Northumberland Preliminary Flood Risk Assessment

Final report

Northumberland

Northumberland County Council

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REVISION SCHEDULE

Northumberland Preliminary Flood Risk Assessment

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DATE	**June 2011**		

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EXECUTIVE SUMMARY

Northumberland is the sixth largest county in England with an administrative area measuring approximately 5010km^2. Northumberland is a predominantly rural county with a concentrated urban area in the south-east of the county. It is located in the North-East of England, and shares its border with Scotland to the North, Cumbria to the west, and County Durham, Newcastle and North Tyneside to the south. To the east, Northumberland's boundary is defined by the North Sea which provides an impressive 132km of coastline with numerous heritage and environmental designations along its length. A large part of Northumberland National Park can be found to the west of the county and this covers approximately 25% of the county's area.

Northumberland County Council has a duty, as Lead Local Flood Authority, to manage and coordinate local flood risk management in its administrative area in conjunction with other partner organisations, including the Environment Agency and Northumbrian Water Ltd, as set out in the Flood Risk Regulations (2009) and the Flood and Water Management Act (2010).

This Preliminary Flood Risk Assessment (PFRA) has been prepared by Northumberland County Council in order to fulfil the first stage reporting requirements of the Flood Risk Regulations. The format of the report follows guidance provided by the Department for the Environment, Food and Rural Affairs (Defra).

The purpose of the PFRA is to identify areas at risk from local flooding sources, defined as Flood Risk Areas, within Northumberland. It provides a high level overview of flood risk from local sources, including surface water, groundwater and ordinary watercourses and considers the likelihood and consequences of past and future flooding. As part of this process and to gain a thorough understanding of existing local flood risk, all available records and data have been collated and analysed. This included a review of documents such as the Phase 1 - Northumberland Strategic Flood Risk Assessment and the Northumberland Flood Action Plan, as well as data provided by the community including County Councillors, Town and Parish Councils, local flood and community groups and the general public.

In line with the guidance and methodology provided by Defra, it has been identified that there are no Indicative Flood Risk Areas in Northumberland and consequently there is no further requirement to progress the subsequent provisions of the Flood

Risk Regulations, which are to produce Flood Risk Maps and subsequent Flood Risk Management Plans.

The Flood Risk Regulations require that the PFRA is reviewed every six years and so a review will be carried out in 2017, using any additional evidence collated over that period.

Although the PFRA has not identified any Indicative Flood Risk Areas in the Northumberland, it is recognised that flooding does occur across the County, causing disruption and distress to affected communities. To address this issue, the next stage for Northumberland County Council is to develop a Local Flood Risk Strategy. The strategy will set out objectives for managing local flood risk, and also give consideration as to how these objectives can contribute to the Council's wider environmental and sustainable development aspirations. The strategy will include measures required to meet any identified objectives, giving details of how and when they are to be implemented.

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GLOSSARY OF TERMS

Assets	Structures, or a system of structures used to manage flood risk
AStGWF	Areas Susceptible to Groundwater Flooding
AStSWF	Areas Susceptible to Surface Water Flooding (national map)
BGS	British Geological society
Catchment	An area that serves a river with rainwater. Every part of land where the rainfall drains to a single watercourse is in the same catchment
CFMP	Catchment Flood Management Plan
Defra	Department for the Environment, Food and Rural Affairs
DG5	OFWAT Directive Guidelines No.5 for annual level of service indicators for properties at risk from sewer flooding
EA	Environment Agency
FCERM	Flood and Coastal Erosion Risk Management
Flood	The temporary covering by water of land not normally covered with water
FMfSW	Flood Map for Surface Water (national map)
FRA	Flood Risk Area. An area determined as having significant risk of flooding in accordance with guidance published by Defra and WAG
FWMA	Flood and Water Management Act
GIS	Geographic Information Systems
Groundwater	Water which is below the surface of the ground and in direct contact with the ground or subsoil
IDB	Internal Drainage Board
IFRA	Indicative Flood Risk Areas. Areas determined by the Environment Agency as indicatively having a significant flood risk, based on guidance published by Defra and WAG and the use of certain national datasets
LLFA	Lead Local Flood Authority (the Authority)
Local flood risk	Flood risk from sources other than main rivers, the sea and reservoirs, principally meaning surface runoff, groundwater and ordinary watercourses

Main River	A watercourse shown as such on the Main River Map, and for which the EA has responsibilities and powers. All watercourses that are not designated Main River, and which are the responsibility of Local Authorities, or where they exist, IDBs
NCC	Northumberland County Council (the Council)
NRD	National Receptors Database
NWL	Northumbrian Water Ltd
PFRA	Preliminary Flood Risk Assessment
PPS25	Planning Policy Statement 25
RFCC	Regional Flood and Coastal Committee
RFDC	Regional Flood Defence Committee
Risk	Measures the significance of a potential event in terms of likelihood and impact
Risk Assessment	A structured and auditable process of identifying potentially significant events, assessing their likelihood and impacts, and then combining these to provide an overall assessment of risk, as a basis for further decisions and action
River Basin District	There are 11 river basin districts in England and Wales, each comprising a number of contiguous river basins or catchments. The EA is responsible for collating LLFA reports at a river basin district level
SAB	SuDS Approving Body
SuDS	Sustainable Drainage Systems
Surface runoff	Rainwater (including snow and other precipitation) which is often on the surface of the ground (whether or not it is moving), and has not entered a watercourse, drainage system or public sewer
TAN15	Technical Advice Note 15
SWMP	Surface Water Management Plan
UKCP09	United Kingdom Climate Change
WAG	Welsh Assembly Government

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1. INTRODUCTION

1.1. Background

A Preliminary Flood Risk Assessment (PFRA) is the collation and evaluation of information on past (historic) and future (potential) floods for the purpose of identifying Flood Risk Areas. This Preliminary Assessment Report provides a high level summary of significant flood risk, and presents the evidence for identifying Flood Risk Areas.

The preliminary assessment report and the resultant identification of Flood Risk Areas account for the first two stages of activity within a six year flood risk management cycle as required by the Flood Risk Regulations 2009 (the Regulations). Figure 1 describes this 6 year cycle of activity. The indicative Flood Risk Areas are areas in which the degree of flood risk in a national perspective is significant and requires further investigation through maps and management in plans, as required by the Regulations with the results reported to the European Commission.

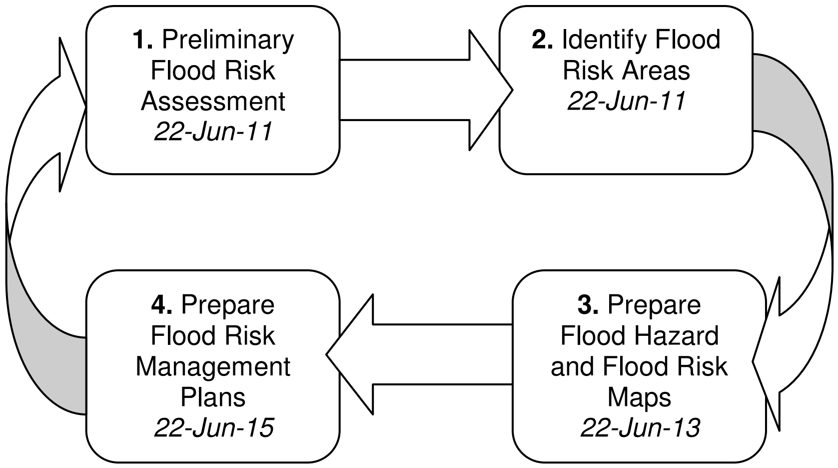

Figure 1 – PFRA Review Cycle, Requirements and Deadlines of the Flood Risk Regulations

The evidence gathered as part of the PFRA process will also support the local strategy for Flood and Coastal Erosion Risk Management which Northumberland County Council, as Lead Local Flood Authority (the Authority), is required to develop and implement under the Flood and Water Management Act (the Act) which gained Royal Assent in April 2010.

1.2. Local Flood Risk

In line with the responsibilities of Northumberland County Council (the Council) as LLFA this report considers past and historic flooding from the following local flood sources, as set out in the Act. These sources are:

- Ordinary watercourses
- Surface water
- Groundwater
- and Canals

The Act describes that flooding from the sea, main rivers or reservoirs is the responsibility of the Environment Agency (E.A.), therefore flooding from these sources is not required to be considered by this report unless interactions occur which may affect flooding from the local flood sources identified above. It should also be noted that there are no canals within the administrative boundary of Northumberland, and they are therefore not considered within this PFRA.

The PFRA is required to consider significant local flood risk. For the purpose of this first PFRA 'locally significant flood risk' is described in this report in line with the national definition of 'significant flood risk', as described by Defra and WAG (2010). The national definition for flood risk areas have been identified using 1km ordinance grid squares where local flood risk exceeds at least one of the following indicators from local sources:

- Greater than 200 people (based on the number of properties multiplied by 2.34)
- Greater than 1 critical service (including schools, hospitals, nursing homes, power and water services)
- Greater than 20 non-residential properties

The Council are working towards developing a local policy and this will be set out in Northumberland's Local Strategy for Flood Risk Management.

1.3. Aims and Objectives

The main aims and purpose of the Northumberland PFRA are to:

- Identify partners with a role and interest in flood risk management and describe the methods for continued engagement
- Establish an organisational framework and data management systems for the collation, storage and maintenance of flood risk data
- Determine significant flood risk and identify Flood Risk Areas within Northumberland by;
  - Describing significant historic flood events from local sources including the impacts of such events
  - Describing the likely impacts of potential flood risk from local sources of flooding

1.4. Study Area

Northumberland is the sixth largest county in England with an administrative area measuring approximately 5010km^2. Northumberland is a predominantly rural county with a concentrated urban area in the south-east of the county. Northumberland is located in the North-East of England, and it shares its border with Scotland to the North, Cumbria to the west, and County Durham, Newcastle and North Tyneside to the south. To the east, Northumberland's boundary is defined by the North Sea which provides an impressive 132km of coastline with numerous heritage and environmental designations along its length. A large part of Northumberland National Park can be found to the west of the county and this covers approximately 25% of the county's area.

The study area encompasses several river catchments, in part or full, as identified in the location plan overleaf, Figure 2. These are the Till and Breamish and NE Northumberland catchments to the north of the county, the Tyne and Eden catchments to the south, and the Blyth and Wansbeck catchments to the south-east.

Northumberland is served by the North-East Region of the Environment Agency and by Northumbrian Water Ltd as potable water distributor and sewerage undertaker.

