and must approve, adopt and maintain any new sustainable drainage schemes.

**Designated powers** – the power to designate structures and features that affect flooding in order to safeguard assets that are relied upon for flood protection.

The details of the legislation and accompanying guidance will provide more details on the exact role to be undertaken by the council in due course.

## **Methodology and data review for PFRA**

### **Approach and methodology**

This PFRA has been prepared by Wiltshire Council in consultation with stakeholder partners including Wessex, Thames and South West Water, Highways Agency, Network Rail and Environment Agency. Records of flooding have been collected in order to develop an understanding of flood risk within the county. No new hydraulic modelling or analysis has been undertaken by the council for the report, which is in accordance with published guidelines regarding the regulations.

The objective was to identify the existing and easily obtainable local information which could be used to improve the national understanding of flood risk. Historical records are often difficult to access and do not necessarily contain all the information required. Local parish and town records have mainly been stored in paper format and often require considerable resources to access them. Currently resources are not available to undertake this task, but a project is being developed to consider the feasibility of transferring this data to an electronic format. Information held by stakeholders has been recorded according to their own requirements and do not necessarily reflect those needed by the council.

### **Information held by Wiltshire council**

The council hold a variety of records within various departments and teams concerned with recording flooding information.

#### **Daily flood reporting spreadsheet**

The council ensures that a log is kept of all in and out of hours flooding events for highway and land drainage flooding. The responses to incidents are reviewed regularly by the drainage engineers, and are discussed at the relevant service delivery meetings as appropriate.

This information provides a good record of frequent events. In recent years there have been many incidents involving road flooding, or flooding of individual properties, but no significant flooding incidents affecting large numbers of properties have occurred.

As a unitary authority the council has developed a new reporting form for recording flooding events for use by officers and to meet the council's responsibilities as the LLFA.

#### **Strategic flood risk assessment**

As the minerals and waste planning authority the council has undertaken a Strategic Flood Risk Assessment (SFRA). This review concentrated on the major flood risks for the county, which are fluvial, surface and groundwater as indicated by the Environment Agency's flood risk zone. It does not contain new information regarding local flood risk.

The council is in the process of preparing its strategic planning policy framework, the cornerstone of which is the Wiltshire core strategy. This document will present policies and proposals to guide the direction of new development across Wiltshire for the period up to 2026.

## **Wiltshire core strategy**

The emerging Wiltshire core strategy, is supported by an evidence base covering a range of social, economic and environmental concerns all underpinned by the rigour of a Strategic Environmental Assessment, Sustainability Appraisal and Habitats Regulations Assessment. One of the fundamental issues covered within the evidence base is the relationship between proposed new development areas and the management of all forms of flood risk.

At a fundamental level, the issue of managing flood risk across Wiltshire reflects the guidance in national policy (PPS25) and best practice locally. In terms of forward planning, a Strategic Flood Risk Assessment (SFRA) has been prepared to help guide strategic decision making through the sequential test approach. This work is being augmented by outputs from our SWMP process in relation to the three key strategic towns of – Trowbridge, Chippenham and Salisbury.

A number of key towns and development areas are known to experience seasonal surface, groundwater or fluvial flooding problems. These include the strategic towns of Chippenham, Trowbridge and Salisbury; as well as the smaller market towns of Marlborough, Warminster, Melksham and Malmesbury. However, the mechanisms that combine to define specific flood issues have not always been easy to characterise. This has led to the Council developing the SFRA and SWMPs to provide more detailed evidence to support the preparation of the Core Strategy. In due course, more detailed work - such as SFRA Level 2 modelling and Water Cycle Studies will be developed to support proposals.

In overall terms, the council is committed to understanding and addressing flood risk. The work associated with preparing the PFRA will help provide an overarching framework for wider initiatives such as – SFRA, SWMPs and securing mechanisms to alleviate flood risk through land-use policies, planning obligations and capital intervention.

The SWMP output is being finalised and will be used to inform the assessment of future flood risk in due course.

## **Town and Parish Council data**

The council holds information on flooding and drainage information received from the ex district councils of North Wiltshire, Kennet, Salisbury and West Wiltshire. Much of this information is stored on paper files and a project is underway to transfer this information into an electronic format to allow easier access.

