

Preliminary Flood Risk Assessment Report

Norfolk County Council

Tuesday, 26 July 2011



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Executive Summary

This Preliminary Flood Risk Assessment (PFRA) Report has been produced to assist Norfolk County Council as Lead Local Flood Authority in its duties to manage local flood risk and deliver its requirements under the Flood Risk Regulations 2009.

The PFRA process provides a consistent high level overview of the potential risk of flooding from local sources such as surface water, groundwater and ordinary water courses. Past flood events and mapping of potential future flooding have been analysed to highlight the areas of locally significant flood risk.

Ten indicative Flood Risk Areas (FRAs) have been identified nationally where flooding could affect over 30,000 people. Whilst no indicative FRAs have been identified in Norfolk, the PFRA process has acknowledged that there is a high risk of flooding from local sources across the county.

The PFRA report will be submitted to Environment Agency (EA) for review by 22 June 2011. The EA will publish all PFRA reports and Flood Risk Areas by 22 December 2011. This report will form basis of evidence for preparing the Local Flood Risk Management Strategy for Norfolk.

1. Introduction

1.1 Introduction to the study area

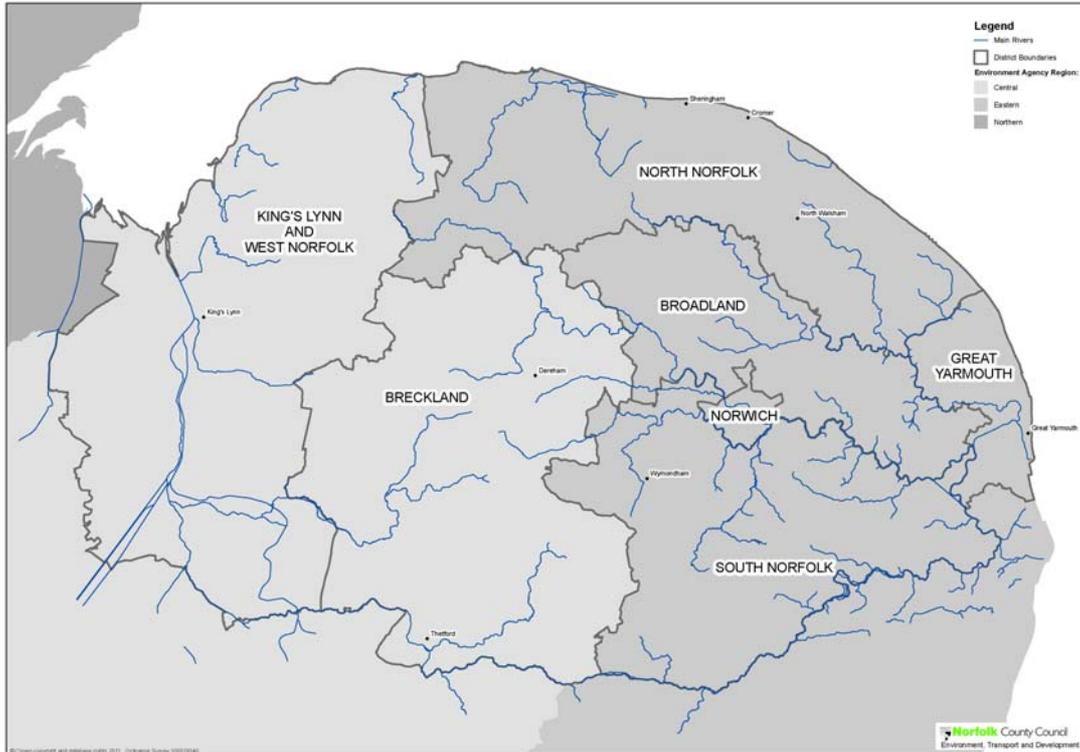
The study area of this PFRA is defined by the administrative boundary of Norfolk County Council that includes seven lower tier authorities: Norwich City Council, Great Yarmouth Borough Council, Borough Council of King's Lynn and West Norfolk, North, South, Breckland and Broadland District Councils. The Broads Authority is the Local Planning Authority and Navigation Authority for the Broads area. The County is bounded by Lincolnshire and Cambridgeshire to the west, Suffolk to the south and the North Sea to the north and east.

Three river catchments: Great Ouse, North Norfolk Rivers and Broads Rivers, flow across the county and it is covered by two Environment Agency regions: Central and Eastern, and two water companies: Anglian Water and Essex & Suffolk Water.

