## 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.

| Source of Data | Dates of data | Depths of flooding | Property Affected | Areas Affected | Risk Rating for event | Frequency/dates of event | Data Confidence |
|---|---|---|---|---|---|---|---|
| **District/ Borough** | SFRA 2009 | Yes in parts | Yes | Yes | No | Yes in parts | High in parts |
| **DCC Emergency Planning** | 2000 - 11 | No | Yes | Yes | No | Yes in parts | Medium |
| **Elected Members** | 2011 | Yes in parts | Yes | Yes | No | Yes in parts | Medium |
| **Parish Councils** | 2011 | Yes in parts | Yes | Yes | No | Yes in parts | High in parts |
| **CONFIRM** | 2000 - 11 | No | Yes | Yes | No | Yes | Medium |
| **Emergency Services** | SFRA 2009 | No | No | No | No | No | Low |
| **Highway Agency** | 2011 | No | No | Yes | No | Yes | Low |
| **LCLIP** | 2008 - 09 | No | Yes | Yes | No | No | Low |
| **News reports** | 2000 - 11 | No | Yes | Yes | No | Yes | Low |
| **DCC District Managers** | 2010 | Yes | No | Yes | No | Yes | High |

**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 | Description |
|---|---|
| Inconsistent Recording Systems | Information has been abstracted from paper, spreadsheet, database, GIS, drainage studies and as such there are inconsistencies in the data held and its accessibility – aiming to rationalise this over the forthcoming 12 month period. |
| Incomplete Datasets | Data has been recorded with different purposes in mind the data is often inconsistent – aiming to rationalise this over the forthcoming 12 month period. |
| Quality of Data | Accuracy of location, source extent and severity of flooding varies considerable with some at a high level of confidence and some anecdotal. |
| Completeness of Records | There are many gaps in the data which makes it unreliable for delivering a complete picture of past flooding it's source extent and severity, however missing fields can be identified and by calculating the proportion of a field available for use then a confidence % can be applied. |

**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;

| Software / Format | Application |
|---|---|
| Microsoft Word | Documents |
| Microsoft Excel | Spreadsheet analysis<br>Data input to GIS<br>GIS data analysis and reporting |
| Adobe PDF | Drawing representing GIS mapping |
| CONFIRM | Associated Highways Assets are managed by CONFIRM Assets |
| MapInfo Professional | Mapping analysis<br>SQL data queries<br>Spatial data queries<br>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 CofE 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.

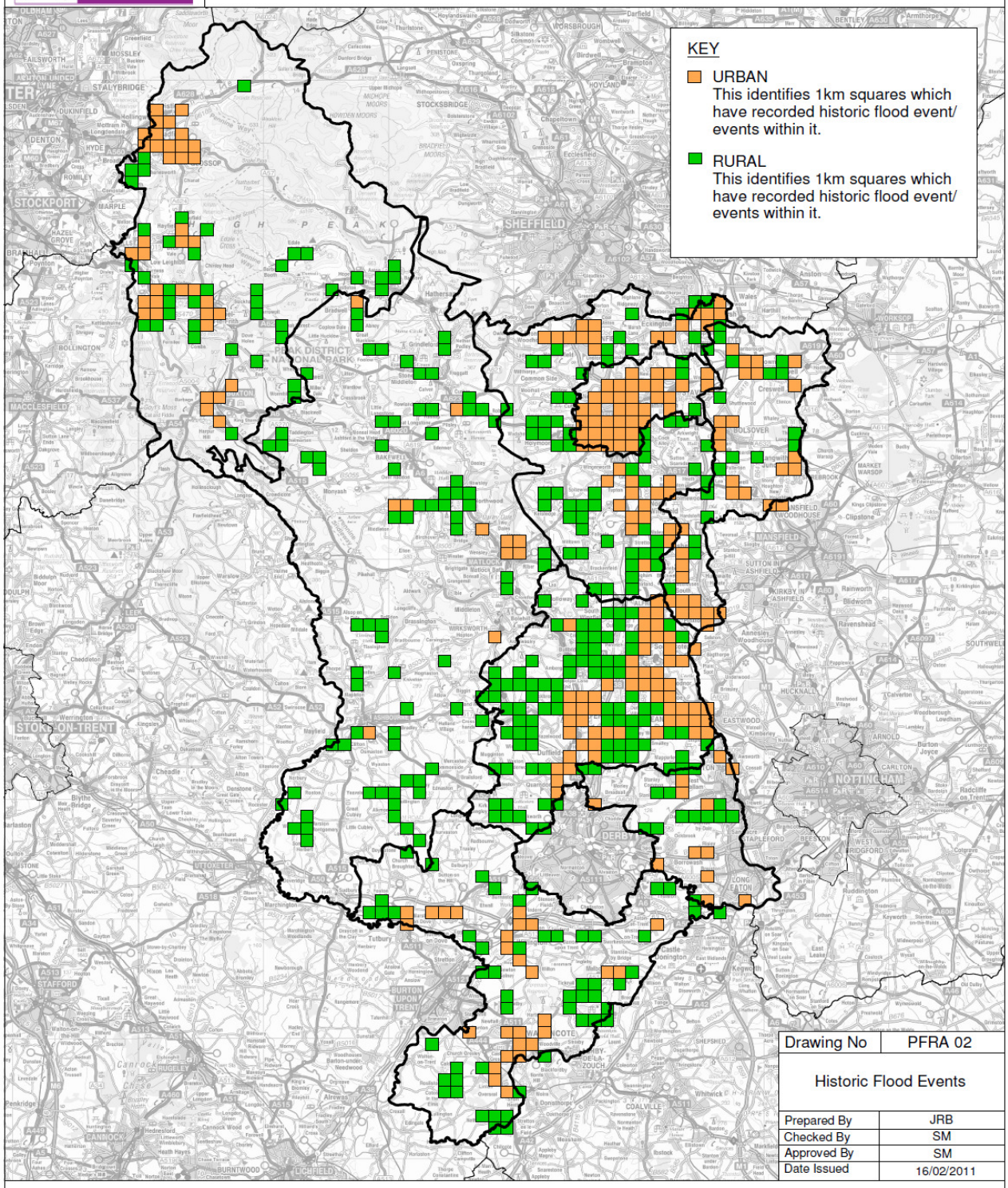
Seven out of the fourteen flood events listed as surface water flooding have been classified as regional flood events affecting locations throughout the county including the floods of 2000 and 2007. Of the remaining seven events, six were attributed to individual parishes and one to the districts of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