In 2010 the council embarked on a community flooding and drainage information project. All the towns and parishes in Wiltshire were issued a map and questionnaire. They were asked to detail any known flooding or drainage issues, and to identify the possible causes. They were also asked to identify whether the flooding was to land, property, roads or a combination of these. If there had been instances of internal property flooding, they were asked to identify the number of properties affected.

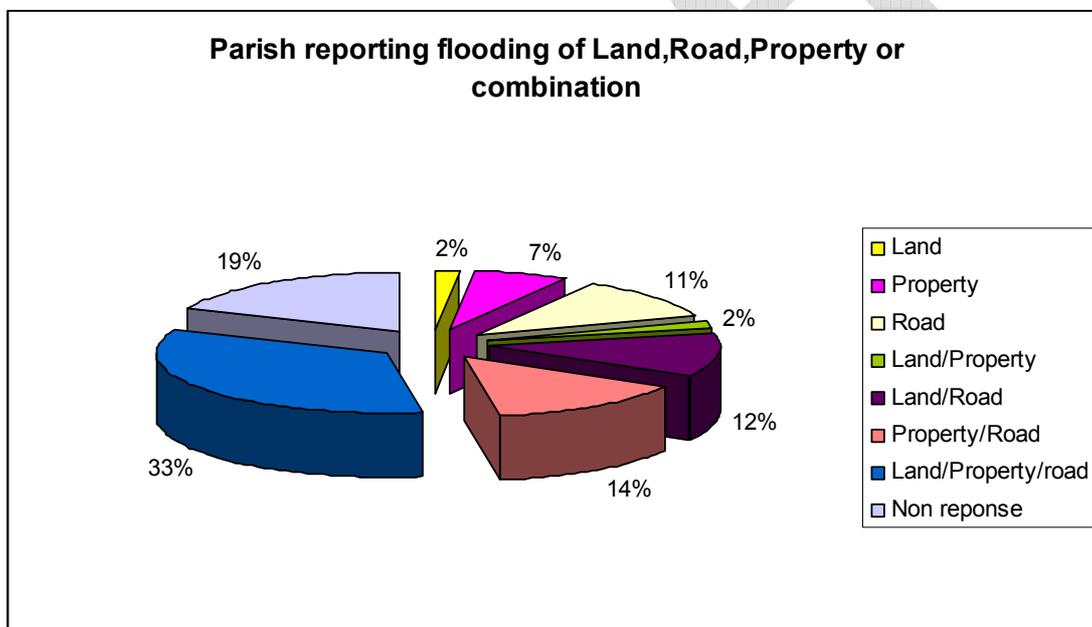
By April 2011 the council had achieved a 74% response rate from the communities, which demonstrated the importance of this issue to them. Other approaches will be made to gather information from those communities who have not yet responded.

Some of the town and parish council now have the ability to prepare and amend their own mapping database, and exchange information with the council's mapping team. They are identifying areas of concern, together with sizes and locations of culverts, ditches and watercourses. Their help in identifying and liaising with landowners can be invaluable.

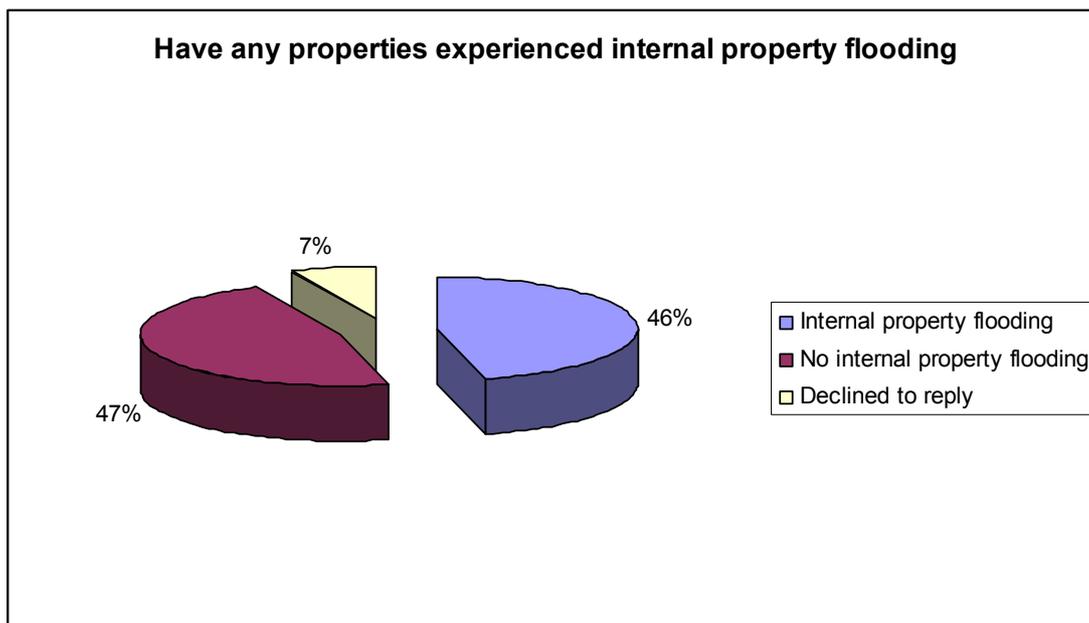
When installing or upgrading drainage systems, the council through the OFWG actively encourages the communities to participate in the decision making process, and monitor its operation giving feedback when needed.

