Derbyshire County Council
Environmental Services

Preliminary Flood Risk Assessment for Derbyshire

May 2011

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County Hall, Matlock, Derbyshire. DE4 3AG
Revision Schedule

**Preliminary Flood Risk Assessment**

**May 2011**

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Executive Summary

The Flood and Water Management Act 2010 resulted from the Pitt Review and concerns over flooding and in particular the need to address Surface Water Flooding “perhaps the most significant feature of last summer’s events (2007 floods) was the high proportion of surface water flooding compared with flooding from rivers”. The Act introduced new duties for County and Unitary Authorities in respect of flooding from surface water, designating them Lead Local Flood Authorities. These new duties are being phased in over a number of years to allow Lead Local Flood Authorities to build knowledge and capacity to manage these responsibilities.

This Preliminary Flood Risk Assessment comprising; the document, mapping and accompanying spreadsheets represents the first stage of the regulatory requirements. The report has been prepared to meet the requirements of a European Directive and the Flood Risk Regulations 2009 regarding flood risk in the UK and the European Union. It is aimed at providing a high level overview of existing and potential flood risk from those sources of flooding for which the Lead Local Flood Authorities are now responsible, including; Surface Water, Groundwater and Ordinary Watercourses.

- The Preliminary Flood Risk Assessment identifies the number of residential, non residential and elements of critical infrastructure that have been affected by past flooding and those that are at risk of potential future flooding recognising that “surface water flooding is complex and affected by many factors, such as the capacity of drainage systems, saturated ground and high river levels that prevent the system from discharging.”

The assessment is based on the use of historic data relating to flood incidents captured from existing records and a recent consultation with the Council Members and Parish / Town Councils. Data regarding predicted flooding is based on the Environment’s Agency’s “Flood Maps for Surface Water” which indicate where surface water originating from a 1 in 200 chance rainfall event is most likely to drain and collect at depths of 300mm.

The methodology used for the assessment complies with guidance prepared by the Environment Agency and DEFRA. This requires that where the number of properties and / or critical infrastructure considered to be at risk of flooding within any one kilometre grid square exceeds thresholds, then that one kilometre grid square be identified as an area at risk.

In Derbyshire the thresholds for identifying flood risk have been set to take account of the largely rural nature of the County, as a result the number of one kilometre grid square at risk appears excessive. To allay fears that the whole of Derbyshire is “at risk” identified grid squares have been prioritised to identify areas where advice on building personal resistance and resilience to future flooding may be more appropriate than large flood management works.

The preparation of the Preliminary Flood Risk Assessment is primarily a duty arising from the European Directive and Flood Risk Regulations. However, it is perhaps of greater value in identifying and understanding the current and future Flood Risk within Derbyshire, as well as forming the basis of the Local Flood Risk Strategy that the Council will be preparing over the coming year.
## Glossary of Terms and Abbreviations

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<td>AStSWF</td>
<td>Areas Susceptible to Surface Water Flooding</td>
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<tr>
<td>Confirm</td>
<td>Derbyshire’s Asset Management System</td>
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<tr>
<td>DCC</td>
<td>Derbyshire County Council</td>
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<td>DEFRA</td>
<td>Department For Environment, Food And Rural Affairs</td>
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<td>DG5</td>
<td>Water Authority Record of Flooding Resulting From Sewer Inundation</td>
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<td>EA</td>
<td>Environment Agency</td>
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<td>EU</td>
<td>European Union</td>
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<td>FRM</td>
<td>Flood Risk Management</td>
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<td>Flood Event</td>
<td>Flood event comprising many individual flood incidents, ie heavy rain</td>
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<tr>
<td>Flood Incident</td>
<td>A single incident of flooding, ie road closed due to flooding</td>
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<td>FMfSW</td>
<td>Flood Maps for Surface Water</td>
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<td>GHG</td>
<td>Greenhouse Gases</td>
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<td>GIS</td>
<td>Geographical Information System</td>
</tr>
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<td>INSPIRE</td>
<td>EU Spatial Data Infrastructure Directive for GIS Data Management</td>
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<tr>
<td>Km Grid Square</td>
<td>OS National Grid mapping overlay of 1km x 1km squares</td>
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<td>LCLIP</td>
<td>Local Climate Impacts Profile</td>
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<td>LDF</td>
<td>Local Development Framework</td>
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<tr>
<td>LIDAR</td>
<td>3D Topographic models of the landform generated by aerial survey</td>
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<td>LLFA</td>
<td>Lead Local Flood Authority</td>
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<td>LRF</td>
<td>Local Resilience Forum</td>
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<td>MasterMap</td>
<td>OS mapping including intelligent information relating to map features</td>
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<td>MapInfo</td>
<td>Derbyshire’s Preferred Geographical Information System Mapping Software</td>
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<tr>
<td>NRD</td>
<td>National Receptor Data – Intelligent information relating to building use</td>
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<td>National Indicator 188: Planning To Adapt To Climate Change</td>
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<tr>
<td>OS</td>
<td>Ordnance Survey</td>
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<td>PFRA</td>
<td>Preliminary Flood Risk Assessment</td>
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<td>Planning &amp; Policy Statement 25: Development And Flood Risk</td>
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<td>Regional Flood Defence Committee</td>
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<td>RMA</td>
<td>Risk Management Authority – (generally lower tier authorities)</td>
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1 Introduction

The main drivers in the production of this PFRA have been two recent pieces of legislation; The Flood Risk Regulations 2009 and the Flood and Water Management Act 2010. The result of this legislation is that all County Councils and Unitary Authorities designated Lead Local Flood Authorities have been allocated new responsibilities with regard to Flood Risk Management.

The Flood Risk Regulations 2009 transpose the European Community Flood Risk Directive into law in England placing responsibility with the Environment Agency and DEFRA to prepare;

- Preliminary Flood Risk assessments
- Flood Hazard and Flood Risk Maps
- Flood Risk Management Plans

The new responsibilities require the LLFAs to prepare Preliminary Flood Risk Assessments with respect to Surface Water, Groundwater and Ordinary Watercourses and to submit these to the EA by June 2011 for inclusion in the overall UK submission to the EU.

| 22nd June 2011 | Prepare Preliminary Flood Risk Assessments | Consider Surface Water, Groundwater and Ordinary Watercourses as sources of flooding |
| 22nd June 2011 | Identify Flood Risk Areas | Identify areas of significant risk in accordance with the national criteria set by the UK Secretary of State |

Table 1.1 Flood Risk Regulations 2009 – Requirements of LLFAs

Derbyshire is a Shire County within the East Midlands region of England. The northern part of Derbyshire overlaps with the Pennines, a chain of hills and mountains forming the backbone of England. The county comprises an area of 2625km² with a population of approximately 1,000,000 and borders on Greater Manchester, Yorkshire, Nottinghamshire, Leicestershire, Staffordshire and Cheshire. The city of Derby is now a unitary authority responsible for its own PFRA area, but remains part of the ceremonial county of Derbyshire. The county contains 30 towns with between 10,000 and 100,000 inhabitants as well as a large amount of sparsely populated agricultural upland.

Derbyshire sits about as far from the coast as a County can in the UK but its’ wide variety of topography, varying from the southern end of the Pennines with steep fast watersheds and large catchments to the flatter land of the south, provides a challenge to Flood Risk Management. As shown in “Drawing No PFRA 01 - Derbyshire Topography and Main River Network”, on the following page.
The study area for this Preliminary Flood Risk Assessment is governed by the administrative boundary of Derbyshire County Council. The three principal rivers in Derbyshire are the Derwent, Trent and the Dove and form part of the River Humber river basin district and eventually discharge into the North Sea via the River Humber. In the North West of the County the Etherow and Goyt discharge into the Atlantic Sea via the River Mersey. The largest tributaries are rivers Wye, Amber and Erewash. There are three catchment areas in Derbyshire; Derbyshire Derwent; Dove; Lower Trent and Erewash. Derbyshire consists of four Water Authorities; Severn Trent, Yorkshire Water, Stafford Water and United Utilities.