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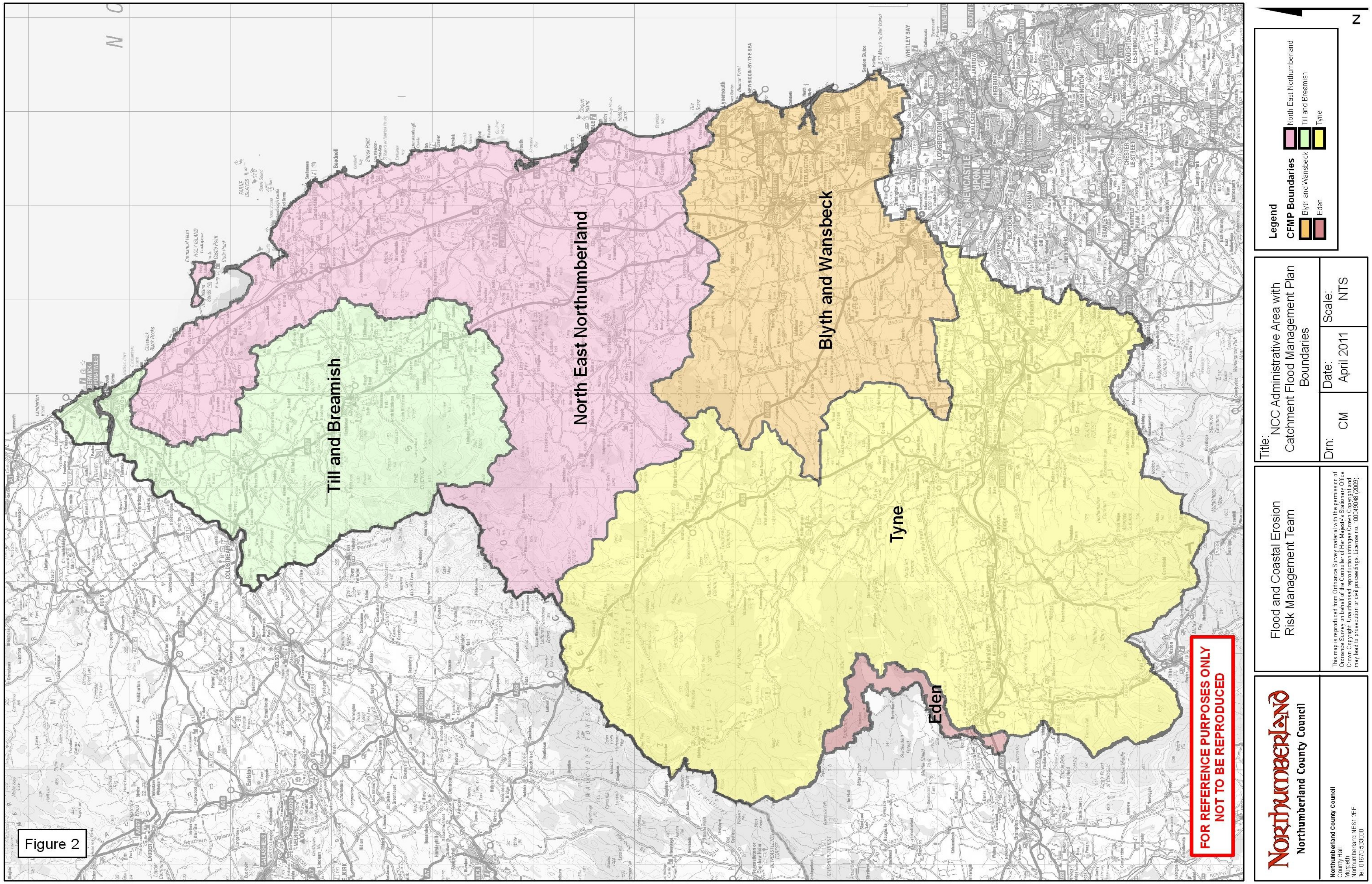
Till and Breamish
North East Northumberland
Blyth and Wansbeck
Tyne
Eden
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NOT TO BE REPRODUCED
Legend
CFMP Boundaries
Blyth and Wansbeck
Eden
North East Northumberland
Till and Breamish
Tyne
N
Title:
NCC Administrative Area with Catchment Flood Management Plan Boundaries
Drn: CM
Date: April 2011
Scale: NTS
Flood and Coastal Erosion Risk Management Team
Northumberland
Northumberland County Council
Northumberland County Council
County Hall
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Figure 2

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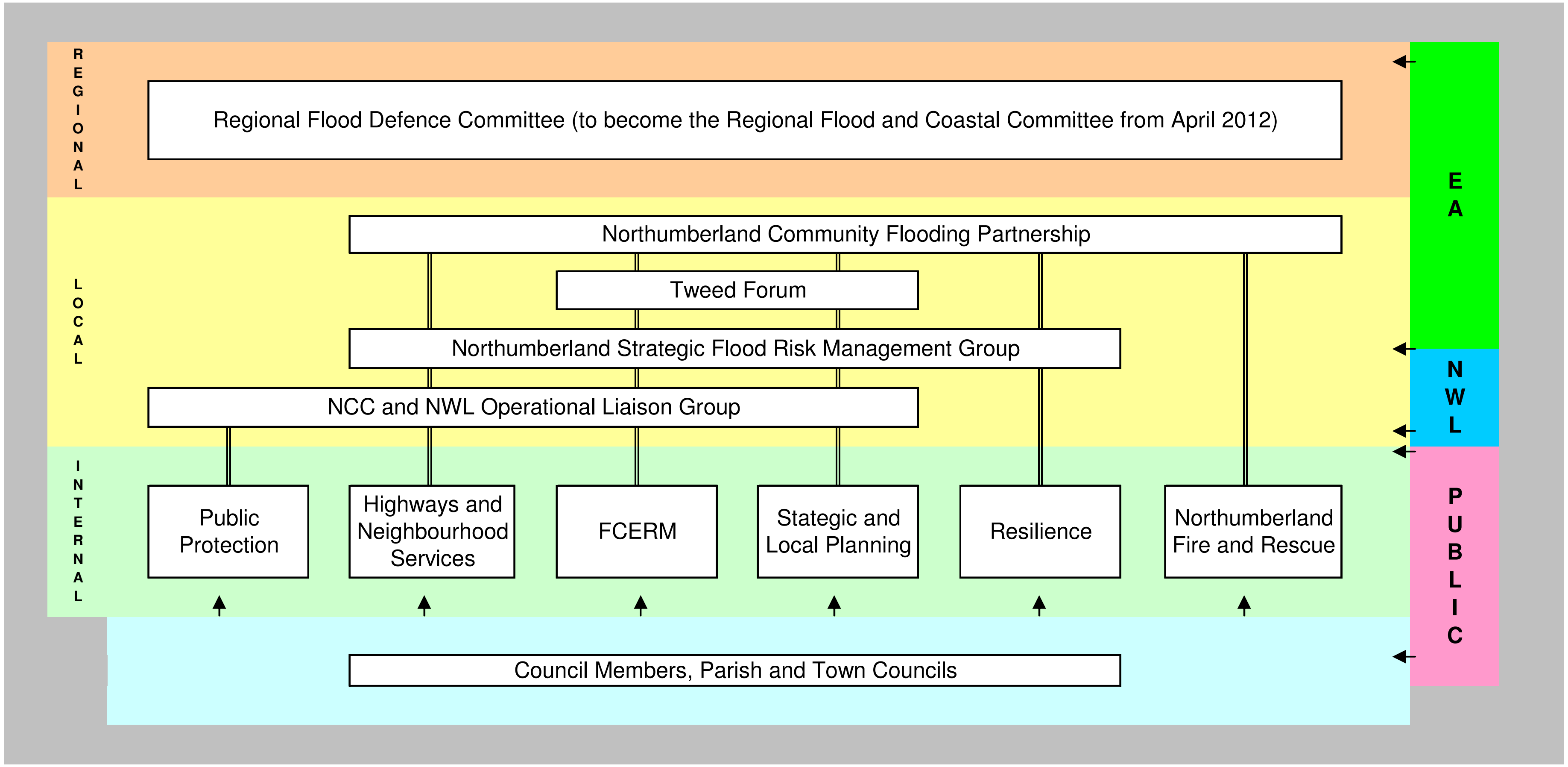
2. LEAD LOCAL FLOOD AUTHORITY RESPONSIBILITIES

2.1. Introduction

The responsibility of Northumberland County Council to develop a PFRA, as described in section 1.1 of this report, is one of a number of relatively new duties born from the Act and the Regulations. This chapter identifies the role and responsibilities of Northumberland County Council as defined within the Act. The Council is taking these duties seriously and are currently consulting on additions to the organisational structure to enable efficient delivery of the roles.

2.2. Governance and Partnership Arrangements

As LLFA the Act gives Northumberland County Council responsibility for strategic coordination of local flood risk management within Northumberland. In anticipation of the Act a strategic flood risk management group was set up in 2009 including the Environment Agency and Northumbrian Water. This partnership supports The Regulations (Regulation 35) and the Act (Section 13) which require cooperation between authorities with flood risk management functions and empower the Authority to call for information in relation to duties imposed by the Act. Figure 3 below sets out the matrix for managing flood and coastal erosion risk management within Northumberland.



NB Local Groups are non-hierarchical

Figure 3 - Northumberland Flood and Coastal Erosion Risk Management Matrix

2.3. Cross Border Areas

The Regulations require coordinated flood risk management plans for rivers that cross international boundaries. Although the border between England and Scotland is not strictly an international boundary, similar provisions have been applied in the Flood Risk (Cross Border Areas) Regulations 2010 to the catchments that lie within the Solway Tweed and Northumbrian River Basin District. A cross border advisory group, which includes the Council as a member, has been established to ensure a coordinated flood risk management approach in these areas.

2.4. Communication with Partners and the Public

Reflecting the Government's strategy for flood risk management 'Making Space for Water' (Defra, 2005), Northumberland County Council strives to work with organisations and stakeholders at all levels, including the public, to address local flood risk priorities and optimise flood risk management. The Authority encourages open and participatory decision making processes to reach agreement and realise sustainable outcomes. Table 1 identifies those stakeholders and their interests.

Table 1 - Key Flood Risk Management Stakeholders

Stakeholder	Interests
Northumberland County Council	FCERM, Emergency Planning and Public Protection, Strategic Planning, Local Planning, Highways and Local Services, Elected Members.
Environment Agency	Strategic overview of national flood risk management and responsible for managing the risk of flooding from the sea and main rivers.
Northumbrian Water	Potable water provider and sewerage undertaker for Northumberland.
Natural England	Earth sciences heritage, nature conservation and landscape.
Northumberland Fire & Rescue Service	Emergency response and water safety.
The Public including local flood groups, Town and Parish Councils of Northumberland	Local knowledge of flooding incidents including source of flood, duration, depths.

In addition to those stakeholders described in Table 1, further stakeholder identification is carried out when considering specific projects or locations, such as landowners, developers and other local authorities.

2.5. Local Strategy for Flood Risk Management

In addition to the partnership arrangements and strategic lead in local flood risk management, the Act (2010) imposes a duty for the Authority to develop, maintain, apply and monitor a Local Flood Risk Management Strategy for its administrative area. The strategy will set out objectives for managing local flood risk, and also give consideration as to how these objectives can contribute to the Council's wider environmental and sustainable development aspirations. The strategy will include the measures required to meet any identified objectives, giving details of how and when they are to be implemented.

The Local Flood Risk Management Strategy for Northumberland will involve an extensive consultation process with other relevant flood risk management authorities in the region and also with the wider public. The consultation process will help inform the priorities for the strategy, and will also define locally significant flood risk.

2.6. Investigate Flooding Incidents

The Authority has a duty to investigate and report flooding incidents of local significance to the Secretary of State. Within these reports the Authority will identify which organisations have relevant flood risk management functions. This will include any steps which should be undertaken to manage, or further understand the risk of a similar event in the future.

The Authority has power to do works where the source of flooding is identified to be from an ordinary watercourse, surface water or groundwater. Any work proposed and carried out has to be in a manner consistent with the national and local strategies and in doing so the Authority has a duty to contribute towards the achievement of sustainable development. The Authority will utilise these powers where it is technically and economically viable to do so and in line with the Authority's other functions.

2.7. Maintain an Asset Register

The Authority has a duty to maintain a register of structures or features which are deemed to have a significant effect on local flood risk. The flood defence asset register will contain as a minimum the details of ownership and condition of an asset, as required by the Act. In relation to this asset register, as well as other flood and coastal erosion risk management functions, the Act gives the authority powers to request information from any person. These powers extend to the designation of structures and features that affect flooding or coastal erosion in order to safeguard the future management of assets that are relied upon for flood or coastal erosion risk management.

2.8. SuDS Approving Body

With effect from April 2012 The Act designates a LLFA as SuDS Approving Body (SAB) and requires the SAB to approve proposed storm water systems for all construction with drainage implications. The SAB will be required to take responsibility for the approval, adoption and maintenance of new SuDS.

2.9. Consenting Works on Ordinary Watercourses

With effect from April 2012 The Authority will have a duty to issue consents to third parties for works or activities on ordinary watercourses that may impact on flood risk.

3. METHODOLOGY AND DATA REVIEW

The methodology for completing the Northumberland PFRA is consistent with that described in the PFRA Final Guidance (Environment Agency, 2010). For the assessment, five main phases of action were identified. These are:

- Collation and review of available data
- Analysis of historic flooding events and identification of significant harmful consequences
- High level analysis of the relevant information on future floods and their consequences
- Review of indicative Flood Risk Areas produced by the EA.
- Identification and justification of Flood Risk Areas

3.1. Collation of Data

Data on historic and potential flood risk was collected from a range of external organisations as well as internally from within the Council. Requests for information were achieved through a variety of methods including mail shots and electronic surveys. Table 2 identifies those parties and how data held by them was obtained, while Table 3 summarises the information that was collected for the PFRA. Information was gathered from readily available sources and included locally specific data in addition to that which is part of large national datasets.