Twenty two Internal Drainage Boards (IDBs) cover the low-lying areas of Norfolk. Some of these are organised in to groups: Downham Market Group of IDB's, Ely Group of IDB's, Middle Level IDB's, and the Water Management Alliance and two are ungrouped: East Harling IDB, Waveney, Lower Yare & Lothingland IDB.

Norfolk's population was estimated to be around 853,400 in 2009 and has an area of approximately 5,371km². Norfolk has the fifth largest area of the 27 English shire counties, and the seventh highest population, but the sixth lowest population density¹.

Figure 1.1 Norfolk County Map



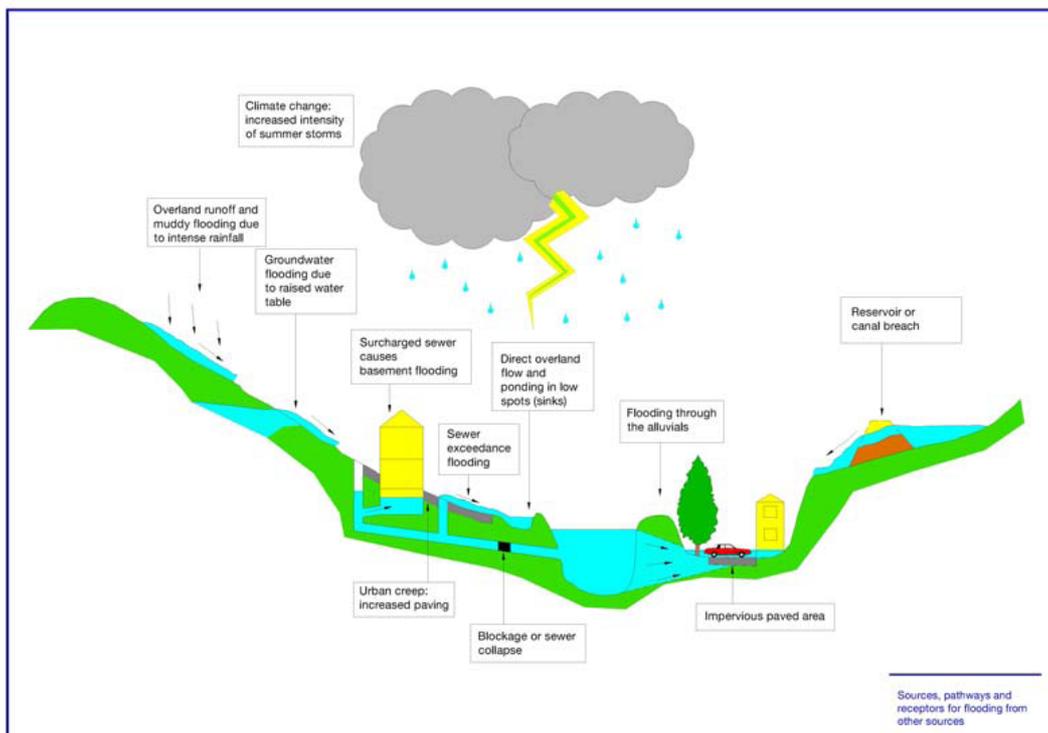
1.2 Scope of the report

Under the Flood Risk Regulations 2009, and in line with responsibilities under the Flood and Water Management Act, Norfolk County Council as Lead Local Flood Authority (LLFA) is responsible for undertaking a PFRA for local sources of flood risk, primarily from surface runoff, groundwater and ordinary watercourses².

This means:

- runoff from impermeable surfaces due to very heavy rain, such as roofs, roads, driveways, patios, car parks;
- groundwater in areas where water has percolated into the soil on high ground and then emerges in lower areas;
- flooding from small streams, drainage ditches, drains or sewers.

Figure 1.2 Flooding from Local Sources³



The Environment Agency retains responsibility for managing flood risk from main rivers and the sea.