The County of Derbyshire includes eight District / Borough Authorities:-

- Amber Valley Borough Council
- Bolsover District Council
- Chesterfield Borough Council
- Derbyshire Dales District Council
- Erewash Borough Council
- High Peak Borough Council
- North East District Council
- South Derbyshire District Council

…and also the Peak District National Park Authority (PDNPA) although they have no Flood Risk responsibilities as they are not designated a Risk Management Authority (RMA) within the scope of the Flood and Water Management Act.
The County suffers the usual rainfall typical of the UK but this rainfall has led to increasing floods as the upland areas of the Pennines have lost their water holding capacity resulting in small isolated storms causing rapid run off and affecting small villages in the surrounding dales. In the more urban areas channelling of watercourses, less water abstraction by industry and increased impermeable development have created floods affecting infrastructure, commerce and residential.

The recent introduction of the Flood Risk Regulations and the Flood and Water Management Act places the responsibility of Lead Local Flood Authority (LLFA) upon Derbyshire County Council along with requirements to produce a Preliminary Flood Risk Assessment (PFRA). The PFRA is the first step for the LLFA in determining a Local Flood Risk Strategy, drawing in all the partners, Borough and District Councils, Water Companies, Environment Agency, adjacent LLFAs, and others involved in managing flood risk.

What is a PFRA and what do we hope to gain from it;

- Legal requirement of the Flood Risk Regulations 2009, the UK enactment of a European Directive following an increase in flooding in central Europe since 2000
- High level screening exercise to locate areas where the risk of flooding is significant and requires further investigation
- Identify partners for better coordination of assessing and responding to flood risk
- Assess historic flood events in conjunction with DEFRA / EA Flood Maps for Surface Water (FMfSW) to predict where future flood events may arise
- Understand the local flood risk to people, properties, communities, services, businesses and the infrastructure that holds together the economy of Derbyshire
- Inform communities of the risk and encourage them to be more resilient to the possibilities of flooding whilst providing a basis for investigating how measures can be brought forward to reduce the risk
- Inform the County Emergency Planning and Emergency Services regarding what action to take given a potential flood scenario
- Provide information to improve engagement and collaborative working with partners and stakeholders to achieve better outcomes regarding flood risk, resilience and reducing the risks.

The PFRA should consider sources of flooding originating from; Surface Water, Groundwater and Ordinary Watercourses and must consider floods that have significant harmful consequences for human health economy, infrastructure and the environment.

Derbyshire is committed to developing a pragmatic approach to Flood Risk within the County recognising that this involves a partnership approach to finding solutions and providing better information to;

- Those at risk,
- The Emergency Services and Emergency Planning organisations,
- Those involved in the planning for new development.
2  Lead Local Flood Authority Responsibilities

2.1 Governance and partnership arrangements

The preparation of a PFRA is just one of the new responsibilities of the LLFA under the Flood and Water Management Act which also makes provision for;

- Coordination of Flood Risk Management
- Investigating Flood Incidents
- Maintaining an Asset Register of structures and other features that may have an influence on flood risk
- Preparing a local strategy for flood risk management
- SuDs Approving Bodies

Derbyshire has been successful in setting up an early Strategic Flood Board, building on the partnership work undertaken by the Emergency Planning in coordinating flood response in recent years. The Strategic Board has been used as a model for many other East Midlands authorities and is active in its relationships with flood resilience and warning as well as taking on the new roles and requirements resulting from the Flood and Water Management Act and Flood Risk Regulations. Leadership of the Strategic Board rests with the Strategic Director - Environmental Services, as many aspects of the act are related to an engineering approach. However the information gathered and the manner in which it is being made available will greatly inform, not only the Councils engineering teams but also the Emergency Services, Emergency Planning and Town & Country Planners.

The Strategic Board currently comprises Derbyshire County Council LLFA, Emergency Planning, District / Borough Authorities, Derby City Council, Derbyshire Fire and Rescue Service, Derbyshire Police Constabulary, Environment Agency, Severn Trent Water and Yorkshire Water.
**Figure 1.2 Partnership group structure**

**Overview of Groups**

**Derbyshire County Council Flooding Scrutiny Panel:** - Derbyshire County Council’s Improvement and Scrutiny Committee (Communities, Culture and the Environment) has established a Flooding Risk Working Group to oversee how the Council and its partners respond to the risk of flooding throughout the county. The group has an action plan, a record of all its activities and recommendations, and reports to the full Improvement and Scrutiny Committee, the role of which has been enhanced with the introduction of the Flood Risk Management Overview and Scrutiny Committee (England) Regulations 2011.

**Regional Flood and Coastal Committees:** - Administered within each Environment Agency Region, the RFCC’s take elected member representatives from each LLFA (Lead Local Flood Authority). Flood protection schemes are considered and funds allocated where the schemes meet the cost benefit criteria.

**Derbyshire County Council Local Flood Management and PFRA Officer Group:** - The operational level working group comprised of appropriate professionals with flood risk management experience and consults widely with stakeholder professionals to obtain further expertise and local knowledge.
Derbyshire Association of Local Councils: -
Shares and disseminates information between County / Borough / District / Town and Parish councils allowing communities that have common problems on flooding to benefit from shared good practice e.g. community resilience schemes in flood risk areas.

Derbyshire Local Resilience Forum: -
County wide forum which ensures the appropriate contingency planning arrangements are in place to meet the area's risk profile. Flood risk, both pluvial and surface water are considered high risks.

Derbyshire LRF Flood Risk Sub-group: -
Specialist working group under the LRF brings together contingency planning specialists from the emergency services, local authorities and Environment Agency ensures the accuracy of civil contingencies’ flood risk assessments.

Derbyshire Development Control Managers Group: -
Establishes local development policies in line with Planning Policy Statement 25 and ensures the strategic flood risk assessments for planning purposes are taken into account on planning decisions.

Derbyshire Chief Executives Group: - The Heads of Service within Derbyshire local authorities are kept informed of progress under the new Flood Risk Management (FRM) framework and where necessary endorse resource requirements within their authority.

2.2 Communications with partners and public

Derbyshire has been able to capitalise on previous experiences of partnership working with its Boroughs and Districts to open easy lines of communication to set about the task of assessing flood risk within the county. This has not been limited to simply talking and exchanging ideas but to loan of IT equipment to capture key data in land drainage and to the work undertaken by the County’s Emergency Planning teams in the organisation of ‘flood fairs’ and other events to develop an understanding of problems and solutions with residents and businesses affected by flooding.

One of the problems highlighted in the Pitt Report was not just the lack of coordinated response to flooding but also the communication between organisations and the sharing of data.

Derbyshire’s original intention was to host all flood management data on the county’s Geographical Information System (GIS), accessible to all members of the Strategic Flood Board. This was envisaged as a website portal, but problems of access, differing file structures and software led to a decision to share information on a more simplified basis using Microsoft SharePoint. (See 3.4 information Sharing)
Communications with the public are an area to be developed but as a newly formed LLFA with limited experience in dealing with the technical aspects of flooding the Council is feeling its’ way and will be cautious about publishing data related to flood risk until a Local Flood Risk Strategy has been fully developed.

3 Methodology and data review

3.1 Information gathered

Whilst the EA / DEFRA recommend that the data used in developing the PFRA should be restricted to that already held, determining Derbyshire to be the LLFA meant that there was little historic data referring to flooding other than that recorded as a part of the Local Climate Impacts Profile (LCLIP) review, incidents affecting the highway and / or Derbyshire’s own property portfolio.