Table 2 - Summary of the Methods for Data Collection

Organisation	Method	Date
Northumberland County Council	Email call for information to the Fire Service, Neighbourhood Services, Planning, Emergency Planning, Strategic Transportation and County Councillors.	Nov 2010
Environment Agency	Geo data store online	Mar 2011
Northumbria Police	Email letter	Feb 2011
Parish and Town Councils	Email letter	Nov 2010
Rural Development Initiatives	Email letter	Nov 2010
Public	Online survey advertised by the County Council website	Feb 2011

Table 3 - Information Gathered from Partners

Source	Dataset	Summary
Northumberland County Council	Level 1 Strategic Flood Risk Assessment	This document provides details of historic information of flooding in the context of local flood risk.
	Flood Action Plan	Primarily focusing on emergency response to flooding, this document provides information on historic flooding.
	Historical Flooding Records	Details of the impacts of historic flooding events.
	Anecdotal Area Information	Local knowledge held by members of county council staff and County Council Councillors
Environment Agency	Indicative Flood Risk Areas	Nationally identified Flood Risk Areas, as defined by Defra and WAG (2010)
	Flood Map	Provides information from flooding from rivers and the sea for England and Wales
	Areas Susceptible to Surface Water Flooding (AStSWF)	The initial national map showing areas that are susceptible to surface water flooding, with three bandings, indicating 'Less' to 'More' susceptible to surface water flooding.
	Flood Map for Surface Water (FMfSW)	Most recent national map showing areas at risk from surface water flooding with consideration to two rainfall events (1 in 30 and 1 in 200 probabilities) and for two depths (>0.1m and >0.3m depths)
	Areas Susceptible to Groundwater Flooding (AStGWF)	National map showing areas susceptible to groundwater flooding
	National Receptors Dataset	A national dataset of social, economic, environmental and cultural receptors.
	Northumberland Catchment Flood Management Plans	These documents consider all types of inland flooding from rivers, groundwater, surface water and tidal flooding, but not directly from the sea.
Northumberland Fire & Rescue	Historic Flooding Records	Records of flooding incidents attended by the Fire Service
Northumbrian Water	DG5 Register	National grid references which identify $100m^2$ grids within which one or more properties are registered on the DG5 Register – properties registered as having suffered from sewer flooding.
	Sewer Capacity Issues	Sewer pipe lengths where there are known capacity issues
Public and Flood Action Groups	Anecdotal Area Information	Local knowledge detailing the extent of flooding, sources and pathways including dated photographs and eye witness accounts

3.2. Historic Flooding

Data and information from the sources acknowledged in Table 2 was collated and reviewed to identify significant past flood events consistent with the definition of local significance described in section 1.2 of this report. The consequences of the significant events identified were considered including human health, social, economic and environmental consequences. Where possible this information was geo-referenced.

3.3. Potential Flooding

The following factors were considered when assessing future flood risk across Northumberland's study area:

3.3.1. Ordinary watercourses

The Detailed River Network has been used to identify all ordinary watercourses within Northumberland and cross referenced with the E.A.'s Flood Map to evaluate the risk of flooding from ordinary watercourses.

3.3.2. Surface water

The risk of future flooding has been assessed using the E.A. supplied Flood Map for Surface Water (FMfSW) and is consistent with the significance definition detailed in this report. FMfSW has been used in this instance as it is felt it considers the most up to date information and provides the best estimate of the worst case scenario for surface water flood risk in Northumberland, compared to Areas Susceptible to Surface Water Flooding (AStSWF) map. FMfSW is also the base for the method for identifying Flood Risk Areas, described in greater detail in the subsequent section 3.4. FMfSW uses a numerical hydraulic model to predict the extent of flood risk from two rainfall events (1 in 30 and 1 in 200 annual chance of flooding) at two depths (0.1m and 0.3m).

3.3.3. Groundwater

Areas Susceptible to Groundwater Flooding (AStGWF) map, supplied by the E.A., has been assessed to provide an indication of flood risk from groundwater. The map does not describe groundwater flooding in terms of probability occurrence but instead highlights areas where geological conditions might enable groundwater to surface. The areas susceptible to the emergence of groundwater are grouped into one of four categories determined by the percentage of 1km grid squares where groundwater may surface.

3.4. Flood Risk Areas

Following consultation with key stakeholders in 2010, Defra and the Welsh Assembly Government (WAG) designed the method for identifying Indicative Flood Risk Areas to ensure a nationally consistent and proportionate approach. The assessment was based on the most recent surface water information (FMfSW) and indicative areas were identified by drawing on national flood risk information to identify 1km grid squares where local flood risk is an issue. Where five grid squares of local risk were connected within blocks of nine grid squares ($9km^2$) these were identified as clusters and where risk is most concentrated. Grid squares are classed as connected where boundaries align or corner points join as shown in Figure 3 which demonstrates how grid squares connect to qualify as a cluster.

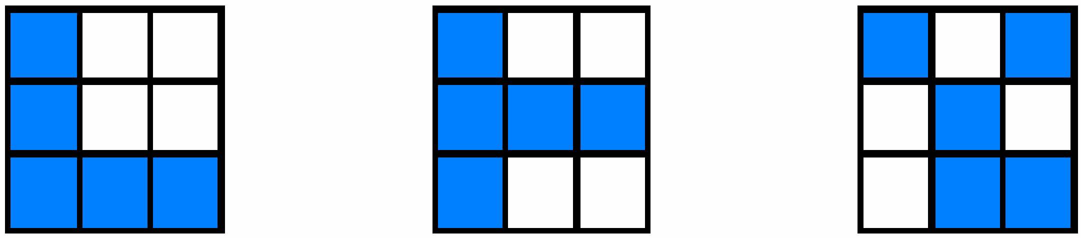


Figure 4 - Examples of Qualifying Clusters of Blue Squares

Instances where the boundaries of these blocks were shared, larger clusters were identified. In England, clusters where the number of people at risk is greater than 30,000 have been identified as Indicative Flood Risk Areas (Defra and WAG, 2010).

The method for calculating Indicative Flood Risk Areas simply gave consideration to surface water flooding and was based on a subset of significance criteria that can be measured at a national level, these being:

- Number of people (based on property numbers x 2.34)
- Number of critical services
- Number of non-residential properties

The risk to these criteria was assessed based on nationally held information and where flooding would occur to a depth of 0.3m as the result of a rainfall event with a

1 in 200 chance of occurring. This assessment was based on the following information:

- Flood Map for Surface Water (FMfSW)
- National Receptors Database (NRD)

3.5. Data Availability and Limitations

In carrying out this PFRA a number of issues were identified during the data collection phase of the assessment. It is expected that by identifying these issues measures can be put in place to support future data collection exercises and improve the format and reliability of data gathered. Limitations of data were predominately found in the information available and gathered for historic flood events.

A common theme throughout the availability of historic information was that much of the data was inconsistent and incomplete. Until the formation of the Council as a unitary authority and procedures put in place to record flooding information in anticipation of expectant responsibilities to come from the Act, flood records were adhoc, incomplete and in some instances non-existent. The type and quality of information collected from across the county is varied, and this inconsistency may be explained by the previous local government arrangements which consisted of seven independent authorities, one county council and six district councils, who each had their own data management systems and generally kept poor flooding records as there was no real need historically. It is expected that there will be gaps in Flood Risk Areas identified from historic flooding events.

3.6. Quality Assurance, Security, Data Licensing and Restrictions

Quality assurance measures were put in place during the collection of data to assess the quality and accuracy of information gathered. All data was registered on receipt and its accuracy and relevance reviewed to assess confidence levels for contribution to the PFRA.

The PFRA final guidance (E.A., 2010) does not suggest a method for assessing confidence levels, therefore the data used for this PFRA was scored in accordance with the Data Quality System provided in the SWMP Technical Guidance (Defra, 2010), as described in Table 4 below.

Table 4 - Data Quality Guidance from SWMP Technical Guidance (Defra, 2010)

Data Quality Score	Description	Explanation	Example
1	Best Available	No better available and not possible to improve in the future	High resolution LIDAR, river flow data, rain gauge data
2	Data with known deficiencies	Best replaced as soon as new data is available	Typical sewer or river model that is a few years old
3	Gross assumptions	Not invented but based on experience and judgement	Location, extent and depth of flooding
4	Heroic assumptions	An educated guess	Ground roughness for 2D models

Consideration for the security of data collected was also given during the assessment. All data has been saved on the Council's password protected local servers.

Table 5 summarises the licence agreements between the Council and partner authorities for the use of data in the PFRA.

Table 5 - Summary of Data Sharing Agreements

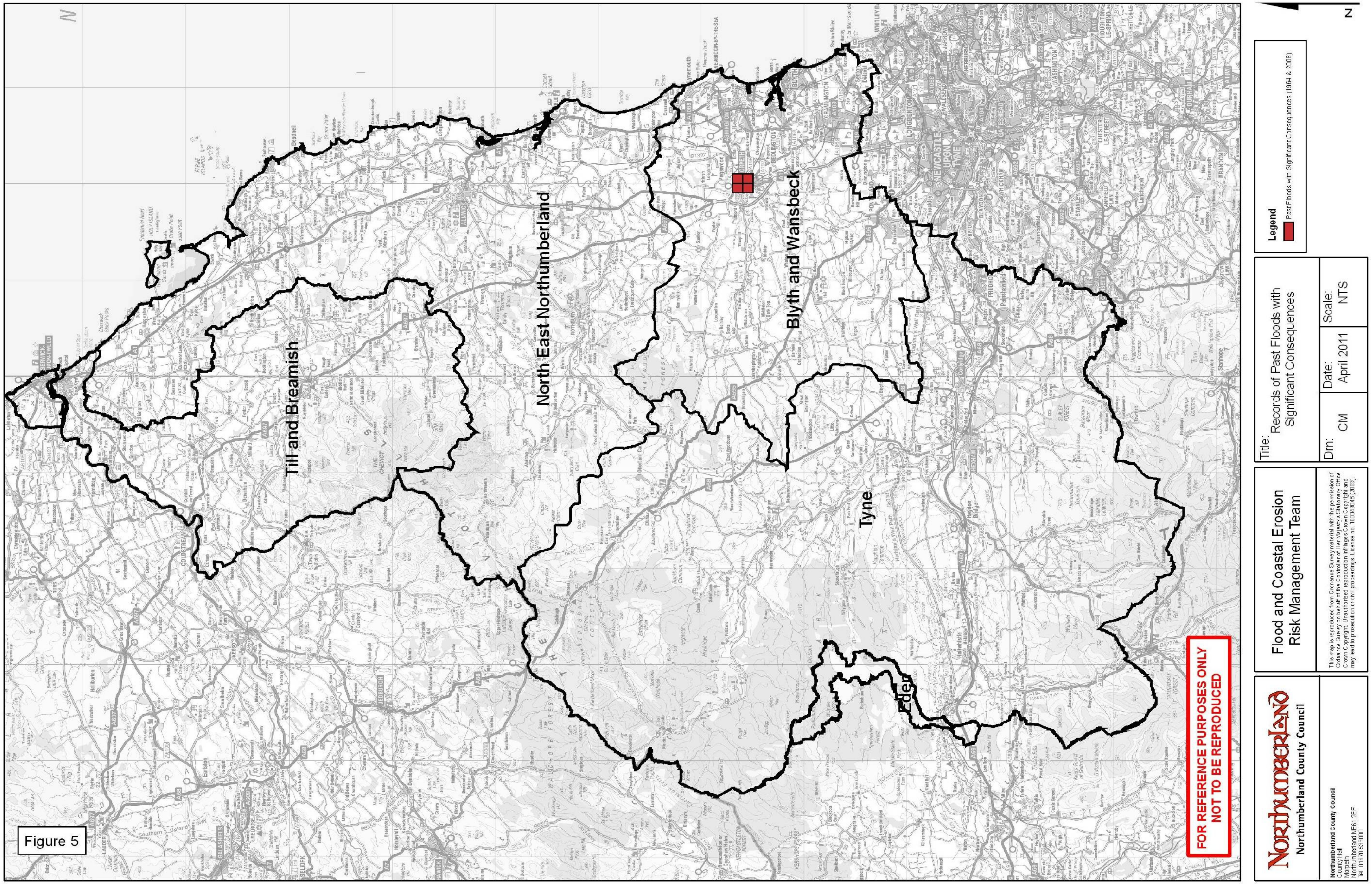
Data Source	Agreement
Environment Agency	Environment Agency Standard data licence and Environment Agency surface water susceptibility maps licence
Northumberland County Council	GIS licences for mapping and data supplied by OS to the Council and British Geological Society (BGS) licence for geological data supplied by GIS
Northumbrian Water	Draft Regional Data Sharing Protocol. Signoff expected by end 2011.

4. PAST FLOOD RISK

This section provides details of historic flood events from local sources where significant harmful consequences have been experienced, as described in Section 1.2 of this report.

Annex 1 provides details of past floods of significant consequences. From the evidence available Morpeth is the only location identified to have experienced significant floods. Two events have been identified, 1964 and 2008. On both occasions the main source of flooding was from main river, the River Wansbeck, although its interaction with surface water exacerbated the problem on both occasions, resulting in significant harmful consequences being experienced.

While this report only acknowledges two significant flood events it is likely that many more events will be identified in subsequent PFRA review cycles following publication of Northumberland's flood risk management strategy. This is because the strategy will define significant flooding in the context of Northumberland as a result of an extensive engagement exercise and local agreement.