The information received to date has been transferred onto a town and parish layer within the council's GIS system.

The communities were asked to identify whether the flooding affected land, property, road or combination of these. The chart below illustrates how these communities were affected by flooding. This is the first stage in enabling the council to create a detailed picture of local flooding within the county.



The communities were also asked if any internal property flooding had been experienced, and if so how many properties were affected. Of the 74% of town and parish councils who responded to the questionnaire almost half reported some internal property flooding. A small percentage declined to respond to this question because of concerns about future property insurance.



A pilot scheme is being established in the south of the county and the local highways officers will be looking at the responses received from parishes in their locality. They will liaise with the parishes and investigate the reasons for the flooding and consider possible measures to alleviate the issue where appropriate.

The data collected from the town and parish councils is proving helpful in identifying locally significant flooding. Data collected from the town and parish councils has been supplied by third party and therefore its accuracy cannot be guaranteed.

### **Bridges and Structures**

The council's bridges are regularly inspected. The Department for Transport has a protocol for managing the risk of scour at bridges BA74/06 and in Wiltshire all of the council's bridges and related structures are assumed to be high risk and are routinely inspected every two years. Following substantial incidents of flooding, structures are inspected for damage. Historical records indicate one instance of damage to a structure in December 2008. All records of bridge inspections are held electronically.

**Wiltshire Farms** – (to be added)

### **Rights of way**

The council's Rights of Way team holds large amounts of information on highways and rights of way, many of which cross or are adjacent to watercourses. Strategic and locally important paths are inspected annually to enable any urgent problems to be identified and the necessary rectification work carried out quickly. Issues on ordinary watercourses are reported directly to the drainage team and those involving main rivers are reported to the Environment Agency. Records of rights of way inspections are held electronically.

## **Information held by Stakeholder partners**

Approaches were made to other organisations with an interest in flooding to obtain any relevant information they held regarding flood risk in Wiltshire. The information supplied has been transferred onto a GIS mapping layer

**Wiltshire Fire & Rescue Services** hold records of flooding incidents in the county. The records for the north and east of the county have been obtained by the council in electronic format for future reference.

**Canal Trust** – Wiltshire has a number of canals, some of which are disused and being restored. These can act as linear drainage features. The council drainage team are working with the canal trust to incorporate the canals and their storage capacity information in the longer term plans for flood prevention. The canal trust do not hold flooding records, but hold information on the disused canals and have a project for reinstatement of canals throughout Wiltshire. Many sections of the canal have already been restored, with other sections are programmed to be restored over the next few years. In doing this work they are recovering spillways, water courses, and water storage areas which could assist in reducing flood risk by safely transporting the water away from populated areas, or allowing the peak event to subside before the water migrates into watercourses. Any changes to the canals could have flood risk implications, and a close working relationship has been established with the trust.

**FWAG & Natural England** - Wiltshire Council has started working with the Farming and Wildlife Group (FWAG), Natural England, Environment Agency (EA) and landowners to identify good farming practices to aid in flood prevention. This includes consideration of land usage, directional ploughing and set aside to help with storage capacity to reduce run off rates in conjunction with rural flood defence schemes. Information is held by FWAG on land ownership and landowners who have signed up to stewardship schemes where they undertake written commitments to qualities and farming practice.