Understanding that there was a considerable amount of ground to cover to produce a meaningful PFRA, work commenced to share information with our partner authorities before the Act became legislation. An initial trawl netted Strategic Flood Risk Assessments (SFRA) undertaken for the Local Planning Authorities and a wealth of information from Call Centres and the groundworks / highways maintenance teams working for the Boroughs, Districts and the County.

This information was received in a number of differing formats. The key to its value was that either a street or National Grid reference was available for 90% of the data enabling it to be plotted on the County GIS systems to provide an initial assessment of areas of historic flooding.

Data has been captured from the following sources and is summarised in the table at the end of this section.

DCC Highway District Managers – records of flooding events which have had a detrimental affect on the Highway Infrastructure, includes some land drainage issues where surface water run off flows onto the adopted highway

DCC Emergency Planning Team – records of flood instances which have been reported directly to the team.

Elected Members and Town/Parish Councils – all of our Elected Members and Parish/Town Councils have been provided with maps of their electoral ward / town / parish seeking the following information;

- Road Name / Location
- Source of flooding
- Type of Properties affected / areas affected by flooding
- Frequency of Flooding
The consulted parties were encouraged to draw / annotate the maps making reference to individual flooding event. The response has been extremely rewarding providing a better understanding of historic flooding within the county.

CONFIRM Reports – CONFIRM is the software used by DCC’s Environmental Services ‘back office’ systems. It is used to log calls from members of the public and inspector reports using sub categories; Collapsed drain, Drain/gully blocked, Flooding and Ponding/Surface Water. Reports date back to 2000.

District / Borough Officers – Strategic Flood Risk Assessment Stage 1 data and Land Drainage information.

Emergency Services – Historic information from the Emergency Services had predominately been provided within the District / Borough Strategic Flood Risk Assessments. Derbyshire Constabulary and Derbyshire Fire and Rescue Service are now partners for data sharing using the Microsoft SharePoint site that has been developed.

Highways Agency – A1+ (HA’s current contractor) provided flood incident reports for the Highway Agencies Infrastructure within Derbyshire.

Water Authorities – Severn Trent Water, Yorkshire Water and the Council have begun the first steps of data sharing signing a ‘Data Sharing Protocol’. Discussions with United Utilities and Stafford Water require more work.

Derbyshire’s LSP Local Climate Impacts Profile (LCLIP) – Derbyshire County Council took part in the first regional LCLIP in 2008. The regional LCLIP was developed to better understand the vulnerability of services to severe weather events on the understanding that the frequency of severe weather events is likely to increase in the future. The LCLIP findings were used to look at the effects flooding and snow melt had on the county between January 2000 and June 2008. The methodology was based upon standards developed by UKCIP;

- Local media sourced for articles about severe weather events between January 2000 and June 2008.
- Weather events were correlated with local authority records to establish the impact of each event on service provision


Newspaper articles and reports – In addition to the information contained within the LCLIP a separate media search was undertaken for flooding events within the County. This search did not have any date restrictions

Data sets were collated and reviewed to identify not just the individual incidents of flooding but also to identify details of major past flood events and associated consequences.
Figure 1.3 Number of historic events recorded across the County Update Chart

As figure 1.3 shows there is wide ranging variation of recorded flood events within each of the eight District/Borough Councils, the highest number being recorded within Amber Valley Borough. However the supporting detail to substantiate events varies significantly. Some events are simple point features with no information attributed to them. South Derbyshire District Council only equates to 6% of the total events within the County although the data set behind the events is quite comprehensive. The data provides a snap shot of the information received, although it is difficult to compare due to the varying levels of detail provided by the different authorities.

Currently the Council are still receiving information from Parish and Town Councils in relation to past flooding events within the community.

Data is still being actively sought from the following sources;

- British Waterways
- Water Authorities – DG5 etc
- EA Geosets
  - Historic Surface Water and Groundwater database
  - Historic Flood Map
3.2 Availability and limitations

One of the main concerns in gathering data is an awareness of its limitations, particularly as most of the data gathered in the short time has been multi sourced and from a range of backgrounds.

<table>
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<th>Dates of data</th>
<th>Depths of flooding</th>
<th>Property Affected</th>
<th>Areas Affected</th>
<th>Risk Rating for event</th>
<th>Frequency/dates of event</th>
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<td>Yes in parts</td>
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<td>Emergency Services</td>
<td>SFRA 2009</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Low</td>
</tr>
<tr>
<td>Highway Agency</td>
<td>2011</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Low</td>
</tr>
<tr>
<td>LCLIP</td>
<td>2008 - 09</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Low</td>
</tr>
<tr>
<td>News reports</td>
<td>2000 - 11</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Low</td>
</tr>
<tr>
<td>DCC District Managers</td>
<td>2010</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 1.2 Data Sources, information collected and confidence rating

The availability and limitations of information has varied across the County. Some information is very anecdotal, being generated by word of mouth between numerous individuals. Other information falls short of all the desired attributes, i.e. road name and location were provided but no other information. A number of GIS layers were provided with point features on a mapping layer, however the points did not contain any information to support the flood incident. As a result of the variance in data it has been difficult to ascertain what is affected, the severity and frequency of flooding events, however now that a data set has been provided further discussions / investigation can be pursued with relevant parties to better support the flood incidents.
Data Limitations

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconsistent Recording Systems</td>
</tr>
<tr>
<td>Incomplete Datasets</td>
</tr>
<tr>
<td>Quality of Data</td>
</tr>
<tr>
<td>Completeness of Records</td>
</tr>
</tbody>
</table>

Table 1.3 Data Limitations

When supporting evidence has been provided such as engineering reports, photographs and paper based maps they are attached to the specific flood incident within the GIS systems and can be viewed alongside the flood information.

DCC has no hydraulic modelling information to substantiate projections for possible future flooding. Information of this nature would most possibly be available at a more local level such as District/Borough Council through the planning/regeneration departments.

It has to be remembered that this is a first step and whilst Derbyshire has been proactive in capturing flood data from a multitude of sources this information will need to be analysed and risk rated to provide support to the developing flood risk management strategy. Consequently the picture for Derbyshire may change but this is unlikely to justify the County hosting nationally significant areas of Indicative flooding.

Future developments to improve the way in which data is captured regarding flooding issues may include;

- Providing ‘call centres’ and other relevant officers who deal with calls from the public with a scripted process for recording specific information about a flood event.
- Issuing questionnaires to follow up on information obtained by call centre staff containing a more detailed set of questions to secure accurate information about a flood event.
- A questionnaire posted on the Councils website asking the residents of Derbyshire about flooding events/memories that they are aware of.
3.3 Storage Systems

All data relevant to flood risk is now stored on dedicated network workspaces and drives within the corporate IT systems and is only accessible to approved officers.

Information is held in a number of data formats including:

<table>
<thead>
<tr>
<th>Software / Format</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Word</td>
<td>Documents</td>
</tr>
</tbody>
</table>
| Microsoft Excel   | Spreadsheet analysis  
                   | Data input to GIS   
                   | GIS data analysis and reporting |
| Adobe PDF         | Drawing representing GIS mapping |
| CONFIRM           | Associated Highways Assets are managed by CONFIRM Assets |
| MapInfo Professional | Mapping analysis  
                      | SQL data queries   
                      | Spatial data queries |
|                   | Comparison with other mapped data sets, e.g. Highways assets, critical services |

Table 1.4 Data Formats

3.4 Information Sharing

The Derbyshire Flood Risk Partnership SharePoint (HITP) was developed to allow documentation and GIS information to be easily shared between Derbyshire County Council and selected authorities and partners. The site is available via external web access. Authorities and partners have their own delegated users with secure logins to the site.