Till and Breamish
North East Northumberland
Blyth and Wansbeck
Tyne
Eden
Figure 5
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Legend
Past Floods with Significant Consequences (1964 & 2008)
Title:
Records of Past Floods with Significant Consequences
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Date: April 2011
Scale: NTS
Flood and Coastal Erosion Risk Management Team
Northumberland County Council
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5. FUTURE FLOOD RISK

This report gives consideration to where flooding might occur in the future to ensure flood risk is assessed objectively and not only against where historical records of flooding exist. The EA. (2010) define a future flood as any flood that has the potential to occur in the future and this assessment is predominately based on modelled data.

The potential floods identified and their possible consequences are summarised below and in the subsequent maps. Annex 2 also provides further details of future flooding that provides significant risk.

5.1. Local Sources of Flooding

5.1.1. Ordinary watercourses

At present, there is no data to suggest there is a significant risk of flooding from ordinary watercourses in Northumberland. This is not to say that risks are not present but rather that there is not sufficient data or modelling to identify areas of significant risk.

5.1.2. Surface water

The significant risk from surface water can be seen in Figure 6 which identifies the 1km grid squares where there are at least 200 people, 20 non-residential properties or 1 critical service at risk from surface water flooding. Thirty-seven grid squares have been identified in total within Northumberland, including within the major settlements of Alnwick, Ashington, Berwick, Cramlington, Hexham, Morpeth, and Prudhoe. Figures 7, 8 and 9 show the locations of where the risks are in relation to each of the risk categories.

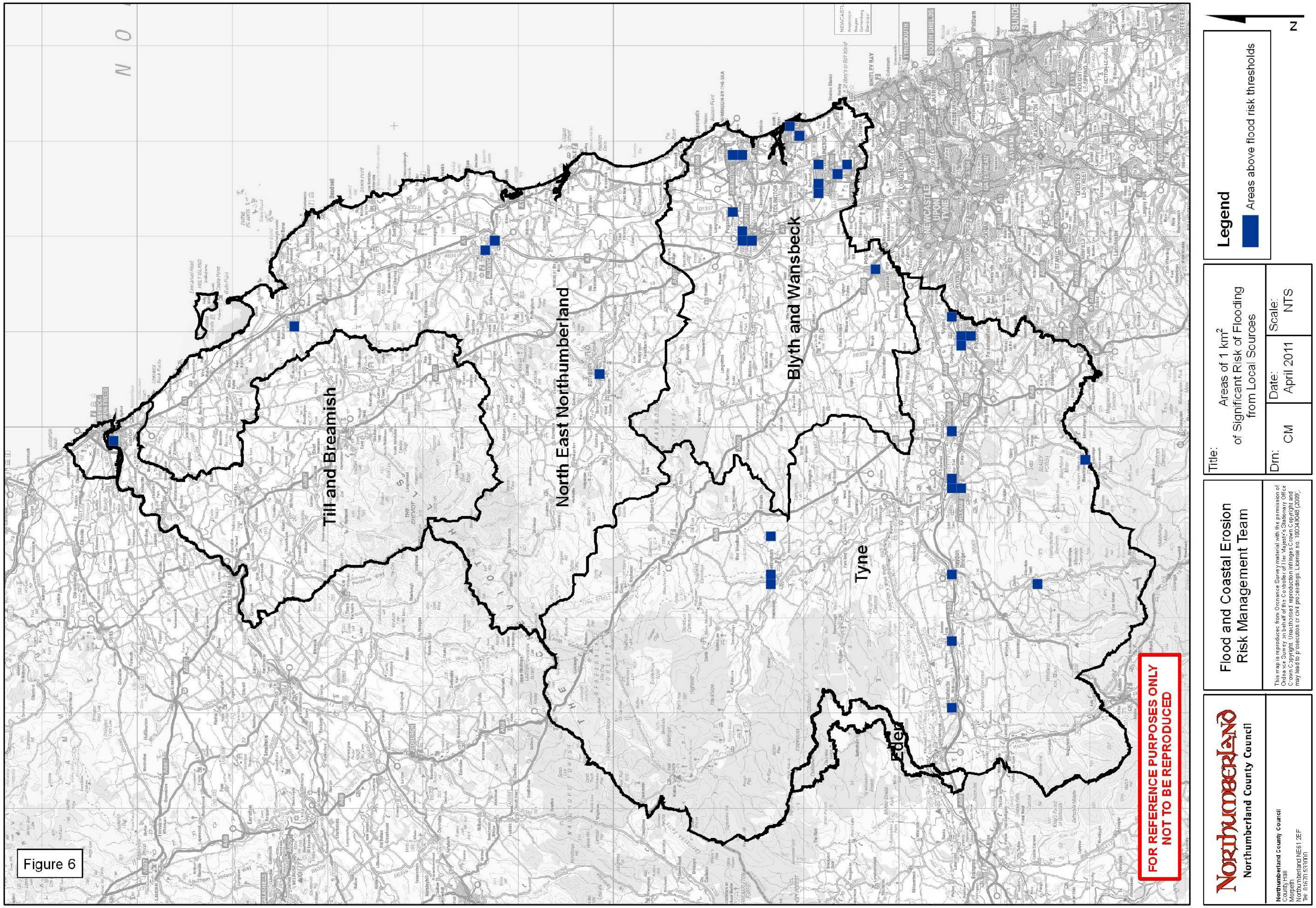
5.1.3. Groundwater

Groundwater flooding is caused by the emergence of water from underground, either at point or diffuse locations. The occurrence of groundwater flooding is usually very local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability. There are several mechanisms which produce groundwater flooding including:

- Prolonged rainfall

- High in bank river levels
- Groundwater rebound
- Mine water rebound

The areas susceptible to the rebound of groundwater are shown in Figure 10. It can be seen that a larger proportion of the 1km grid squares where groundwater may surface are concentrated to the south-east of Northumberland and in a corridor along the eastern edge of the county. More sporadic grid squares where a high proportion of groundwater surfacing may occur can be seen to the west. The major settlements identified where a high proportion of area may experience groundwater rebound include Blyth, Ashington, Ponteland and Bedlington. It should be noted that groundwater flooding is very localised and no incidents with significant consequences have been identified.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Blyth and Wansbeck
Tyne
Eden
Legend
Areas above flood risk thresholds
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Title:
Areas of 1 km2 of Significant Risk of Flooding from Local Sources
Drn: CM
Date: April 2011
Scale: NTS
Flood and Coastal Erosion Risk Management Team
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County Hall
Morpeth
Northumberland NE61 2EF
Tel: 01670 533000
FOR REFERENCE PURPOSES ONLY
NOT TO BE REPRODUCED
Figure 6

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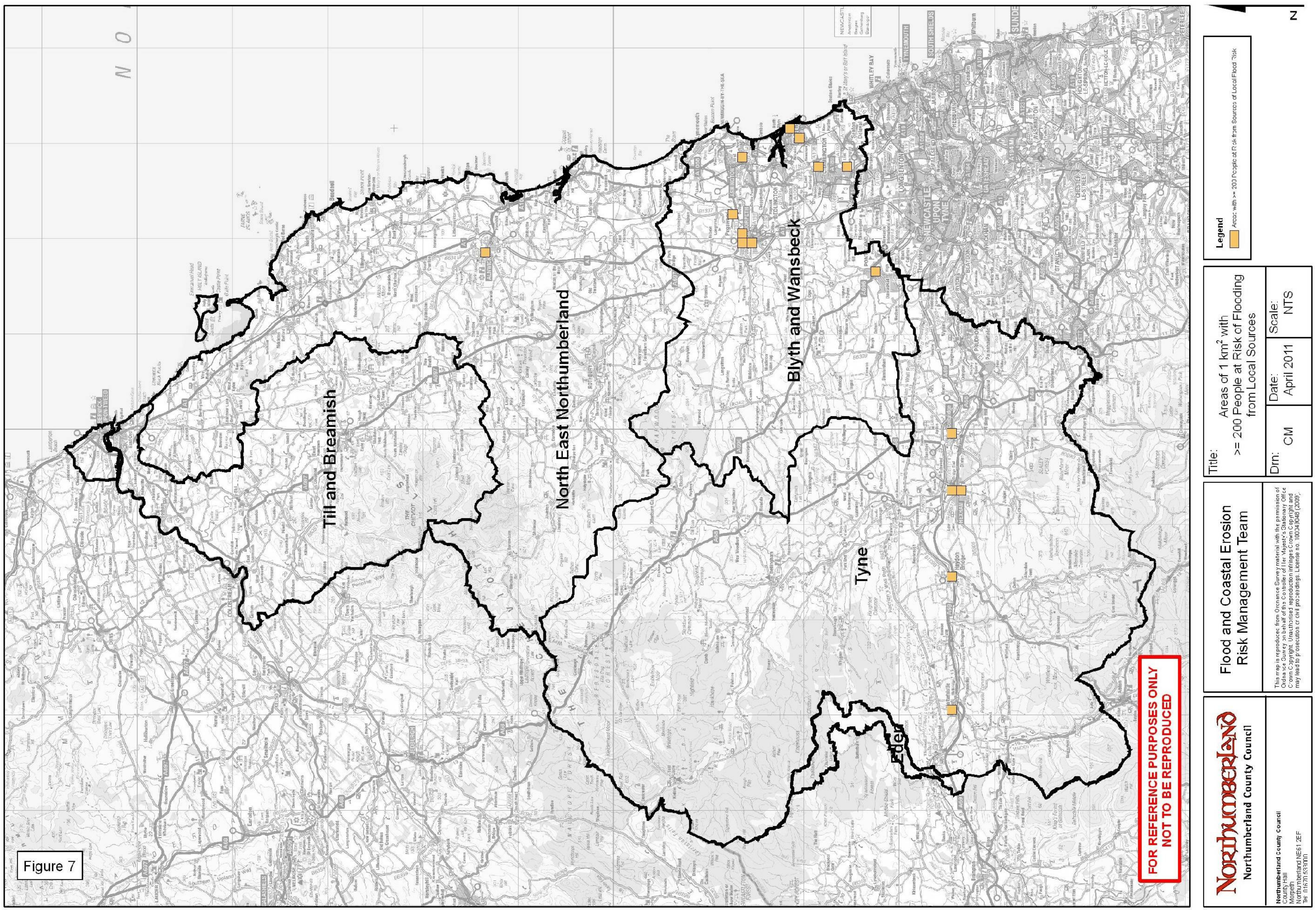
Northumberland
Northumberland County Council