**Wessex, Thames and Southern Water** - Water authorities regularly attend the two OFWGs in order to help identify problem areas and consider opportunities for collaborative working. They have a particular interest as high levels of surface water inundation within foul systems can cause flooding, health hazards, pollution, and risk to safety, properties and ecology. The council has worked with them on many projects and joint ventures within the county. This includes work on existing assets, proposed schemes and prospective planning applications, where assets can be shared or co-ordinated to reduce maintenance liability. The water authorities hold information on incidents of flooding from public sewers and the DG5 register. They also hold information on surface water systems, culverted watercourses and shared highway drainage systems.

Information held by Thames and Wessex Water has been provided to the council and included in the council's GIS mapping system.

**MoD** - The Ministry of Defence has a significant land holding within the county and undertakes maintenance as riparian owners. Where there is a shared interest in flooding there is an agreed protocol in place, and liaison takes place with their managing agents.

**Town and Parish Councils** – From the data collection exercise it is apparent that information held by town and parish councils on local flooding is largely anecdotal,

with only a small number of parishes holding detailed records of historical flooding in either paper or electronic format.

**Highways Agency & Network Rail** - Both organisations have assets which cross the whole county and can affect watercourses and surface water flows. They also have their own drainage assets such as ditches, watercourses, culverts, and control features. There is scope for collaborative working with these agencies to help reduce flood risk, coordinate maintenance to re-establish natural flood routes and improve attenuation. Both agencies hold comprehensive records relating to the property and assets they own.

The Highways Agency have provided the council with data on flooding affecting the A36, A303, A419 and M4. This information has been included in the council's GIS mapping system.

### **National Data**

Significant data has been provided by the Environment Agency regarding flood risk and consists of the following:-

**Flood Map (Rivers and Sea)** - These maps show the extent of potential flooding from rivers with a catchment of more than 3km<sup>2</sup>. Flood zone 2 shows the areas at risk of greater than 0.1%, and Flood zone 3 shows the areas at risk of greater than 1% and 0.5% from the sea.

**Areas Susceptible to Surface Water Flooding (ASfSWF)** - This is the first generation of national flooding outlining areas at risk from surface water flooding across the country with three susceptibility bandings.

**Flood map for Surface Water (FMfSW)** - This is the second generation national surface water flood mapping released in 2010. The dataset includes two flood events (with a 1 in 30 and a 1 in 200 chance of occurring) and two depth bandings (greater than 0.1m and greater than 0.3m).

**Areas Susceptible to Groundwater Flooding (ASfGWF)** - These plans indicate areas which are susceptible to groundwater flooding, but are at a low level of detail.

**Historic Flood Map** - Spatial flood extent data showing flooding from all sources

**Historic Surface Water and Groundwater Geodatabase (HSWG) National Receptor Database** - This is a national database of social economic, environmental and cultural receptors, including residential properties, schools, hospitals, transport infrastructure and electricity substations.

**Indicative Flood Risk Areas** - National identified flood risk areas based on the definition of "significant flood risk" described by Defra and the Welsh Assembly.

**PFRA CD of supporting information** - Information on property counts in flood risk clusters and designated sites at risk of flooding.

**Association of British Insurance (ABI)** - The Association of British Insurance holds information on insurance claims relating to flood. Currently this data is not collated by postcode and is difficult to use for historical data purposes.

## **Data limitations**

### **Inconsistent recording systems**

As a unitary authority Wiltshire Council has been responsible for land drainage since April 2009 following the unification of the county and the four district councils.

Highway maintenance records from the former county council contain information on flooding affecting the highway, but do not identify any significant or harmful consequences from the flooding, such as the flooding of property, as it was held for highway maintenance purposes only.

The flooding information held by the former district councils is mainly held in paper format, and can be difficult to review and analyse. A project is being developed to transfer this information into electronic format to make accessing the information easier as there is detailed information on some locations which will be helpful in developing schemes to reduce flood risk.

The information provided by the town and parish councils was useful, but there were some difficulties in the use of terminology, and not all the communities have responded. Information is still being received and this will be added to the database as it becomes available.

### **Incomplete datasets**

As a result of the different ways in which information has been stored by the various organisations the records are not as complete as would be wished, and in some cases may not represent the complete flood risk issues within the study area.