SharePoint does is not a visual map viewer, it provides an exchange portal to publish and share data in relevant file formats that all partners can download and open within their own systems; i.e. Microsoft Excel, Word, Map Info Tab files, Arc GIS Shape Files and many more. The partnership group currently consists of eight District/Borough Authorities, Derby City Council, Derbyshire Fire and Rescue Service and Derbyshire Police Constabulary. There are no reasonable limitations to the number of partners that can be created for this site. SharePoint is used to upload and share relevant data sets between the partnership groups.

SharePoint offers a secure two way data exchange and creates a data store for which flood related information can be held for all to use and access. SharePoint eradicates the issues of having to manually post sensitive information, oversized email account issues and security concerns about who may have access to sensitive data.

SharePoint is similar in its overall function to an ftp site, but has far greater facilities and can be created to have high levels of security.
SharePoint allows partners to see a list of Project and IT contacts with email link to specific individuals. It allows website hyperlinks to be created which are relevant to the partnership group. Therefore all members have access to the most up to date information and as a LLFA we can ensure that appropriate information is disseminated down to our partners.

SharePoint allows announcements to be posted, notifying partners by email, documents and images can also be attached to announcements. The site also contains a Discussion Board and a Questions and Answer section. This is seen to be especially beneficial for cross border issues, through an open and accessible forum.

Benefits of SharePoint:

- It can be designed to be extremely secure.
- User friendly Microsoft Application.
- The Authorities Microsoft Licence Agreement made SharePoint Services free to use.
- SharePoint’s web base and password protection raised no issues in allowing access for all our partners.
- Its functionality allows for it to be far more than just a data sharing software.

3.5 Quality assurance, security, data licensing and restrictions.

The way in which historic flooding information has been stored by various parties differs throughout the County. The aim over the next twelve months is to standardise the historic data, providing partners with a template as to how data should be captured in future. Whilst looking to standardise the way in which data is captured the INSPIRE directives for spatial data infrastructure are at the forefront of future development plans. Hopefully this will enable spatial information to be shared among public sector organisations and better facilitate public access.

Current aims are to meet the key objectives of the INSPIRE directives;

- Data should be collected only once and kept where it can be maintained most effectively.
- It should be possible to combine seamless spatial information from different sources across Europe and share it with many users and applications.
- It should be possible for information collected at one level / scale to be shared with all levels / scales; detailed for thorough investigations, general for strategic purposes.
- Geographic information required for good governance at all levels should be readily and transparently available.
- It should be easy to find what geographic information is available, how it can be used to meet a particular need, and under which conditions it can be acquired and used.

There is a corporate template for storage of Metadata an example of the structure that relates to Flood Risk Management is shown below and is for illustrative purposes only.
Flood ID | 1  
Dataset Title | Parish Councils Flooding Data  
Resource Type | Dataset  
Data Format | MapInfo Tab  
Location | *************************  
Description | Data on historical flooding events within the Parish Council Wards  
DCC Data Contact | Highway Asset Management  
DCC Section or Team | ESD Highways Section  
Data Supplier | Parish/Town Councils  
Use Constraints | *************************  
Access Level | Available to all Highway Department Staff  
Reason for Access Level | *************************  
Frequency of update | Annually  

Table 1.5 Metadata template

Future guidance from the Environment Agency and the INSPIRE directives may lead to amendment in the storage of Metadata.

All data relevant to flood risk is now stored on dedicated network workspaces and drives within the corporate IT systems and is only accessible to approved officers.

There is a Data recovery protocol a differential back up every night and a full backup every week. The information held is governed by the County’s corporate disaster recovery protocol.

SharePoint is hosted on a secure server and is governed by authorised users having a username and password to access the site.

4 History of past flood risk

4.1 Outline of historic floods and their consequences

The requirements of the Flood and Water Management Act are specific regarding the responsibilities of LLFAs. Consequently, for the purposes of this PFRA historic flooding has been assessed based on;

Surface Water Flooding – resulting from heavy or prolonged rainfall exceeding the capacity of natural and engineered drainage networks, generally affecting low lying areas and water flow paths.

Groundwater Flooding – resulting from water rising through underlying aquifers, resurgences, springs and mine workings also affecting areas where the water table shallow and generally associated with heavy or prolonged rainfall.
Ordinary Watercourses - resulting from heavy or prolonged rainfall exceeding / overtopping the natural / engineered banks or failure of engineered spill ways.

Information collected for the purposes of understanding Past Flood Risk can be displayed in map form to illustrate a knowledge of where flooding has occurred in the past but limitations in the data used constrain identification of the consequences (i.e. no of properties affected, frequency depth, dates) and limit the use of this mapping for the purposes of identifying significant harmful consequences.

Please refer to “Drawing No PFRA 02 - Historic Flood Events” on page 24.

To overcome these problems a history of past flood events in Derbyshire was identified using data collected for the Local Climate Impacts Profile 2010 (LCLIP) and those considered to be of “significant harmful consequence” to Derbyshire have been recorded in Annex 1. The data was sourced from local media and Derbyshire County Council recording systems.

Flood events listed have been identified as of local significance within Derbyshire and are based on one of the following:

- Properties flooded (more than 5, which approximates to 12 people affected)
- Disruption of critical infrastructure

For each flood event there may have been more than one flood incident. Since each flood event often resulted in flooding in different areas.

The resolution of the LCLIP and local authority data was only sufficient to attribute flood events and incidents to areas on a county, district or parish level, rather than specific geographical location. For some events the incidents were so widespread that they were attributed to districts or the county as whole.

The most significant flooding events occurred in 2000, 2002 and 2007. The sources of flooding were a combination of fluvial and surface water flooding for all three events. The 2000 and 2007 flooding events were national events with many incidents across the county. In July 2002 there was a localised event with flooding in the Glossop area.

During the 2000 and 2007 floods there was widespread disruption to road and rail transport network across the county. Chesterfield was particularly affected on both occasions.

In 2000 the army and council engineers worked to protect approximately 200 residential properties in Hatton. In Chesterfield approximately 26 residential properties were evacuated and 15 flooded. The River Derwent and Beeley brook overtopped and arterial roads in Chesterfield, Matlock and Bakewell were closed. Babington hospital and Rowsley CoE school basements were flooded. There was structural damage to thirty roads across the county.

In July 2002 in Glossop the A57 was closed and properties flooded. Flood waters reached a depth of approximately one metre along High Street West. Manor Park suffered significant damage to bridges, footpaths and riverbanks.
Chesterfield was particularly affected in 2007 when the River Hipper/Rother overtopped its banks. The A617 flooded and sewage system surcharged, residential homes were flooded and hundreds of residents were evacuated. River Derwent and River Trent overtopped. Surface water flooding caused damage to properties in Erewash. Livestock were lost in Walton-on-Trent.

Finally in September 2008 Kniveton, Parwich and Matlock Town Centre were subjected to specifically surface water flood events well in excess of Derbyshire’s proposed thresholds for urban and rural communities.

Seven out of the fourteen flood events listed as surface water flooding have been classified as regional flood events affecting locations throughout the county including the floods of 2000 and 2007. Of the remaining seven events, six were attributed to individual parishes and one to the districts of Derbyshire Dales and South Derbyshire.

Please refer to “Drawing No PFRA 02 - Historic Flood Events” on the following page.
4.2 What are ‘significant harmful consequences’ and why

There are clear consequences in setting the threshold of what constitutes a flood event of ‘significant harmful consequences’ either too low or too high. The former will result in every flood event in Derbyshire having the potential to be of Significant Harmful Consequence. The latter will result in only a few events being considered to be of Significant Harmful Consequence, a result that will prove difficult to justify to members and more importantly those residents suffering from long term flooding, who will feel abandoned.