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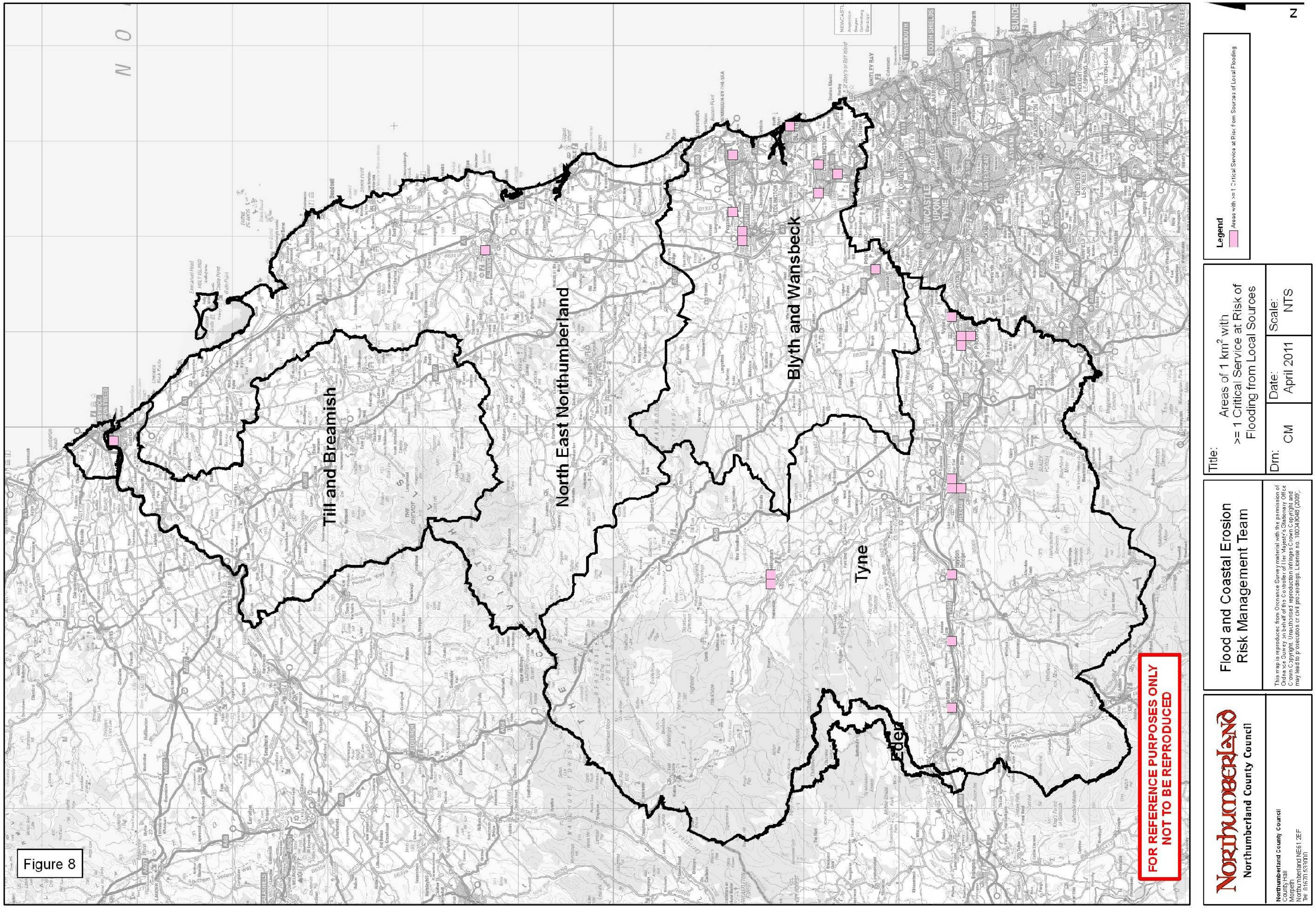
Till and Breamish
North East Northumberland
Blyth and Wansbeck
Tyne
Eden
Figure 8
FOR REFERENCE PURPOSES ONLY
NOT TO BE REPRODUCED
Legend
Areas with >= 1 Critical Service at Risk from Sources of Local Flooding
N
Title:
Areas of 1 km² with >= 1 Critical Service at Risk of Flooding from Local Sources
Drn: CM
Date: April 2011
Scale: NTS
Flood and Coastal Erosion Risk Management Team
Northumberland County Council

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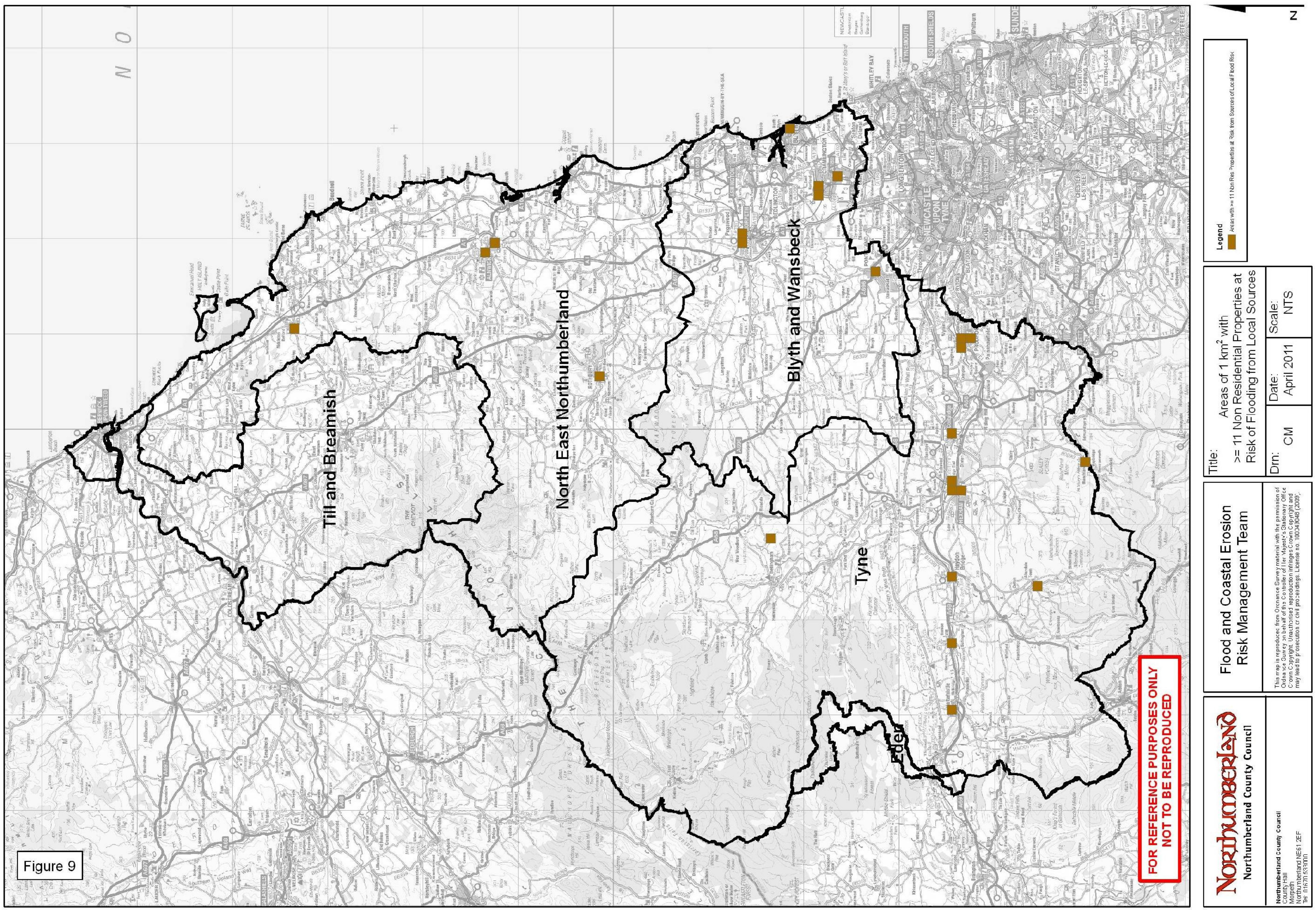
Till and Breamish
North East Northumberland
Blyth and Wansbeck
Tyne
Eden
FOR REFERENCE PURPOSES ONLY
NOT TO BE REPRODUCED
Figure 9
N
Legend
Areas with >= 11 Non Res Properties at Risk from Sources of Local Flood Risk
Title:
Areas of 1 km² with
>= 11 Non Residential Properties at
Risk of Flooding from Local Sources
Drn: CM
Date: April 2011
Scale: NTS
Flood and Coastal Erosion
Risk Management Team
NORTHUMBERLAND
Northumberland County Council
Northumberland County Council
County Hall
Morpeth
Northumberland NE61 2EF
Tel: 01670 533000

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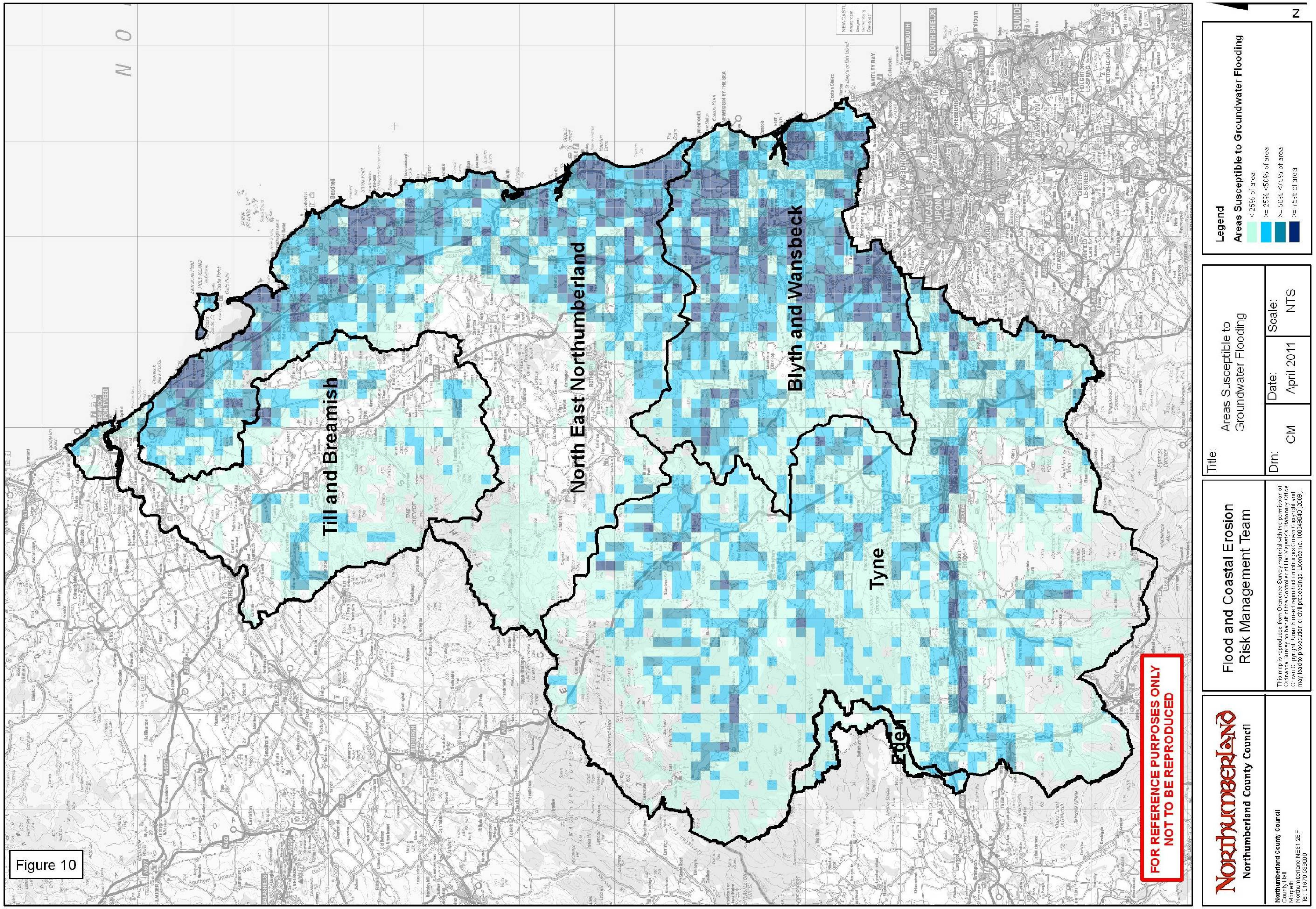
Northumberland
Northumberland County Council



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5.2. The Impacts of Climate Change

The impact of climate change on local flood risk is relatively poorly understood. Several national flood maps have informed this preliminary assessment report – specifically the Flood Map for Surface Water (surface runoff), Areas Susceptible to Surface Water Flooding (surface runoff), Areas Susceptible to Groundwater Flooding (groundwater) and Flood Map (ordinary watercourses). These do not show the impact of climate change on local flood risk.

There was consensus amongst climate model projections presented in the IPCC fourth assessment report for northern Europe suggesting that in winter high extremes of precipitation are very likely to increase in magnitude and frequency. These models project drier summers with increased chance of intense precipitation – intense heavy downpours interspersed with longer, relatively dry periods (Soloman *et al.*, 2007).

5.3. UKCP09

United Kingdom Climate change Projections 2009 (UKCP09) provides the most up to date projections of future climate change for the UK (http://ukclimateprojections.defra.gov.uk/). In terms of precipitation, the key findings are:

By the 2080s, under Medium emissions, over most of lowland UK

- Central estimates are for heavy rain days (rainfall greater than 25mm) to increase by a factor of between 2 and 3.5 in winter, and 1 to 2 in summer.

By the 2080s, under Medium emissions, across regions in England and Wales

- The central estimate (50% probability) for winter mean precipitation % change ranges from +14 to +23
- Central estimate for summer mean precipitation % change ranges from -18 to -24.

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

5.4. Appraisal Guidance

Current project appraisal guidance (Defra, 2006) provides indicative sensitivity ranges for peak rainfall intensity, for use on small catchments and urban / local drainage sites. These are due to be updated following the UKCP09 projections above. They describe the following changes in peak rainfall intensity; +5% (1990-2025), +10% (2025-2055), +20% (2055-2085) and +30% (2085-2115). This was reviewed by the Met Office in 2008 using UKCP09 models (Brown *et al.*, 2008). They suggest that, on the basis of our current understanding, these levels represent a pragmatic but not a precautionary response to uncertainty in future climate impacts. In particular for a 1 in 5 year event, increases in precipitation intensity of 40% or more by the 2080s are plausible across the UK at the local scale.