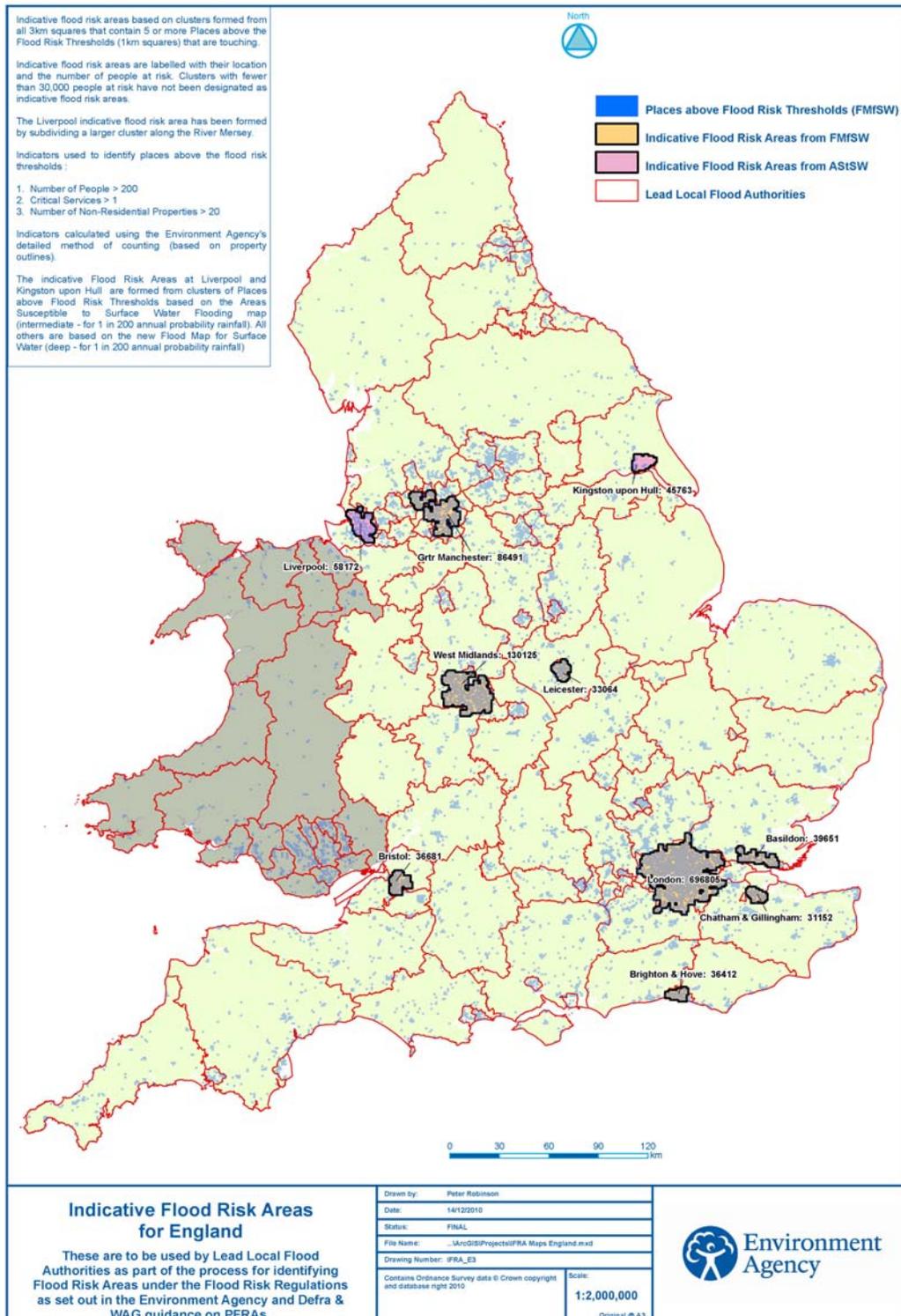
1.3 Aims and objectives

The PFRA provides a high level summary of significant flood risk, based on available and readily derivable information, describing both the probability and harmful consequences of past and future flooding².

The Environment Agency, working to Defra guidance and with national flood risk mapping, has produced maps of the indicative Flood Risk Areas (FRAs)

This identified ten areas where the potential flood risk could affect over 30,000 people. These are: London, West Midlands, Greater Manchester, Liverpool, Kingston upon Hull, Basildon, Bristol, Brighton & Hove, Leicester and Chatham & Gillingham.

Figure 1.3 Indicative Flood Risk Areas for England



No indicative FRAs have been identified in Norfolk, however, it must be noted that there is a high risk of flooding from local sources across the county, particularly from surface water and in combination with other sources of flooding such as main rivers and the sea. Based on national surface water modelling approximately 37,000 properties are estimated to be at risk from flooding during a rainfall event with a 1 in 200 annual chance of occurring. Through this process, Norfolk was recognised as the 10th most at risk area out of 149 Authorities for the distribution of this funding.