DEFRA set a national threshold of what constitutes a flood event of local ‘significant harmful consequence’ at 200 persons or 20 non residential properties per km grid square using the Environment Agency’s detailed method of counting (based on property outlines) for the new Flood Map for Surface Water (300mm deep - 1 in 200 annual chance). National Flood Risk Thresholds are km grid squares where at least one of the following flood risk indicators is above the threshold given below:

1. Number of People > 200
2. Critical Services > 1
3. Number of Non-Residential Properties > 20

Indicative flood risk is defined as where the number of people within five adjoining km grid squares is greater than or equal to 30,000 people, however this situation does not occur within Derbyshire.

However, recognising the rural nature and generally low population density in many of the Shire Counties, a threshold of 20 persons (equating to approx. 9 properties) and two non residential properties is being considered by the South West Flood Risk Managers Group.

To resolve the differences in urban and rural environments within Derbyshire, in particular population densities and the importance of the rural significance of the county, the Council has been working on a similar principle to the South West Flood Risk Managers Group and is hopeful that in meeting with other East Midlands LLFA’s then a consistent definition can be agreed for use by shire and unitary authorities across the region.

For Derbyshire it was decided to create two local threshold levels for flood risk significance by creating an urban / rural split. The data source used to identify the split was obtained from the Office of National Statistics for England and Wales which adopts a settlement-based approach, comprising of four settlement types:

- Urban (population over 10,000) – (Urban)
- Town and Fringe – (Rural) - DCC evaluation (Semi Urban)
- Village – (Rural)
- Hamlet and Isolated Dwellings – (Rural)

Please refer to “Drawing No PFRA 03 - Identifying Local Thresholds for Significance Urban/Rural Split” on the following page.
Identifying Local Thresholds For Significance
Urban/Rural Split

Drawing No.: PFRA 03

KEY
- Urban Definition
  - Population over 10,000
  - Town and Fringe
- Rural Definition
  - Village
  - Hamlet and Isolated Dwellings

Scale: 1:400,000 at A4

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When looking at the Urban/Rural split the decision was balanced by using local knowledge of individual settlements, determining that the Office of National Statistics for England and Wales definition for Town and Fringe would be better identified as Urban instead of Rural. The county has been broken into km grid squares based on the ordnance survey national grid with each square being defined as either Urban or Rural. There are 639 (23%) km grid squares classified as Urban and 2147 (77%) classified as Rural.

With the county split into urban and rural areas a local definition of the thresholds for considering flood events to be of ‘significant harmful consequences’ required considerable thought;

- 9 properties in an urban environment could be an acceptable threshold but would not necessarily be considered by the public or local politicians as being a reasonable level to be unaware of
- 9 properties in a rural environment could be an entire hamlet.

Adopting a threshold of 20 persons (approx. 9 properties) as suggested by the South West Flood Risk Managers Group may lead to residents, businesses and occupiers suffering one off or repeat flood incidents feeling ignored. Consequently it was determined to set the levels a little lower and to take a view on the effects of this threshold and prioritise the outcomes providing an opportunity to look at self-help in some of the lower risk areas and investigation in those areas indicating a higher risk.

**Local definition of Significant Harmful Consequences – Urban**

For the purpose of identifying past and future floods, a flood is deemed significant if it:
- caused / causes internal flooding to five or more residential properties, or
- flooded / floods two or more non-residential premises, or
- flooded / floods one or more items of critical infrastructure

As the County is predominantly rural, to take a threshold for locally significant harmful consequences based on the above urban threshold would exclude those at risk in rural areas as there are unlikely to be 5 properties in per km grid square at risk. Consequently, a rural threshold has been considered as;

**Local definition of Significant Harmful Consequences – Rural**

For the purpose of identifying past and future floods, a flood is deemed significant if it:
- caused / causes internal flooding to two or more residential properties, or
- flooded / floods one or more non-residential premises, or
- flooded / floods one or more items of critical infrastructure

**Investigation**

Not only do these thresholds allow the flood risk to be considered across the County, they also set reasonable criteria to investigate flooding issues and whilst resources will clearly be stretched in this area the work undertaken in compiling this PFRA will help guide two areas;
Multiple incidents of flooding where the source may require the intervention of several parties.

Single source flooding where the solution may lie in something as simple as clearing a blocked gully or drain, or raising a kerb.

### 4.3 Summary table and description, outlining when floods have occurred and their consequences

<table>
<thead>
<tr>
<th>Flood ID</th>
<th>Areas Affected</th>
<th>Date</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Derbyshire</td>
<td>Oct - Nov 2000</td>
<td>Disruption to critical infrastructure and properties flooded in several towns and villages.</td>
</tr>
<tr>
<td>2</td>
<td>Rowsley</td>
<td>Oct 2001</td>
<td>Disruption to critical infrastructure.</td>
</tr>
<tr>
<td>3</td>
<td>Derbyshire Dales</td>
<td>Feb 2002</td>
<td>Disruption to critical infrastructure and commercial property flooded.</td>
</tr>
<tr>
<td>4</td>
<td>Glossop</td>
<td>Jul 2002</td>
<td>Properties flooded and disruption to critical infrastructure.</td>
</tr>
<tr>
<td>5</td>
<td>Derbyshire</td>
<td>Dec 2002</td>
<td>Disruption to critical infrastructure across county.</td>
</tr>
<tr>
<td>6</td>
<td>Buxton</td>
<td>Feb 2004</td>
<td>Disruption to critical infrastructure.</td>
</tr>
<tr>
<td>7</td>
<td>Derbyshire</td>
<td>Aug 2004</td>
<td>Disruption to critical infrastructure across county.</td>
</tr>
<tr>
<td>8</td>
<td>Derbyshire</td>
<td>Aug 2004</td>
<td>Disruption to critical infrastructure across county.</td>
</tr>
<tr>
<td>9</td>
<td>Derbyshire</td>
<td>Nov 2005</td>
<td>Properties flooded.</td>
</tr>
<tr>
<td>10</td>
<td>Derbyshire</td>
<td>June 2006</td>
<td>Disruption to critical infrastructure across county. Babington hospital and more than 100 residential properties flooded.</td>
</tr>
<tr>
<td>11</td>
<td>Swadlincote</td>
<td>Sep 2006</td>
<td>Properties flooded.</td>
</tr>
<tr>
<td>12</td>
<td>Stoney Middleton</td>
<td>Jan 2007</td>
<td>Approximately 30 residential properties flooded and disruption to critical infrastructure.</td>
</tr>
<tr>
<td>13</td>
<td>Derbyshire</td>
<td>Jun 2007</td>
<td>Disruption to critical infrastructure and properties flooded in several towns and villages.</td>
</tr>
<tr>
<td>14</td>
<td>Derbyshire Dales &amp; South Derbyshire</td>
<td>Sep 2008</td>
<td>Disruption to critical infrastructure and properties flooded in several towns and villages.</td>
</tr>
</tbody>
</table>

**Table 1.6 Summary of flood events and areas affected**

The events listed in Table 1.6 are not of national significance as they do not meet the threshold of indicative flood risk. However the events listed are of local significance, but due to the lack of detailed supporting information are difficult to evaluate as being of harmful significant consequence.
4.4 Reference to the detailed records of past floods with significant harmful consequences in the spreadsheet (Annex 1)

Please refer to Annex 1.

5 Future Flood Risk

5.1 Locally agreed surface water information

The Environment Agency has produced a national assessment of surface water flood risk in the form of two national mapping datasets. The first generation of national mapping; “Areas Susceptible to Surface Water Flooding” (AStSWF), is based on a rainfall event with a 1 in 200 chance of occurring.