However, it is considered that there is adequate information to inform the preparation of the PFRA.

### **Records of consequences of flooding**

Few of the data providers had comprehensive details of consequences for past flood events. This makes accurately assessing the consequences of historic flooding difficult.

### **Data storage**

Wiltshire Council is recording flood risk data using the Esri GIS system and is party to the Public Sector Mapping agreement with Ordnance Survey which includes data copyright restrictions. At present files are only accessible to Wiltshire council staff, using Arc Map and Map Explorer, but systems will be developed to enable wider viewing of relevant information.

## PAST FLOOD RISK

### Significant harmful consequences

The national guidance issued by Defra has set the thresholds for defining areas where flood is significant. However, no guidance has been issued for defining locally significant harmful consequences, and it is for each LLFA to set its own definition.

The South West Flood Risk Managers Group, which Wiltshire is an active member of, has agreed a consistent definition for use in all South West PFRAs. This threshold will be used for recording past flood risk.

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

- Caused internal property flooding to 5 more residential properties, or
- Flooded 2 or more business premises, or
- Flooded 1 or more items of critical infrastructure, or
- Caused a transport link to be totally impassable for a significant period.

Using the UKRLG Code of Practice for Highway Maintenance Table, the definition of a significant period is determined as:

- Category 1 highways (motorways) and major rail links – 2 hours or more
- Category 2 and 3a highways and other railway links – 4 hours or more
- Category 3b and 4a highways – 10 hours or more
- Category 4b – 24 hours or more.

This has been determined for the following reasons:

1. Defra set a threshold of 200 persons or 20 businesses per km grid square flooded to a depth of 300mm during a 1:100 flood.
2. An order of magnitude less can be considered as 20 persons, which would average 8.5 properties (based on the national occupancy rate of 2.34 persons per property)
3. Recognising the rural nature and generally low population density within Wiltshire and the other South West Counties, a threshold of 10 properties has been adopted.
4. The number of business premises has not been reduced beyond 2 (as suggested by the EA) as this would have reduced the threshold to 1, which could result in very isolated minor flooding being considered significant.
5. Using the square grouping criteria of 30,000 persons an order of magnitude less would result in a threshold of 3,000 persons or 1,300 properties and Wiltshire would have no significant past events which was not considered to be appropriate.
6. The 2 hour period for closure of a motorway or major railway link is based on figures suggested by the Highway Agency representative for all parts of the trunk road and motorway network.
7. The 4 hour closure period of a category 2 or 3a highway or other railway link equates to an event affecting one peak period in a working day. (08.00 – 18.00)
8. The 10 hour closure period of a category 3b or 4a highway equates to an event affecting both peak periods in a working day (08.00 – 18.00)
9. The 24hour closing period of a category 4b highway equates to an event cutting off small numbers of properties and impacting on some rural businesses.

10. Major rail links have twin tracks carry several trains per hours in each direction, of which a number are “through trains” which do not stop at minor stations.

**Past flooding in Wiltshire**

From the information reviewed in connection with this assessment the following sites have been identified as being subject to flooding:-

Information to be added in final version			

It should be noted that because of the data limitations described previously the list of past flooding is unlikely to be a complete list of flooding events in Wiltshire. However, no events of the magnitude necessary to qualify as ‘significant’ within the definition as set out in the regulations and guidance have been noted.

Historic flood events considered to have had locally significant harmful consequences have been recorded on the Preliminary Assessment Spreadsheet which will be submitted with this document.

The information on historic flooding will be updated as any review or digitising of historic records takes place.

**Significant harmful consequences of historical flooding**

The information on historic flood events on people, the economy and the environment has not been consistently recorded in the past, and is likely to be incomplete.

It is concluded that there is insufficient data available to provide definitive conclusions regarding the consequences of historical flooding in Wiltshire.

## **FUTURE FLOOD RISK**

### **Future flood risk in Wiltshire**

In order to consider future or potential flood risk the existing available information has been reviewed.

There have not been any significant studies or modelling of the effects of surface water flooding carried out by Wiltshire council for the whole of the county to date. Some work has been carried out with regard to specific sites and schemes, and the SWMPs are being developed for the main towns, but these are not adequate to accurately predict future flood risk for the whole of the county.