5.5. Long Term Developments

It is possible that long term developments might affect the occurrence and significance of flooding. However current planning policy aims to prevent new development from increasing flood risk.

In England, Planning Policy Statement 25 (PPS25) on development and flood risk aims to "ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall."

In Wales, Technical Advice Note 15 (TAN15) on development and flood risk sets out a precautionary framework to guide planning decisions. The overarching aim of the precautionary framework is "to direct new development away from those areas which are at high risk of flooding."

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

6. INDICATIVE FLOOD RISK AREAS

6.1. Determining Indicative Flood Risk Areas

The EA. Identified and ranked 219 clusters of significant risk nationally using the method used by Defra and the Welsh Assembly Government to identify 1km^2 areas where local flood risk is an issue. Figure 11 highlights 35 grid squares of national significance. It can be seen that there are no qualifying clusters of significance risk identified within Northumberland.

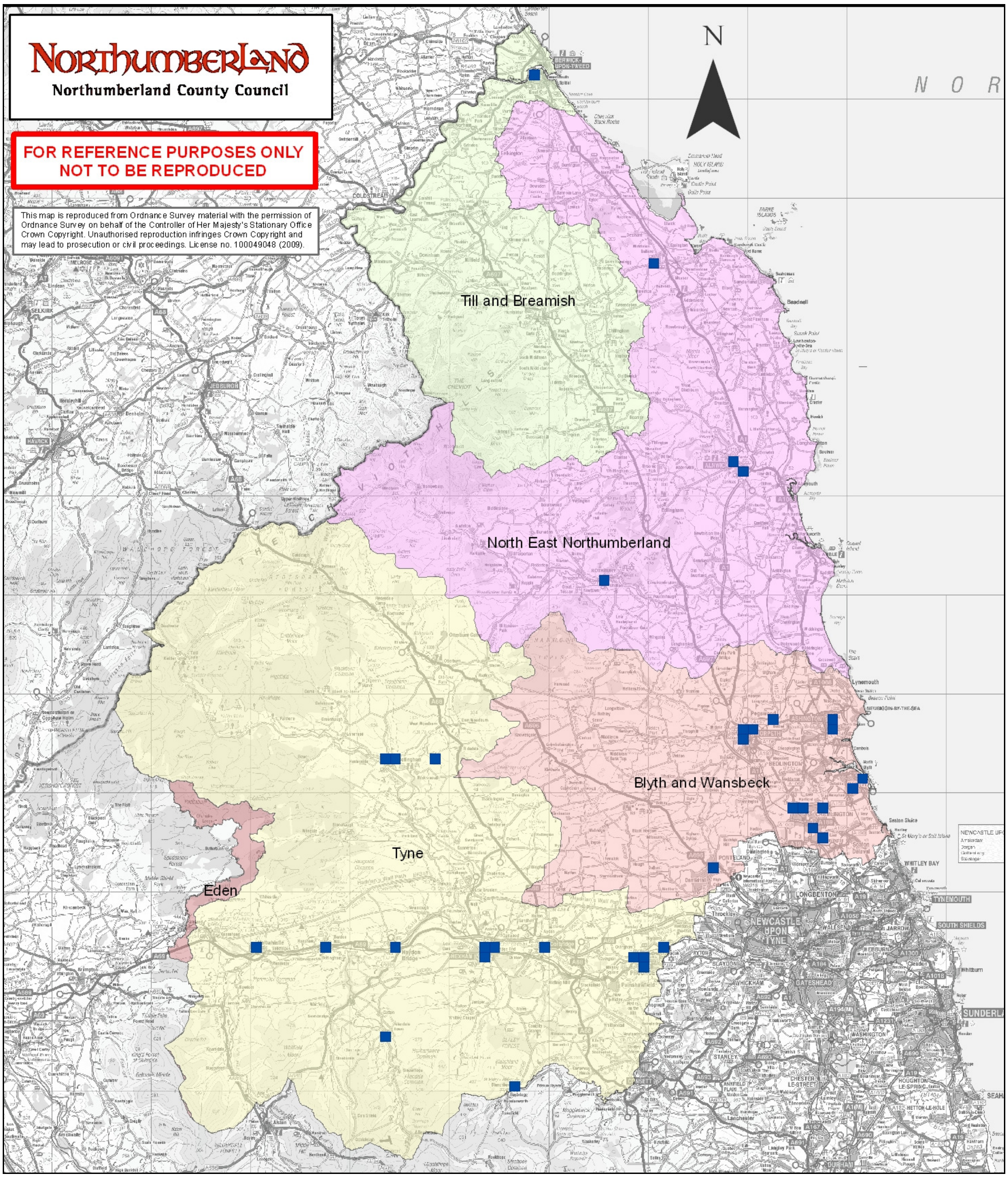

Figure 11 – Grid Squares within Northumberland of Local Significance

The EA. identified 10 Indicative Flood Risk Areas across England, where the number of people at risk was greater than 30,000. From Figure 12, it can be seen that there are no Indicative Flood Risk Areas in Northumberland which satisfy the specified significance criteria.

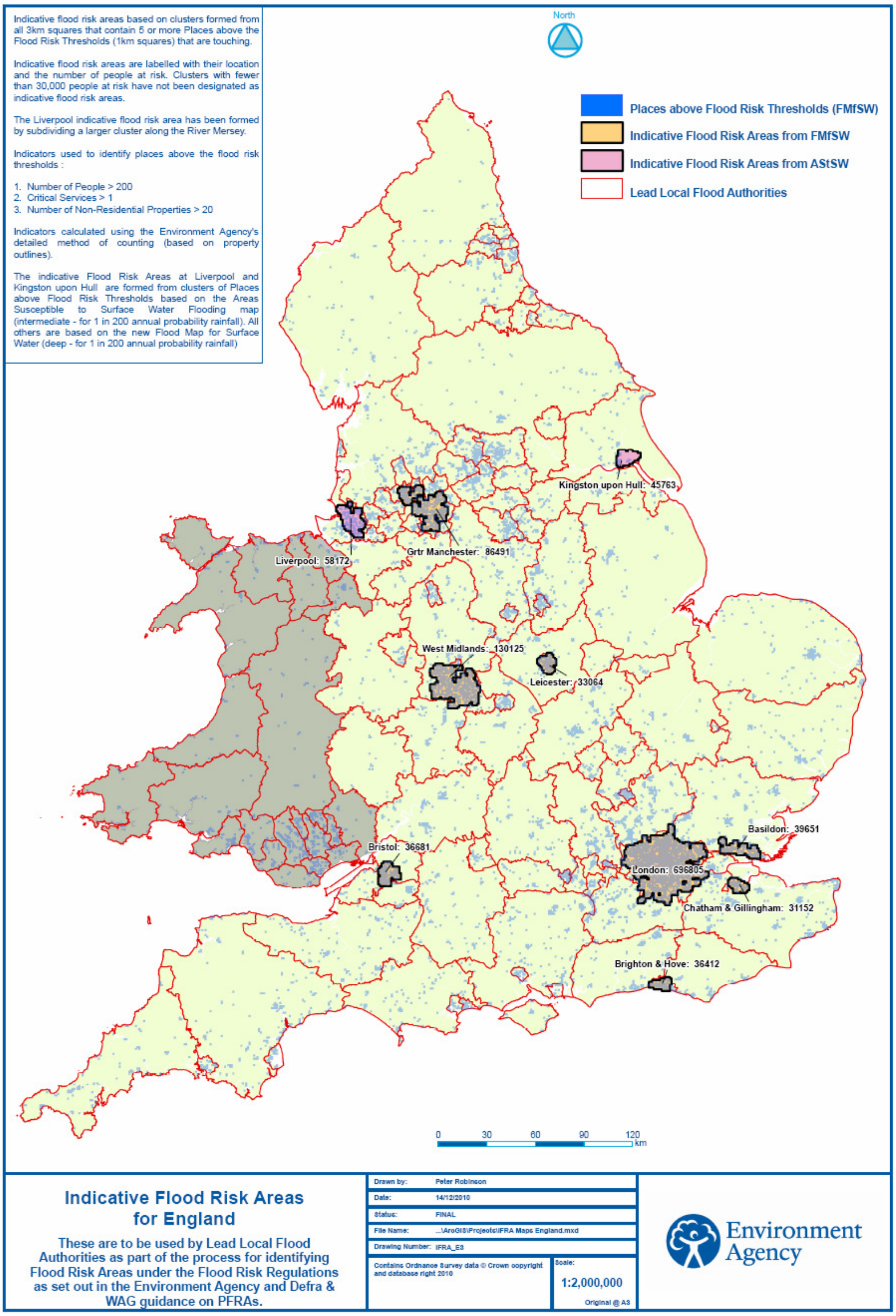

Figure 12 - Indicative Flood Risk Areas Identified Within England

6.2. Review of Indicative Flood Risk Areas

Although it has been identified in section 6.1 that there are no Indicative Flood Risk Areas in Northumberland which satisfy the specified significance criteria, the areas identified have been derived through the consideration of only the risk of flooding from surface water. A review was carried out based on the findings reported in sections 4 and 5 of this report to consider additional sources of flooding that may result in the identification of significant flood risk areas within Northumberland in terms of European legislation. It has been identified that there is no additional local evidence to change the nationally identified Indicative Flood Risk Areas in Northumberland.

7. NEXT STEPS

7.1. Additional Requirements of the Flood Risk Regulations 2009

This report satisfies the first two of the four stages of activity required by the Regulations for the management of flood risk, as described in Figure 1. It has been identified from the initial PFRA that there are no indicative flood risk areas within Northumberland; therefore stages 3 and 4 of the six year cycle, to prepare flood hazard and flood risk maps and the resultant flood risk management plans, are not required in the context of European level significance. However, the Northumberland Local Flood Risk Management Strategy will consider this work in satisfying the Act; flood hazards and risks will be mapped, and a flood risk management plan will be developed in the context of local significance.

7.2. Data Management

The cycle of managing flood risk as required by the Regulations starts again in 2016, therefore it is important to ensure that information is maintained and kept up to date for future reporting and to support the Authority's other flood risk responsibilities and the Northumberland Local Flood Risk Management Strategy. Responsibility for gathering and managing flood risk data belongs to the Authority and information will continue to be collected, assessed and managed by the Council's Flood and Coastal Erosion Risk Management (FCERM) team. Data will be gathered from continued liaison with all stakeholders identified in section 2.3 of this report and from investigation of incidents of flooding as required by the Act. Data will be collected to better understand the environmental and cultural consequences of flooding from local sources to inform future PFRAs.

7.3. Review and Publication

The review of all PFRAs is required to ensure the areas at significant risk are identified for attention in the next stages of the 6 year flood risk management cycle. It is also to check that the standards of the Directive have been met to protect against the risk of infraction proceedings and associated fines.

7.3.1. Local Authority Review

The Northumberland PFRA will be reviewed by the Council's scrutiny committee in accordance with internal review procedures before it is submitted to the Environment Agency.

7.3.2. Environment Agency Review

The Environment Agency has a duty under the Regulations to review, collate and publish all PFRA reports. The review will be carried out at both a local and national level.

Locally, the Environment Agency will review the preliminary assessment reports to ensure they meet the minimum standards required by the European Commission. The checklist provided in Annex 4 will be used to ensure consistency. The area review will inform the national review, which will focus on the Flood Risk Areas, in particular where the Flood Risk Areas have been amended.

In England, the review panel will make recommendations to the relevant Regional Flood Defence Committee (RFDC) for endorsement. Following consideration by the RFDC the final stage of the Environment Agency's review will be sign-off by the relevant Director, before all PFRAs are collated, published and submitted to the European Commission.

8. REFERENCES

Brown, S.J., Beswick, M., Buonomo, E., Clark, R., Fereday, D., Hollis, D., Jones, R.G., Kennett, E.J., Perry, M., Prior, J. and Scaife, A.A. (2008) *Met Office Submission to the Pitt Review – Executive Summary, The extreme rainfall of Summer 2007 and future extreme rainfall in a changing climate.*

Department for the Environment, Food and Rural Affairs (2005) *Making space for water: Taking Forward a new Government strategy for flood and coastal erosion risk management. Response to first consultation document.* London: Department for the Environment, Food and Rural Affairs.

Department for the Environment, Food and Rural Affairs (2006) *Flood and Coastal Defence Appraisal Guidance, FCDPAG3 Economic Appraisal, Supplementary Note to Operating Authorities – Climate Change Impacts October 2006.* Available online at http://www.defra.gov.uk/environment/flooding/documents/policy/guidance/fcdpag/fcd3climate.pdf

Department for the Environment, Food and Rural Affairs and Welsh Assembly Government (2010) *Selecting and Reviewing Flood Risk Areas for local sources of flooding – Guidance to Lead Local Flood Authorities.* London: Department for the Environment, Food and Rural Affairs; Cardiff: Welsh Assembly Government.