In the past year, the national methodology has been updated to produce a second generation of national mapping, “Flood Map for Surface Water” (FMfSW). This is based on modelling where surface water is likely to accumulate and uses a LIDAR 3D model of Derbyshire’s topography to determine low lying areas. To provide a more realistic approach the modelling exercise also considered all parts of the built environment to have an elevation of 5m thereby generating a number of water flow paths likely to occur within urban areas as a result of an intense rainfall event. The result of the modelling exercise is a comprehensive map depicting a series of polygons that either represent where water will stand in low lying areas or where it will run between walls and other elements of the built environment.

The Flood Map for Surface Water is based on two rainfall events of 1 in 30 and 1 in 200 annual chance and provides for two flood depth bandings; greater than 100mm and greater than 300mm.

The analyses undertaken in this PFRA are based on the Flood Map for Surface Water with a rainfall event of 1 in 200 annual chance and a flood depth of greater than 300mm.

“Drawing No PFRA 04 - Flood Map of Surface Water 1 in 200 Annual Chance” highlights the geography of the polygons within Derbyshire illustrating the flood events at 1 in 200 annual chance at a depth banding of greater than 300mm, as described above and is shown on the following page.
5.2 Outline of methodology for identifying future floods and their consequences

The methodology for identifying future floods and their consequences within Derbyshire is outlined in the ‘Flood Map for Surface Water Property Count Method’ published by the Environment Agency and based on thresholds for what is considered to be of local Significant Harmful Consequence as discussed in “Section 4.2 - What are ‘significant harmful consequences’ and why”.

Derbyshire has identified future flood risk in accordance with the ‘Flood Map for Surface Water Property Count Method’ guidelines published by the Environment Agency by making reference to all the Ordnance Survey MasterMap building outlines and comparing these with the Flood Maps for Surface Water. Where buildings either intersected with or were wholly contained within the polygons identified within Flood Maps for Surface Water these buildings were extracted into a separate layer / table. Using the building type attributes stored in the National Receptor Data (NRD) it was possible to identify three types of building; Dwellings, Critical Services and Non Residential Properties. These three categories were extracted to separate layers and each layer compared with the km grid squares enabling a count of the numbers of each building type in each grid square to be undertaken.

The category counts per km grid squares were compared to the local thresholds for Significant Harmful Consequence determined in “Section 4.2 - What are ‘significant harmful consequences’ and why” and where any one of the three categories; Dwellings, Critical Services and Non Residential Properties exceeded the threshold the km grid square was highlighted to show that there was a likelihood of Significant Harmful Consequence within the km grid square.

**Urban**
Number of Properties > 5  
Critical Infrastructure > 1  
Number of Non Residential Properties > 2

If any one of the above thresholds were exceeded then the km grid square was highlighted buff as shown in “Drawing No PFRA 05 - Future Surface Water Flood Risk – (Urban based on local threshold)” on page 33.

**Rural**
Number of Properties > 2  
Critical Infrastructure > 1  
Number of Non Residential Properties > 1

If any one of the above thresholds were exceeded then the km grid square was highlighted green in colour as seen in “Drawing No PFRA 05/01 - Future Surface Water Flood Risk – (Rural based on local threshold)” on page 34.

The two drawings, urban and rural, were combined to provide a County picture of Future Flooding likely to occur as a result of a 1 in 200 year chance event and a flood depth of
300mm. This may include areas which are already prone to flooding and have a flood history known to the LLFA. In these areas flood risk may increase in the future.

Please refer to “Drawing No PFRA 05/2 - Future Surface Water Flood Risk – (Combined Urban and Rural Split)” on page 35.

Finally, an exercise was undertaken in order to identify areas where future flooding may occur, particularly where it is not identified within the current records of past flooding. The drawing of Historic Flood Events (Drg No PFRA 02) was combined with the drawing of Future Surface Water Flood Risk – Combined Urban and Rural Split (Drg No PFRA 05/2) to identify areas of flooding or future flooding that may not have been reported or may not yet have occurred, but can be identified. This will provide information to assist the councils Emergency Planning teams be more proactive in working with communities to develop an awareness of future risk.

Please refer to “Drawing No PFRA 06 - Predicted Areas of Surface Water Flooding based on Local Thresholds” on page 36.
Future Surface Water Flood Risk (Urban based on Local Threshold)

Drawing No.: PFRA 05

Notes:
All analysis is based from EA Flood Map for Surface Water 200 yr deep.

KEY:
These 1km grid squares are above the Urban Local Threshold for possible future Flood Risk.

Places above the Urban Local Threshold are 1km grid squares were at least one of the following Local flood risk indicators is above the threshold given below:

1. Number of Properties > 5
2. Critical Infrastructure > 1
3. Number of Non-Residential Properties > 2

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Scale: 1:400,000 at A4
Predicted Areas of Surface Water Flooding based on Local Thresholds

**KEY**

- Places above the Urban Local Threshold are 1km grid squares where at least one of the following local flood risk indicators is above the threshold given below:
  1. Number of Properties > 5
  2. Critical Infrastructure > 1
  3. Number of Non-Residential Properties > 2

- Places above the Rural Local Threshold are 1km grid squares where at least one of the following local flood risk indicators is above the threshold given below:
  1. Number of Properties > 2
  2. Critical Infrastructure > 1
  3. Number of Non-Residential Properties > 1

**Notes**

This map illustrates possible future surface water flood risk within 1km grid squares, for which we have no historical records of flood events.

All analysis is based from EA Flood Map for Surface Water 200 yr deep.
5.3 Reference to the detailed records of future floods and their possible consequences in the spreadsheet (Annex 2)

Section 5.2 has described Derbyshire’s methodology used in identifying future floods, although specific consequences have only been identified on a km grid square. The principle reason for this is that there has been insufficient time to validate the Flood Maps for Surface Water and the council has reservations where areas of standing water and flood paths do not accord with local experience. To publish this PFRA and include drawings, maps and spreadsheets identifying specific streets or properties at this stage is not seen as being reasonable given the reservations over the data used and the high level screening exercise this PFRA is principally aimed at delivering.

Consequently Derbyshire County Council will be assessing the risk posed by the grid squares identified in Drawing Nos;

PFRA 05 Future Surface Water Flood Risk – (Urban based on local threshold)
PFRA 05/1 Future Surface Water Flood Risk – (Rural based on local threshold)
PFRA 05/2 Future Surface Water Flood Risk – (Combined Urban and Rural Split)
PFRA 06 Predicted of Surface Water Flooding based on Local Thresholds

…. and have produced a draft assessment of priorities based on the number of Dwellings affected in each of the OS grid square.

Please refer to “Drawing No PFRA 07 - Prioritisation of Predicted Areas of Surface Water Flooding based on Local Thresholds” on the following page.
Prioritisation of Predicted Areas of Surface Water Flooding based on Local Thresholds

Drawing No. - PFRA 07

Number of Dwellings within FMISW Area
(Future subtract Historic)

- 240 to 480 (1)
- 160 to 240 (3)
- 80 to 160 (15)
- 40 to 80 (17)
- 0 to 5 (470)

20 to 40 (50)
10 to 20 (57)
5 to 10 (63)

Notes:
All analysis is based from EA Flood Map for Surface Water 200 yr deep.

Prepared By: JRB
Checked By: SM
Approved By: SM
Date Issued: 11/03/2011

Scale: 1:400,000 at A4

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The Council will be reviewing the properties affected and Flood Maps for Surface Water polygons prior to publishing any more detailed information regarding the risk to specific Districts Parishes, Streets and Properties.