The best information on future flood risk available for Wiltshire is considered to be the Environment Agency national mapping datasets. These are the Areas Susceptible to Surface Water Flooding (AStSWF) and the Flood map for Surface Water (FMfSW) described previously.

It should be noted that this information is not sufficiently accurate to determine whether individual properties will be subject to flooding. The modelling only gives an indication of the areas potentially at risk.

Groundwater flooding is an appreciable risk in Wiltshire, especially in the south of the county, because of the local geology. The information contained in the Environment Agency's mapping of Areas Susceptible to Groundwater Flooding (AStGWF) is not sufficiently detailed to allow firm conclusions to be made regarding this aspect of flood risk in Wiltshire.

### **Locally agreed surface water Information**

From the information reviewed in connection with the assessment it would appear that the FMfSW shows a reasonable representation of surface water flood risk. It is likely that future studies, including the developing SWMPs will allow some refinement or confirmation of the information.

In the meantime the FMfSW is considered to be the best surface water information for Wiltshire.

### **Future floods and possible consequences**

Wiltshire Council has reviewed the available data and has noted that a number of areas within the county are at risk of flooding following significant periods of heavy rainfall. These communities do not meet the threshold in the Defra guidance definition of significant, but they do meet the criteria agreed by the South West Managers Group as being locally significant.

The PFRA for England carried out by the Environment Agency considered clusters of properties at risk of flooding within 1km map squares, with a threshold of an estimated 200 people at risk within any 1km square. Both Salisbury and Chippenham were above this threshold level based on a 1 in 200 annual probability using the Flood Map for Surface Water. They were ranked 180<sup>th</sup> and 190<sup>th</sup> respectively in the list of areas at risk in that assessment.

It should be noted that the mapping is not accurate enough to identify individual properties at risk, but it does help confirm that Salisbury and Chippenham both have

locally significant potential flood risks. However, the numbers of properties which may be affected are substantially below the threshold of significant under the regulations.

It is estimated from the surface water modelling carried out by Defra that over 16,000 properties in Wiltshire are at risk of surface water flooding in an extreme event. Over half of these are located in ten settlements. The mapping gives an indication of the scale of possible risk, but does not provide sufficient information to enable individual properties to be identified.

(The initial assessment has provided the indicative figures below which will be reviewed).

<b>Community</b>	<b>Number of Properties at risk</b>	<b>Rank order nationally</b>
Salisbury	2100	152
Trowbridge	1600	211
Warminster	1200	290
Calne	1100	308
Melksham	790	398
Westbury	690	441
Chippenham	690	444
Pewsey	610	488
Aldbourn	600	493
Marlborough	570	505

The above information provided by the Environment Agency on behalf of Defra has been reviewed and it confirms that there are no areas which meet the definition of a Flood Risk Area as defined by the regulations.

## **Climate change and long term development**

### **Evidence**

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

Over the past century around the UK we have seen sea levels 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 the 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 as the 2080's.

We have enough confidence in large scale climate models to say that we must plan for change. There is more uncertainty at a local scale but model results can still help us plan to adapt. For example we understand rain storms may become more intense even if we can't be sure about exactly where or when. By the 2080's, 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%.

### **Key projections for South West River Basin District**

Winter precipitation in Key Projections for South West River Basin District.

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

- Winter precipitation increases of around 17% (very likely to be between 4 and 38%)
- Precipitation on the wettest day in winter up by around 12% (very unlikely to be more than 24%)
- Relative sea level at Plymouth very likely to be up between 12 and 42cm from 1990 levels (not including extra potential rises from polar ice sheet loss)
- Peak river flows in a typical catchment likely to increase between 11 and 21%

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

### **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.

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 in 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.

### **Adapting to change**

Past emissions mean 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 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 under 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.

### **Long term developments**

It is possible that the long term developments might affect the occurrence and significance of flooding. However current planning policy aims to prevent 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 developments are exceptionally necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reduce flood risk overall”.

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

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

## **Possible impacts of climate change in Wiltshire**

### **Summary of likely climate trends in Wiltshire**

The likely climate change trends in Wiltshire over the period up until the end of the century are summarised in table 1. These trends are derived from detailed

projections for annual, summer and winter changes, as set out in the following sections.