Norwich was identified as having approximately 14,000 people at risk of flooding and was ranked 19th in a list of English settlements outside the indicative Flood Risk Areas.

The PFRA report will be used to inform our Local Flood Risk Management Strategy by identifying areas potentially at flood risk and that require more detailed studies.

Annex 5 Norfolk Settlement Ranking

Figure 1.4 Norfolk Settlement Ranking

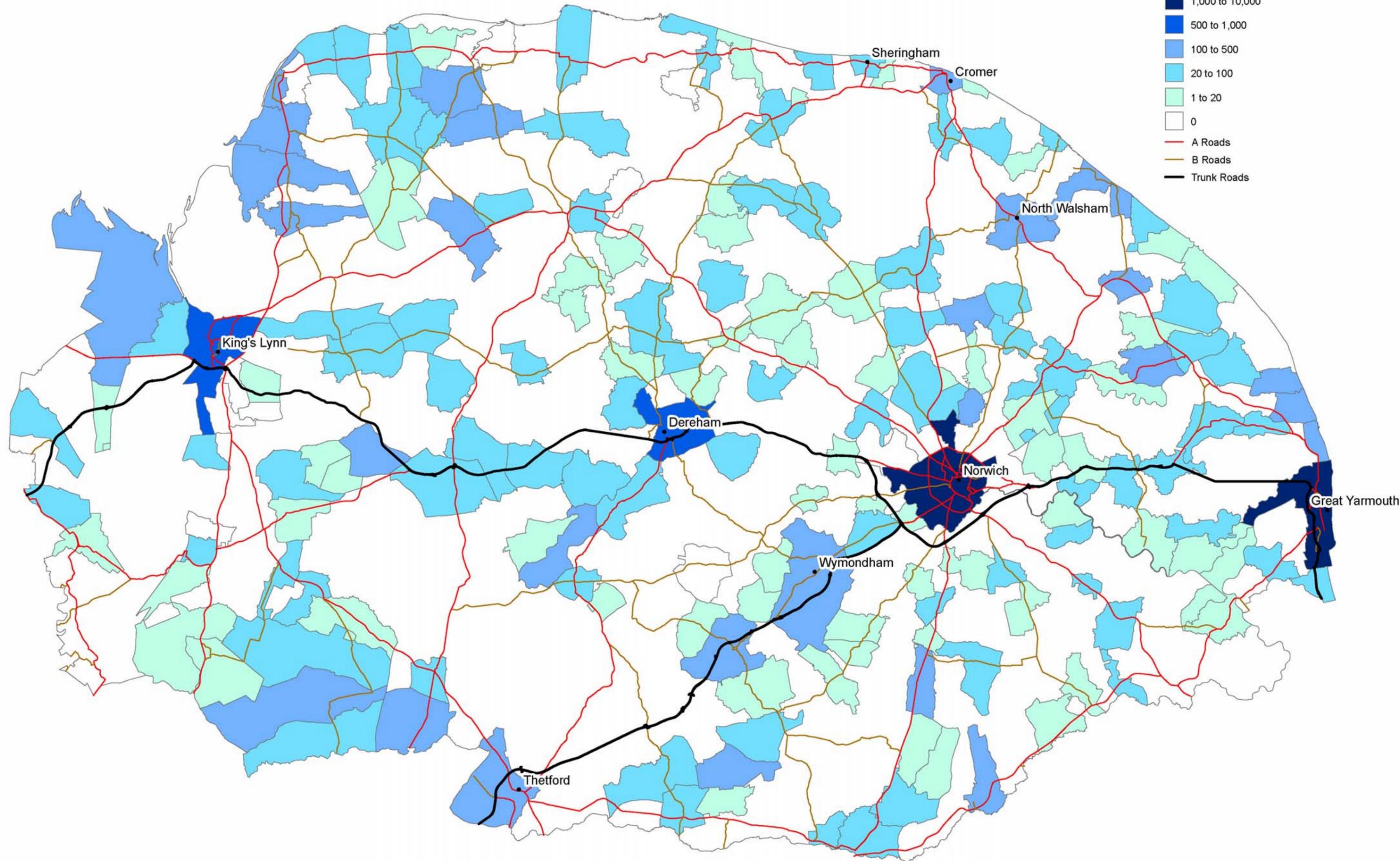
Figure 1.4 Norfolk Settlement Ranking

Legend

Estimated number of properties susceptible to surface water flooding (based on Environment Agency data - Aug 2009)