The detailed records of future surface water floods and their possible consequences in the spreadsheet (Annex 2) will therefore be a high level review of future floods based on the information made available by the Environment Agency in their Flood Maps for Surface Water (FMfSW) 1 in 200 Deep. To aid in understanding how this may affect Derbyshire an analysis of the future risk to each of Derbyshire’s eight Borough / District Councils is outlined in the table below, ranking the Borough / Districts based on % of grid squares likely to be subject to future flooding;

<table>
<thead>
<tr>
<th>Borough / District</th>
<th>Number of km grid squares within Borough/District</th>
<th>Number of km grid squares at risk of future flooding</th>
<th>Percentage</th>
<th>Future Risk Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chesterfield</td>
<td>67</td>
<td>56</td>
<td>84%</td>
<td>1</td>
</tr>
<tr>
<td>Amber Valley</td>
<td>296</td>
<td>160</td>
<td>54%</td>
<td>2</td>
</tr>
<tr>
<td>Erewash</td>
<td>136</td>
<td>70</td>
<td>52%</td>
<td>3</td>
</tr>
<tr>
<td>North East Derbyshire</td>
<td>273</td>
<td>129</td>
<td>47%</td>
<td>4</td>
</tr>
<tr>
<td>Bolsover</td>
<td>193</td>
<td>82</td>
<td>43%</td>
<td>5</td>
</tr>
<tr>
<td>Derbyshire Dales</td>
<td>848</td>
<td>329</td>
<td>39%</td>
<td>6</td>
</tr>
<tr>
<td>High Peak</td>
<td>574</td>
<td>172</td>
<td>30%</td>
<td>7</td>
</tr>
<tr>
<td>South Derbyshire</td>
<td>395</td>
<td>114</td>
<td>29%</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 1.7 Summary of future flood increase by Borough / District

A preliminary analysis of future surface water floods and their possible consequences, where they may affect the local transport network of county roads has also been undertaken. This identifies 3.9km (0.07%) of the 5,500km of county roads to be at risk from future flooding based on the Flood Maps for Surface Water. Whilst the table below illustrates the distribution of potential highways flooding, there are reservations as to whether all of these are flood events where standing water may be a danger to users, as some may be roads that have historically been a flood path for water at a much lesser depth than 300mm.

<table>
<thead>
<tr>
<th>Hierarchy</th>
<th>Road Length at Risk from Surface Water (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a HA Trunk Road</td>
<td>199</td>
</tr>
<tr>
<td>2a County Strategic Route</td>
<td>236</td>
</tr>
<tr>
<td>3a Main Distributor</td>
<td>238</td>
</tr>
<tr>
<td>3b Secondary Distributor</td>
<td>387</td>
</tr>
<tr>
<td>4a Link Road</td>
<td>865</td>
</tr>
<tr>
<td>4b Local Access Road</td>
<td>1,939</td>
</tr>
<tr>
<td>Not Specified</td>
<td>23</td>
</tr>
<tr>
<td><strong>Total Road Length at Risk</strong></td>
<td><strong>3,887</strong></td>
</tr>
</tbody>
</table>

Table 1.8 Summary of future flood risk to local transport infrastructure - county roads
5.4 Climate change and long term developments

The impacts of climate change on future flood risk are not fully understood. United Kingdom Climate Projections 2009 (UKCP09) information has been used in this PFRA to provide an insight into the possible impacts of climate change on future flood risk within Derbyshire.

There is scientific evidence that global climate change is happening now and cannot be ignored. Over the past century around the UK sea levels have risen and more winter rain falls in intense wet spells. Seasonal rainfall is highly variable and seems to have decreased in summer and increased in winter. 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 and past GHG emissions suggest 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. There is enough confidence in large scale climate models to require a plan for change and whilst there is more uncertainty at a local level, model results can help in planning to adapt. eg. rain storms may become more intense, but there is no certainty 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) and it is plausible that the amount of rain in extreme storms could increase locally by 40%.

The climate change projections provided by UKCP09 currently reflect the best scientific understanding of how the climate system operates and might change in the future.

Using UKCP09 – 2011, climate projections were obtained for the year 2020 this date being closest to 2017, when the next PFRA will be produced by each LLFA. The climate projections used were based on a 50% probability and medium emissions scenario in the East Midlands region. Therefore for a 50% probability at a given location, it should be interpreted that there is a 50% likelihood that the climate variable will be equal to or less than the predicted climate variable value.

By 2020, for the East Midlands region and for a medium emissions scenario, the following rainfall statistics are estimated.

- Mean winter precipitation is estimated to increase by up to 5%.
- Mean summer precipitation is estimated to decrease by up to 8%.
- Precipitation on the wettest day in winter is estimated to increase by up to 10%.
- Precipitation on the wettest day in summer is estimated to increase by up to 10%.

The consequences being an increase in surface water flooding due to increased levels of precipitation. During the winter months flooding may increase as a result of higher rainfall. During the summer months with estimated increased temperatures there is a possibility of increased convective rain storms with high intensity rainfall events. Climate changes can affect local flood risk in several ways as impacts will depend on local conditions and vulnerability. Wetter winters and more rain falling in wet spells may increase river flooding with more intense rainfall causing 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 there is a need to be prepared for the unexpected. In adapting to change there is a requirement to plan ahead and understand current and future vulnerability to flooding, to develop plans for increased resilience and build capacity to adapt to achieve long-term, sustainable benefits. Local information will be invaluable in understanding climate impacts in detail, including effects from other factors, such as land use. Sustainable development and sustainable drainage (SuDs) will help in adapting to climate change and managing the risk of damaging floods in future.

5.5 New or proposed major developments which may increase local flood risk

With regards to future developments the number of proposals shown within the LDF would prove difficult to assess against the criteria due to the uncertainty of those likely to be progressed and the likely timescales. To provide a more appropriate response relevant to the timescale of this PFRA only those most likely to come forward within the next six to ten years have been included. No assessment of the likely impact of these proposals has been undertaken as the information available at this time is not sufficient to provide a reasonable projection.

<table>
<thead>
<tr>
<th>Development Title</th>
<th>Location; i.e. town, village</th>
<th>Type of development; i.e. housing, industry, etc.</th>
<th>Size; i.e. no of houses, approx area</th>
<th>Current position; Under Construction Submitted for planning Long term proposals (i.e. Waterside Chesterfield)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterside Chesterfield</td>
<td>Residential, retail &amp; employment</td>
<td>1500 dwellings, offices, retail, hotel, car parks</td>
<td>Outline planning consent granted</td>
<td></td>
</tr>
<tr>
<td>Silkstone Clay Cross</td>
<td>Residential &amp; employment</td>
<td>950 dwellings, offices, hotel and limited retail</td>
<td>Outline planning consent granted</td>
<td></td>
</tr>
<tr>
<td>The Avenue</td>
<td>Residential and employment</td>
<td>800 dwellings, offices, mixed employment</td>
<td>Master planning stage, Application imminent</td>
<td></td>
</tr>
<tr>
<td>Bolsover North Bolsover</td>
<td>Residential + ancillary community uses</td>
<td>900 dwellings, school, limited retail</td>
<td>Master planning stage</td>
<td></td>
</tr>
<tr>
<td>Staveley Chesterfield</td>
<td>Residential &amp; employment</td>
<td>2000 dwellings and 28ha employment</td>
<td>Pre-application/ Master planning stage</td>
<td></td>
</tr>
<tr>
<td>Drakelow Park Drakelow</td>
<td>Residential, retail &amp; employment</td>
<td>2000 dwellings, school, retail, employment, leisure</td>
<td>Resolution to grant planning permission</td>
<td></td>
</tr>
<tr>
<td>Stanton Pipes / Ironwork Ilkeston</td>
<td>Residential, retail &amp; employment</td>
<td></td>
<td>Outline application pending</td>
<td></td>
</tr>
<tr>
<td>Cawdor Quarry Matlock</td>
<td>Residential</td>
<td>400 Dwellings</td>
<td>Outline planning consent granted</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.9 New or proposed major developments
New, proposed or long term developments may 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) 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." However, in exceptional circumstances the Local Planning Authority may accept that flood risk can be increased, contrary to Government policy, because of the wider benefits of a new or proposed major development. Any exceptions would not be expected to increase risk to levels which represent ‘significant harmful consequences’ at national level.