### **Summary of climate changes in Wiltshire for the 2020s, 2050s, and 2080s**

The summaries below show the likely changes in temperature and precipitation in Wiltshire for the 2020s, 2050s, and 2080s under the medium emissions scenario. In each case, the figures given represent the 'likely range' (probability levels of 33 to 67%), and changes are relative to the 1961-1990 baseline.

#### **Likely changes in temperature and precipitation in Wiltshire for the 2020s under medium emissions scenario**

##### **Temperature**

- Increase in annual mean temperature by between 1.2 and 1.7°C
- Increase in summer mean temperature by between 1.2 and 2.0°C
- Increase in winter mean temperature by between 1.0 and 1.6°C
- Increase in temperature of warmest summer day by between 0 and 2.7°C

##### **Precipitation**

- Annual precipitation stays roughly the same
- Decrease in summer mean precipitation by between 1 and 15%
- Increase in winter mean precipitation by between 2 and 10%
- Increase in precipitation on the wettest winter day by between 2 and 11%

#### **Likely changes in temperature and precipitation in Wiltshire for the 2050s under medium emissions scenario**

##### **Temperature**

- Increase in annual mean temperature likely to be between 2.2 and 2.9°C
- Increase in summer mean temperature by between 2.3 and 3.5°C
- Increase in winter mean temperature by between 1.8 and 2.6°C
- Increase in temperature of warmest summer day by between 0.9 and 4.4°C

##### **Precipitation**

- Annual precipitation stays roughly the same
- Decrease in summer mean precipitation by between 10 and 28%
- Increase in winter mean precipitation by between 9 and 22%
- Increase in precipitation on the wettest winter day by between 6 and 21%

## **Likely changes in temperature and precipitation in Wiltshire for the 2080s under medium emissions scenario**

### **Temperature**

- Increase in annual mean temperature likely to be between 3.1 and 4.1°C
- Increase in summer mean temperature by between 3.3 and 4.9°C
- Increase in winter mean temperature by between 2.4 and 3.5°C
- Increase in temperature of warmest summer day by between 1.2 and 5.8°C

### **Precipitation**

- Annual precipitation stays roughly the same
- Decrease in summer mean precipitation by between 13 and 34%
- Increase in winter mean precipitation by between 12 and 29%
- Increase in precipitation on the wettest winter day by between 11 and 29%

## **Impacts of climate change in Wiltshire**

These projected climate changes are likely to lead to a range of impacts in Wiltshire. The Met Office has produced a table (below) showing some of the likely impacts for the energy, water, agriculture, built environment, and transport sectors across the UK as a whole. In addition, Wiltshire Council has been compiled a *Local Climate Impacts Profile* (LCIP) to identify the most frequent weather events and those services that have been most affected by recent severe weather events directly and indirectly. The main event to cause disruption was excessive rainfall and flooding. The most frequent impacts of these events were infrastructure disruption which had a direct impact on frontline service delivery as well as indirectly impacting all services through access to offices or workplaces. The council is currently working towards the development of a *Climate Change Adaptation Action Plan* as part of the overarching *ECO Strategy 2011-2020*.

## **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, 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).

No such developments have been identified in Wiltshire.

## **Identification of flood risk areas**

Indicative flood risk areas have not been identified within the county of Wiltshire by the Environment Agency, and the review of flood risk by Wiltshire Council confirms that this is the case.

## **Next steps**

There are no Flood Risk Areas in Wiltshire and consequently there is no requirement to produce hazard and risk maps by 2013 or Flood Risk Management Plans by 2015.

The draft PFRA will be considered by the Council's the Overview and Scrutiny Environmental Select Committee on 10<sup>th</sup> May 2011 prior to submission to the Environment Agency before 22<sup>nd</sup> June 2011.

The PFRA will require updating in 2016 and it is important that the council ensures accurate information is collected and recorded to inform this process. It will need to be kept up to date for future use, and will be used to support any additional flood risk assessments in connection with local flood risk management.

In the next cycle of PFRA development there is a mandatory requirement for the recording of floods that occur after 22<sup>nd</sup> December 2011.

Wiltshire council will investigate future flood events, and ensure the collection, assessment and recording of flood risk data. Work will continue with the Environment Agency, other organisations and the public to reduce flood risk in Wiltshire and to improve the resilience of local communities.

## **References**

(To be added)