Environment Agency (2010) *Preliminary Flood Risk Assessment (PFRA) Final Guidance.* Bristol: Environment Agency.

Scott Wilson (2010) *Northumberland County Council Level 1 Strategic Flood Risk Assessment – Final Report.* Middlesbrough: Scott Wilson.

Soloman, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Avery, K.B., Tignor, M. and Miller, H.L. (2007) *Summary for Policy Makers. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge: Cambridge University Press. Available online at http://www.ipcc.ch/ipcccreports/ar4-wg1.htm

ANNEXES

Annex 1 – Records of past floods and their significant consequences

Annex 2 – Records of future floods and their consequences

Annex 3 – Records of Flood Risk Areas and their rationale

(Not required as no Flood Risk Areas have been identified)

Annex 4 – Review checklist (provided on compact disc)

Annex 5 – GIS layer of Flood Risk Areas (not applicable)

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ANNEX 1: Records of past floods and their significant consequences (preliminary assessment report spreadsheet)

Field:	Flood ID	Summary description	Name of Location	National Grid Reference	Location Description	Start date	Days duration	Probability	Main source of flooding	Additional source(s) of flooding	Confidence in main source of flooding
Mandatory / optional:	Mandatory	Mandatory	Mandatory	Mandatory	Optional	Optional for first cycle	Optional for first cycle	Optional for first cycle	Optional for first cycle	Optional	Optional
Records begin here:	1	For EA	Morpeth	NZ 419000 585000		06/09/2008			Main rivers	Surface Water	High
	2	For EA	Morpeth	NZ 419000 585000		07/03/1964			Main rivers		High

Main mechanism of flooding	Main characteristic of flooding	Significant consequences to human health	Human health consequences - residential properties	Property count method	Other human health consequences	Significant economic consequences	Number of non-residential properties flooded	Property count method	Other economic consequences	Significant consequences to the environment	Environment consequences	Significant consequences to cultural heritage	Cultural heritage consequences
Optional for first cycle	Optional for first cycle	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Mandatory	Optional
Defence exceedance	Natural flood	Yes	882	Observed number	Yes, unquantified	Yes	126	Observed number	No	Yes	Flooding to Morpeth STW and likely discharging of untreated sewage to Wansbeck SAC. Effects unquantified	Yes	7 listed buildings within flood outline. Unknown extent of damages to these structures
Defence exceedance	Snow melt flood	Yes	126	Observed number	Yes, unquantified	Yes			No	Yes	Unknown	Yes	Unknown

Comments	Data owner	Area flooded	Flood event outline confidence	Flood event outline source	Survey date	Photo ID	Lineage	Sensitive data	Protective marking descriptor	European Flood Event Code
Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Auto-populated
The Environment Agency hold responsibility for reporting on Main River events										UKE06000048P0001
The Environment Agency hold responsibility for reporting on Main River events - There are no complete records within the County Council in relation to this event										UKE06000048P0002

ANNEX 2: Records of future floods and their consequences (preliminary assessment report spreadsheet)

Field:	Flood ID	Description of assessment method	Name of Location	National Grid Reference	Location Description	Name	Flood modelled	Probability	Main source of flooding	Additional source(s) of flooding	Confidence in main source of flooding
Mandatory / optional:	Mandatory	Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Mandatory	Optional	Optional
Records begin here:	1	• Topography is derived from LIDAR (in larger urban areas, on 1, 2 and 3m grids; original accuracy ± 0.15m) and Geoperspective data (original accuracy ± 1.5m), processed to remove buildings and vegetation, then degraded to a composite 5m DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; no allowance made for manmade drainage. The DTM may miss flow paths below bridges. • Areas that may flood are defined by dynamically routing a 6.5 hour duration storm with 1 in 200 chance of occurring in any year, over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 is used throughout, to allow broad scale effects of buildings and other obstructions to be approximated. • No allowance made for drainage, pumping or other works constructed for the purpose of flood risk management. • The 'less susceptible' layer shows where modelled flooding is 0.1-0.3m deep; you must not interpret this as depth of flooding, rather as indicative of susceptibility to flooding	Blanchland	NY 396000 550000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Ordinary Watercourse	High
	2	• Topography is derived from LIDAR (in larger urban areas, on 1, 2 and 3m grids; original accuracy ± 0.15m) and Geoperspective data (original accuracy ± 1.5m), processed to remove buildings and vegetation, then degraded to a composite 5m DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; no allowance made for manmade drainage. The DTM may miss flow paths below bridges. • Areas that may flood are defined by dynamically routing a 6.5 hour duration storm with 1 in 200 chance of occurring in any year, over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 is used throughout, to allow broad scale effects of buildings and other obstructions to be approximated. • No allowance made for drainage, pumping or other works constructed for the purpose of flood risk management. • The 'intermediate susceptibility' layer shows where modelled flooding is 0.3-1.0m deep; you must not interpret this as depth of flooding, rather as indicative of susceptibility to	Allendale Town	NY 383000 555000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Ordinary Watercourse	High
	3	• Topography is derived from LIDAR (in larger urban areas, on 1, 2 and 3m grids; original accuracy ± 0.15m) and Geoperspective data (original accuracy ± 1.5m), processed to remove buildings and vegetation, then degraded to a composite 5m DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; no allowance made for manmade drainage. The DTM may miss flow paths below bridges. • Areas that may flood are defined by dynamically routing a 6.5 hour duration storm with 1 in 200 chance of occurring in any year, over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 is used throughout, to allow broad scale effects of buildings and other obstructions to be approximated. • No allowance made for drainage, pumping or other works constructed for the purpose of flood risk management. • The 'more susceptible' layer shows where modelled flooding is >1.0m deep; you must not interpret this as depth of flooding, rather as indicative of susceptibility to flooding because of	S.Prudhoe	NZ 309000 562000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High
	4	• Topography is derived from 64.5% LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m) and 35.5% NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation, then combined on a 2m grid; buildings added with an arbitrary height of 5m based on OS MasterMap 2009 building footprints, then resampled to a 5m grid DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; a uniform allowance of 12mm/hr has been made for manmade drainage in urban areas. Infiltration allowance reduces runoff to 39% in rural areas and 70% in urban areas. • Areas that may flood are defined by dynamically routing a 1.1 hour duration storm with 1 in 30 chance of occurring in any year over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 in rural areas; 0.03 in urban areas, to reflect explicit modelling of buildings in urban areas. • No allowance made for local variations in drainage, pumping or other works constructed for the purpose of flood risk management.	Hexham	NY 393000 563000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River and Ordinary Watercourse	High
	5	• Topography is derived from 64.5% LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m) and 35.5% NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation, then combined on a 2m grid; buildings added with an arbitrary height of 5m based on OS MasterMap 2009 building footprints, then resampled to a 5m grid DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; a uniform allowance of 12mm/hr has been made for manmade drainage in urban areas. Infiltration allowance reduces runoff to 39% in rural areas and 70% in urban areas. • Areas that may flood are defined by dynamically routing a 1.1 hour duration storm with 1 in 30 chance of occurring in any year over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 in rural areas; 0.03 in urban areas, to reflect explicit modelling of buildings in urban areas. • No allowance made for local variations in drainage, pumping or other works constructed for the purpose of flood risk management.	Ovingham	NZ 408000 563000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River and Ordinary Watercourse	High

Main mechanism of flooding	Main characteristic of flooding	Significant consequences to human health	Human health consequences - residential properties	Property count method	Other human health consequences	Significant economic consequences	Number of non-residential properties flooded	Property count method	Other economic consequences	Significant consequences to the environment	Environment consequences	Significant consequences to cultural heritage	Cultural heritage consequences
Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Mandatory	Optional
Natural exceedance	Natural flood	No	24	Detailed GIS		Yes	24	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	56	Detailed GIS		Yes	26	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	73	Detailed GIS		Yes	31	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	110	Detailed GIS		No	19	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	77	Detailed GIS		No	16	Detailed GIS		No		No	

Comments	Data owner	Area flooded	Confidence in modelled outline	Model date	Model Type	Hydrology Type	Lineage	Sensitive data	Protective marking descriptor	European Flood Event Code
Optional	Optional JBA Consulting (distributed by Environment Agency under licence)	Optional	Optional Low	Optional 2009-07	Optional JFLOW-GPU	Optional Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 6.5 hr, 1:200 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile.	Optional	Optional Protect	Optional Commercial	Auto-populated UKE06000048F0001
	JBA Consulting (distributed by Environment Agency under licence)		Low	2009-07	JFLOW-GPU	Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 6.5 hr, 1:200 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile.		Protect	Commercial	UKE06000048F0002
	JBA Consulting (distributed by Environment Agency under licence)		Low	2009-07	JFLOW-GPU	Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 6.5 hr, 1:200 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile.		Protect	Commercial	UKE06000048F0003
	Environment Agency		Medium-Low	2010-11	JFLOW-GPU	Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 1.1 hr, 1:30 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile. See "Description of assessment method" for allowances for infiltration and drainage.		Unmarked		UKE06000048F0004
	Environment Agency		Medium-Low	2010-11	JFLOW-GPU	Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 1.1 hr, 1:30 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile. See "Description of assessment method" for allowances for infiltration and drainage.		Unmarked		UKE06000048F0005

Field:	Flood ID	Description of assessment method	Name of Location	National Grid Reference	Location Description	Name	Flood modelled	Probability	Main source of flooding	Additional source(s) of flooding	Confidence in main source of flooding
Mandatory / optional:	Mandatory	Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Mandatory	Optional	Optional
	6	• Topography is derived from 64.5% LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m) and 35.5% NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation, then combined on a 2m grid; buildings added with an arbitrary height of 5m based on OS MasterMap 2009 building footprints, then resampled to a 5m grid DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; a uniform allowance of 12mm/hr has been made for manmade drainage in urban areas. Infiltration allowance reduces runoff to 39% in rural areas and 70% in urban areas. • Areas that may flood are defined by dynamically routing a 1.1 hour duration storm with 1 in 200 chance of occurring in any year over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 in rural areas; 0.03 in urban areas, to reflect explicit modelling of buildings in urban areas. • No allowance made for local variations in drainage, pumping or other works constructed for the purpose of flood risk management.	N.Prudhoe	NZ 409000 563000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River and Ordinary Watercourse	High
	7	• Topography is derived from 64.5% LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m) and 35.5% NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation, then combined on a 2m grid; buildings added with an arbitrary height of 5m based on OS MasterMap 2009 building footprints, then resampled to a 5m grid DTM. Manual edits applied where flow paths clearly omitted e.g. below bridges. • Flow routes dictated by topography; a uniform allowance of 12mm/hr has been made for manmade drainage in urban areas. Infiltration allowance reduces runoff to 39% in rural areas and 70% in urban areas. • Areas that may flood are defined by dynamically routing a 1.1 hour duration storm with 1 in 200 chance of occurring in any year over the DTM using JBA's JFLOW–GPU model. • Manning's n of 0.1 in rural areas; 0.03 in urban areas, to reflect explicit modelling of buildings in urban areas. • No allowance made for local variations in drainage, pumping or other works constructed for the purpose of flood risk management.	Haltwhistle	NY 370000 564000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Ordinary Watercourse	High
	8	• Areas Susceptible to Groundwater Flooding (AStGWF) is a strategic scale map showing groundwater flood areas on a 1km square grid • This data has used the top two susceptibility bands of the British Geological Society (BGS) 1:50,000 Groundwater Flood Susceptibility Map, which was developed on a 50m grid from: • NEXTMap 5m grid DTM. • National Groundwater Level data on a 50m grid • BGS 1:50 000 geological mapping, with classifications of permeability • It covers consolidated aquifers (chalk, limestone, sandstone etc.) and superficial deposits. • Flood plains are not explicitly identified; the mapping identifies where groundwater is likely to emerge, and not where the water is subsequently likely to flow or pond. • No allowance is made for engineering works, or for groundwater rebound or abstraction to prevent groundwater rebound. • Shows the proportion of each 1km grid square which is susceptible to groundwater emergence, using four area categories.	Bardon Mill	NY 377000 564000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River and Ordinary Watercourse	High
	9	• Modelling developed from combination of national (2004) and local (generally 1998-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	Haydon Bridge	NY 384000 564000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River and Ordinary Watercourse	High
	10	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	W.Hexham	NY 393000 564000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River	High