6 Review of Indicative Flood Risk Areas

6.1 Review Indicative Flood Risk Areas provided by the Environment Agency

There are no indicative flood risk areas identified by DEFRA within Derbyshire.

7 Identification of Flood Risk Areas

7.1 Amendments to Indicative Flood Risk Areas (due to geography, information about past flooding or information about future flooding)

Using the methodology identified within the guidance provided, no further indicative flood risk areas haven been identified within Derbyshire.

7.2 Justification of New Flood Risk Areas (using information about past flooding or information about future flooding), or state why no Flood Risk Areas have been identified

Using the methodology identified within the guidance provided, no further indicative flood risk areas haven been identified within Derbyshire.

8 Next Steps

8.1 Proposed measures to support the review of the PFRA every six Years

As previously referred to in the introduction, the PFRA is the first step in developing a Local Flood Risk Strategy and the production of a PFRA is not a ‘one off’ event but the start of a six yearly assessment of the flood risk in Derbyshire. Data will continue to be collected relating to flood incidents, investigations and capturing the history of past flood events, and consequently
the information held will grow in detail as well as volume providing a solid basis for future resistance and resilience against the risk of future floods.

Key to this is the rationalisation of data into meaningful information; a flood is not just a spot on the map as much of the historic data is. Measures are in place to capture data through call centres, borough, district and parish councils and other sources to better assess the;

- Area flooded
- Source and type of flooding
- Types of properties affected
- Frequency and duration of flooding, providing data to help determine the probability

Further information is being sought on some of the more difficult areas such as;

- Groundwater arising from springs, underground cave, mines
- Abandoned coal pits
- Flood Action Groups

And from other sources such as;

- Network Rail
- Association of British Insurers

As information improves the thresholds for locally significant harmful consequences may be amended to reflect the reliability of the new data and this could be refined to 100m grid squares in urban areas to provide a more accurate identification of the problems. The next PFRA will also benefit from six years of local understanding and skills development in the LLFAs.

In order to support future PFRAs Derbyshire will:-

- Continue to develop and populate it’s GIS systems
- Capture data that meets with requirements of the PFRA Annexes
- Continue to assess the relevance of historic flood events through investigation
- Develop strategies to reduce local flood risk
- Promote local flood fairs and support local communities in developing inexpensive solutions to localised SW flooding
- Undertake further analysis of the Flood Maps for Surface Water to verify future indicators of flooding which conflict with local knowledge
- Undertake further analysis of the transport infrastructure within Derbyshire (County roads and National railways) to identify where critical sections of the transport infrastructure may be affected by areas identified within the Flood Maps for Surface Water.
9 Scrutiny, Review and Approval

Scrutiny and review procedures are set out by the European Commission.

All LLFAs have been advised to approach Scrutiny to ensure that an internal review of the PFRA has been undertaken. Derbyshire’s Scrutiny and Improvement Group have been concerned about the consequences of flooding for some time and have a sub group which has addressed issues regarding Highways Surface Water Flooding and the need for better gully cleansing procedures. This PFRA has been developed with advice from the Scrutiny Flooding Sub Group and has been presented to the full Scrutiny group for their comments and agreement prior to being laid before the Councils Full Cabinet for final approval.

<table>
<thead>
<tr>
<th>Cabinet Meeting</th>
<th>Date of Meeting</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scrutiny and Improvement</td>
<td>16th March 2011</td>
<td>Recommended for Approval</td>
</tr>
<tr>
<td>Derbyshire Full Cabinet</td>
<td>10th May 2011</td>
<td>Approved</td>
</tr>
</tbody>
</table>

Table 2.0 Review and Approvals timetable

10 References


Derbyshire County Council (2010), Derbyshire LSP Local Climate Impacts Profile (LCLIP)


Flood and Water Management Act (2010)

Flood Risk Regulations (2009)


11 Annexes

11.1 Annex 1 Records of past floods and their significant consequences (Preliminary Assessment Report Spreadsheet)
Please refer to Annex 1 of the Preliminary Assessment Spreadsheet attached with this report. Due to the lack of comprehensive historic flood information, no events included within Annex 1 have been considered to have ‘significant harmful consequences’ at a national level. However they are deemed as significant at a local level.

11.2 Annex 2 Records of future floods and their consequences (Preliminary Assessment Report Spreadsheet)

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

11.3 Annex 3 Records of Flood Risk Areas and their rationale (Preliminary Assessment Report Spreadsheet)

Using the methodology identified within the guidance provided no indicative flood risk areas have been identified within Derbyshire, consequently Annex 3 has not been completed.

11.4 Annex 4 Review Checklist

Please refer to Annex 4 attached to this report, which contains the Review Checklist that has been provided by the Environment Agency to act as a checklist for reviewing the PFRA submission.

11.5 GIS layer of flood risk area(s) if one/any exist

Using the methodology identified within the guidance provided no further indicative flood risk areas haven been identified within Derbyshire.

11.6 Methodology for data analysis in MapInfo

The methodology for identifying grid squares as undertaken by Derbyshire County Council where the numbers of Dwellings, Critical Services and Non Residential Properties are in excess of the thresholds for local ‘significant harmful consequences’ is detailed below.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Open MasterMap within MapInfo</td>
</tr>
<tr>
<td>2</td>
<td>Open a new browser window and select Topo Area</td>
</tr>
<tr>
<td>3</td>
<td>Select the appropriate building type within the Legend column and run an SQL query to extract (Legend 0321 Building). Save the query as a new subset of data.</td>
</tr>
<tr>
<td>4</td>
<td>Open Flood Map for Surface Water 1 in 200 300mm deep layer provided by the Environment Agency.</td>
</tr>
<tr>
<td>5</td>
<td>Using the new (0321 Building layer) and the Flood Map for Surface Water select the buildings that Intersect with the flood zone outline using an INTERSECT query. This allows buildings (polygons) to be selected if entirely</td>
</tr>
</tbody>
</table>
6 Open the National Receptor Database (NRD)

7 Using an SQL query join the information contained within the NRD to the new layer (0321 Buildings) which now only contains buildings which may be at future flood risk. Once joined save this sub set of data.

8 Now run numerous queries to categories the NRD building types into:-
   - Dwellings
   - Critical Services
   - Non Residential Properties**

   **some of the NRD data did not provide an OS Class therefore it was not known specifically what the building may be. However these have been included for consistency with the national mapping data set used to identify ‘indicative flood areas’, which also included these buildings. The use of this information may result in an over-estimate of properties ‘at risk’ within this category.

9 On completion of the queries save three individual mapping layers as per the above categories; Dwellings, Critical Services and Non Residential Properties

10 To undertake a county wide analysis, open an OS 1km grid square layer and identify specific squares which may be affected by future Surface Water Flooding using an SQL query and the local thresholds for Significant Harmful Consequence determined in Section 4.2. Finally open the three ‘approved category’ layers and using a table update process count the number of each type of building or critical service falls within a 1km grid square.

11 An individual property count is now available for each of the categories; Dwellings, Critical Services and Non Residential Properties
Annex 1
Records of past floods and their significant consequences (Preliminary Assessment Report Spreadsheet)
Annex 2
Records of future floods and their consequences (Preliminary Assessment Report Spreadsheet)
Annex 3
Records of Flood Risk Areas and their rationale (Preliminary Assessment Report Spreadsheet)
Annex 4
Review Checklist