Please refer to "Drawing No PFRA 02 - Historic Flood Events" on the following page.

DERBYSHIRE County Council
Improving life for local people

## Historic Flood Events

Drawing No : - PFRA 02




| Drawing No | PFRA 02 |
|---|---|
| Historic Flood Events | |
| Prepared By | JRB |
| Checked By | SM |
| Approved By | SM |
| Date Issued | 16/02/2011 |



**Scale: 1:400,000 at A4**

N

## 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:

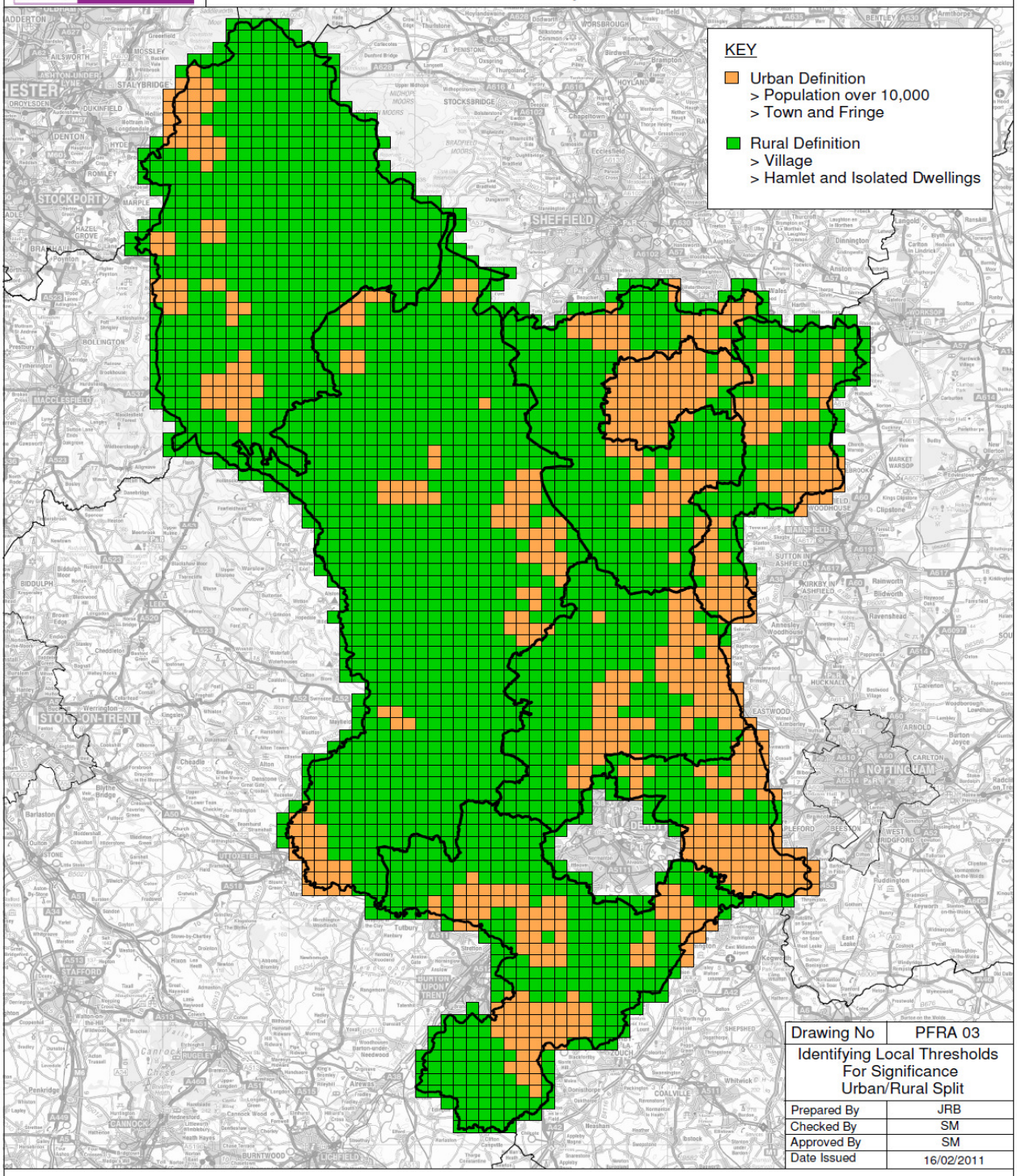
- Urban (population over 10,000) – (Urban)
- Town and Fringe – (Rural) - DCC evaluation (Semi Urban)
- Village – (Rural)
- Hamlet and Isolated Dwellings – (Rural)

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

DERBYSHIRE County Council
Improving life for local people

## Identifying Local Thresholds For Significance
## Urban/Rural Split

Drawing No : - PFRA 03






**Scale: 1:400,000 at A4**

N

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

<u>Local definition of Significant Harmful Consequences – Urban</u>

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;

<u>Local definition of Significant Harmful Consequences – Rural</u>

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

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

**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 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.