Main mechanism of flooding	Main characteristic of flooding	Significant consequences to human health	Human health consequences - residential properties	Property count method	Other human health consequences	Significant economic consequences	Number of non-residential properties flooded	Property count method	Other economic consequences	Significant consequences to the environment	Environment consequences	Significant consequences to cultural heritage	Cultural heritage consequences
Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Mandatory	Optional
Natural exceedance	Natural flood	No	54	Detailed GIS		Yes	27	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	94	Detailed GIS		Yes	38	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	3	Detailed GIS		No	14	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	110	Detailed GIS		Yes	38	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	178	Detailed GIS		Yes	105	Detailed GIS		No		No	

Comments	Data owner	Area flooded	Confidence in modelled outline	Model date	Model Type	Hydrology Type	Lineage	Sensitive data	Protective marking descriptor	European Flood Event Code
Optional	Optional Environment Agency	Optional	Optional Medium-Low	Optional 2010-11	Optional JFLOW-GPU	Optional Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 1.1 hr, 1:200 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile. See "Description of assessment method" for allowances for infiltration and drainage.	Optional	Optional Unmarked	Optional	Auto-populated UKE06000048F0006
	Environment Agency		Medium-Low	2010-11	JFLOW-GPU	Depth-duration-frequency curves derived from FEH CD-ROM, from centre of each 5km model, with areal reduction factor applied to convert point rainfall estimate to more representative figure. Curve then used to derive 1.1 hr, 1:200 chance rainfall depth; this is converted to hyetograph, using summer rainfall profile. See "Description of assessment method" for allowances for infiltration and drainage.		Unmarked		UKE06000048F0007
Data developed specifically for PFRA, and is unlikely to be suitable for any other purposes.	Environment Agency		Low	2010-11	ArcGIS	Uses data which is developed from published BGS groundwater level contours, groundwater levels in BGS WellMaster database and some river levels. No probability is associated with this data.		Unmarked		UKE06000048F0008
Data updated quarterly. To understand the likelihood of future flooding, taking account of defences, refer to Areas Benefitting from Defences and National Flood Risk Assessment (NaFRA) data. Marked 'Protect' for complete national dataset only.	Environment Agency		Medium	2010-11	Varies but mainly JFLOW, ISIS, HEC-RAS, TUFLOW for fluvial, and HYDROF for tidal.	National methodology described in "National Generalised Modelling for Flood Zones - Fluvial & Tidal Modelling Methods - Methodology, Strengths and Limitations". A national dataset (for England and Wales) of fluvial flood peak estimates was derived from the Flood Estimation Handbook (FEH) to generate a 1 in 100 chance fluvial flood. Local fluvial modelling uses FEH methods. Peak tidal water levels from either Dixon & Tawn (DT3) or local data sets to derive 1 in 200 chance tide levels including surge from POL CSX model.		Protect	Commercial	UKE06000048F0009
Data updated quarterly. To understand the likelihood of future flooding, taking account of defences, refer to National Flood Risk Assessment (NaFRA) data. Marked 'Protect' for complete national dataset only.	Environment Agency		Medium	2010-11	Varies but mainly JFLOW, ISIS, HEC-RAS, TUFLOW for fluvial, and HYDROF for tidal.	National methodology described in "National Generalised Modelling for Flood Zones - Fluvial & Tidal Modelling Methods - Methodology, Strengths and Limitations". A national dataset (for England and Wales) of fluvial flood peak estimates was derived from the Flood Estimation Handbook (FEH) to generate a 1 in 1000 chance fluvial flood. Local fluvial modelling uses FEH methods. Peak tidal water levels from either Dixon & Tawn (DT3) or local data sets to derive 1 in 1000 chance tide levels including surge from POL CSX model.		Protect	Commercial	UKE06000048F0010

Field:	Flood ID	Description of assessment method	Name of Location	National Grid Reference	Location Description	Name	Flood modelled	Probability	Main source of flooding	Additional source(s) of flooding	Confidence in main source of flooding
Mandatory / optional:	Mandatory	Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Mandatory	Optional	Optional
	11	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	E.Hexham	NY 394000 564000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River and Ordinary Watercourse	High
	12	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	Corbridge	NY 399000 564000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High
	13	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	Wylam	NZ 411000 564000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River	High
	14	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	Ponteland	NZ 416000 572000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River and Ordinary Watercourse	High
	15	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	SE.Cramlington	NZ 427000 575000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High

Main mechanism of flooding	Main characteristic of flooding	Significant consequences to human health	Human health consequences - residential properties	Property count method	Other human health consequences	Significant economic consequences	Number of non-residential properties flooded	Property count method	Other economic consequences	Significant consequences to the environment	Environment consequences	Significant consequences to cultural heritage	Cultural heritage consequences
Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Mandatory	Optional
Natural exceedance	Natural flood	No	1	Detailed GIS		Yes	26	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	117	Detailed GIS		No	16	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	21	Detailed GIS		No	6	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	108	Detailed GIS		Yes	26	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	138	Detailed GIS		No	1	Detailed GIS		No		No	

Comments	Data owner	Area flooded	Confidence in modelled outline	Model date	Model Type	Hydrology Type	Lineage	Sensitive data	Protective marking descriptor	European Flood Event Code
Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Auto-populated
										UKE06000048F0011
										UKE06000048F0012
										UKE06000048F0013
										UKE06000048F0014
										UKE06000048F0015

Field:	Flood ID	Description of assessment method	Name of Location	National Grid Reference	Location Description	Name	Flood modelled	Probability	Main source of flooding	Additional source(s) of flooding	Confidence in main source of flooding
Mandatory / optional:	Mandatory	Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Mandatory	Optional	Optional
	16	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	C.Cramlington	NZ 426000 576000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High
	17	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	NW.Cramlington	NZ 424000 578000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High
	18	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	N.Cramlington	NZ 425000 578000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High
	19	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	NE.Cramlington	NZ 427000 578000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High
	20	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	C.Blyth	NZ 430000 580000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High

Main mechanism of flooding	Main characteristic of flooding	Significant consequences to human health	Human health consequences - residential properties	Property count method	Other human health consequences	Significant economic consequences	Number of non-residential properties flooded	Property count method	Other economic consequences	Significant consequences to the environment	Environment consequences	Significant consequences to cultural heritage	Cultural heritage consequences
Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Mandatory	Optional
Natural exceedance	Natural flood	No	13	Detailed GIS		Yes	22	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	0	Detailed GIS		Yes	20	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	3	Detailed GIS		Yes	24	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	129	Detailed GIS		No	2	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	98	Detailed GIS		No	0	Detailed GIS		No		No	

Comments	Data owner	Area flooded	Confidence in modelled outline	Model date	Model Type	Hydrology Type	Lineage	Sensitive data	Protective marking descriptor	European Flood Event Code
Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Auto-populated UKE06000048F0016
										UKE06000048F0017
										UKE06000048F0018
										UKE06000048F0019
										UKE06000048F0020

Field:	Flood ID	Description of assessment method	Name of Location	National Grid Reference	Location Description	Name	Flood modelled	Probability	Main source of flooding	Additional source(s) of flooding	Confidence in main source of flooding
Mandatory / optional:	Mandatory	Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Mandatory	Optional	Optional
	21	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	E.Blyth	NZ 431000 581000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River	High
	22	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	W.Bellingham	NY 383000 583000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River	High
	23	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	E.Bellingham	NY 384000 583000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Ordinary Watercourse	High
	24	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	Broomhope Mill	NY 388000 583000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Ordinary Watercourse	High
	25	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	SW.Morpeth	NZ 419000 585000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River	High

Main mechanism of flooding	Main characteristic of flooding	Significant consequences to human health	Human health consequences - residential properties	Property count method	Other human health consequences	Significant economic consequences	Number of non-residential properties flooded	Property count method	Other economic consequences	Significant consequences to the environment	Environment consequences	Significant consequences to cultural heritage	Cultural heritage consequences
Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Mandatory	Optional
Natural exceedance	Natural flood	Yes	194	Detailed GIS		Yes	82	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	10	Detailed GIS		No	9	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	0	Detailed GIS		No	4	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	0	Detailed GIS		Yes	23	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	86	Detailed GIS		No	2	Detailed GIS		No		No	

Comments	Data owner	Area flooded	Confidence in modelled outline	Model date	Model Type	Hydrology Type	Lineage	Sensitive data	Protective marking descriptor	European Flood Event Code
Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Auto-populated
										UKE06000048F0021
										UKE06000048F0022
										UKE06000048F0023
										UKE06000048F0024
										UKE06000048F0025

Field:	Flood ID	Description of assessment method	Name of Location	National Grid Reference	Location Description	Name	Flood modelled	Probability	Main source of flooding	Additional source(s) of flooding	Confidence in main source of flooding
Mandatory / optional:	Mandatory	Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Mandatory	Optional	Optional
	26	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	NW.Morpeth	NZ 419000 586000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River	High
	27	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	NE.Morpeth	NZ 420000 586000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River	High
	28	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	SE.Ashington	NZ 428000 586000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High
	29	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	Pegswood	NZ 422000 587000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High
	30	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	NE.Ashington	NZ 428000 587000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High

Main mechanism of flooding	Main characteristic of flooding	Significant consequences to human health	Human health consequences - residential properties	Property count method	Other human health consequences	Significant economic consequences	Number of non-residential properties flooded	Property count method	Other economic consequences	Significant consequences to the environment	Environment consequences	Significant consequences to cultural heritage	Cultural heritage consequences
Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Mandatory	Optional
Natural exceedance	Natural flood	Yes	106	Detailed GIS		Yes	31	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	116	Detailed GIS		Yes	27	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	135	Detailed GIS		Yes	7	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	95	Detailed GIS		Yes	5	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	46	Detailed GIS		Yes	2	Detailed GIS		No		No	

Comments	Data owner	Area flooded	Confidence in modelled outline	Model date	Model Type	Hydrology Type	Lineage	Sensitive data	Protective marking descriptor	European Flood Event Code
Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Auto-populated
										UKE06000048F0026
										UKE06000048F0027
										UKE06000048F0028
										UKE06000048F0029
										UKE06000048F0030

Field:	Flood ID	Description of assessment method	Name of Location	National Grid Reference	Location Description	Name	Flood modelled	Probability	Main source of flooding	Additional source(s) of flooding	Confidence in main source of flooding
Mandatory / optional:	Mandatory	Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Mandatory	Optional	Optional
	31	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	Rothbury	NU 405000 601000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River and Ordinary Watercourse	High
	32	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	S.Alnwick	NU 419000 612000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High
	33	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	N.Alnwick	NU 418000 613000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	No	High
	34	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	Belford	NU 410000 633000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Main River and Ordinary Watercourse	High
	35	• Modelling developed from combination of national (2004) and local (generally 2004-2010) modelling. • Topography derived from LIDAR (on 0.25m-2m grids; original accuracy ± 0.15m), NEXTMap SAR (on 5m grid; original accuracy ± 1.0m), processed to remove buildings & vegetation. For local modelling, topography may include ground survey. • Location of watercourses and tidal flow routes dictated by topographic survey. • Areas that may flood are defined for catchments >3km² by routing appropriate flows for that catchment through the model to ascertain water level and thus depth and extent. • Manning's n of 0.1 used for national fluvial modelling; variable (calibrated) values for national tidal modelling; appropriate values selected for local modelling. Channel capacity assumed as QMED for national fluvial modelling; local survey methods used for local modelling. • For the purpose of flood risk management, models assume that there are no raised defences.	W. Berwick-upon-Tweed	NT 398000 652000		Flood Map for Surface Water (FMfSW) - 1 in 200	Probability refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth.	200	Surface runoff	Ordinary Watercourse	High

Main mechanism of flooding	Main characteristic of flooding	Significant consequences to human health	Human health consequences - residential properties	Property count method	Other human health consequences	Significant economic consequences	Number of non-residential properties flooded	Property count method	Other economic consequences	Significant consequences to the environment	Environment consequences	Significant consequences to cultural heritage	Cultural heritage consequences
Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Mandatory	Optional
Natural exceedance	Natural flood	No	44	Detailed GIS		Yes	31	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	62	Detailed GIS		Yes	37	Detailed GIS		No		No	
Natural exceedance	Natural flood	Yes	111	Detailed GIS		Yes	66	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	32	Detailed GIS		Yes	21	Detailed GIS		No		No	
Natural exceedance	Natural flood	No	0	Detailed GIS		Yes	6	Detailed GIS		No		No	

Comments	Data owner	Area flooded	Confidence in modelled outline	Model date	Model Type	Hydrology Type	Lineage	Sensitive data	Protective marking descriptor	European Flood Event Code
Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Auto-populated
										UKE06000048F0031
										UKE06000048F0032
										UKE06000048F0033
										UKE06000048F0034
										UKE06000048F0035

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