- 1,000 to 10,000
- 500 to 1,000
- 100 to 500
- 20 to 100
- 1 to 20
- 0

A Roads
B Roads
Trunk Roads



2. Lead Local Flood Authority responsibilities

2.1 Flood and Water Management Act 2010

Sir Michael Pitt's review of the flooding in 2007 stated that "the role of local authorities should be enhanced so that they take on responsibility for leading the co-ordination of flood risk management in their areas"⁴. The Flood and Water Management Act provides for this through the new role of the lead local flood authority.

The Act also requires a lead local flood authority to develop, maintain, apply and monitor a strategy for local flood risk management in its area. The lead local flood authority will be responsible for ensuring the strategy is put in place and delivered in partnership with local Risk Management Authorities. The Act sets out the minimum that a local strategy must contain, and the lead local flood authority is required to consult on the strategy with risk management authorities and the public⁵.

2.2 The Floods Directive and Flood Risk Regulations 2009

The European Floods Directive was developed in response to serious pan European floods to enable a common understanding and coordinated management of flood risk. Its main requirements are for Member States to prepare a Preliminary Flood Risk Assessment (PFRA) of flooding from all sources, and then to use this evidence base to identify areas of significant flood risk (Flood Risk Areas). Flood hazard maps and flood risk maps must then be prepared for these areas to further investigate the risk of flooding. Finally, flood risk management plans must be developed for these areas with the objective of reducing the probability and/or consequences of flooding. The results of the PFRA and any flood hazard and flood risk maps and flood risk management plans prepared under the Regulations must be reported to the European Commission.

In England and Wales the Directive was transposed into law by the Flood Risk Regulations 2009. These require the Environment Agency to assess, map and plan for flood risk from the sea, main rivers and large raised reservoirs and Lead Local Flood Authorities (LLFAs), for all other sources of flooding including where the two interact.

The timetable for preparing assessments, maps and plans is driven by the Floods Directive and includes a 6-month review, collation and reporting process by the Environment Agency to ensure national consistency. LLFAs must therefore submit their assessments, including identification of Flood Risk Areas, to the Environment Agency by 22 June 2011. Maps must be submitted by 22 June 2013 and plans by 22 June 2015. The Environment Agency will then publish each product by 22 December in the year it is due. Immediately after the plans are completed the second cycle begins, starting with a review of preliminary assessments by 2017⁶.

2.3 Eastern and Central Regional Flood and Coastal Committees (RFCC)

Formally known as Regional Flood Defence Committees

The Environment Agency carries out its work on flood risk management through the RFCCs and is responsible for:

- Maintaining or improving any watercourses which are designated as main rivers;
- Maintaining or improving any tidal defences;
- Installing and operating flood warning systems;
- Controlling actions by riparian owners and occupiers which might interfere with the free flow of watercourses;
- Supervising Internal Drainage Boards.

The committees help develop and complete multi-million pound programmes of work, and provide advice on community engagement, coastal erosion, incident management and emergency planning within their regions. They also have responsibility for raising local levies and providing an accountable forum for testing new ideas and ways of working.

The Flood and Water Management Act 2010 changes the RFCCs approach to Flood and Coastal Erosion Risk Management giving them additional responsibilities to cover both local and strategic flood risks as well as coastal erosion.

2.4 Norfolk Water Management Partnership (NWMP)

Sir Michael Pitt's Review of 2007 recommended that the LLFA should bring together all relevant bodies to help manage local flood risk. As such the Norfolk Water Management Partnership (NWMP) has been established to bring together the LLFA, District Councils, Internal Drainage Boards, Highway Authorities and Water Companies, and the Environment Agency (EA) (all of whom are identified as Risk Management Authorities under the new Act). Many of these bodies have retained their existing water management / drainage powers, with some enhancements, as part of the legislative changes.

2.5 Norfolk Resilience Forum (NRF)

The NRF, under the requirements of the Civil Contingencies Act 2004, brings together agencies and organisations involved in the response and recovery to emergencies and disruptive challenges. One of its roles, along with the planning for and response to emergencies, is to provide information to the public and to warn and inform about emergencies. The NRF makes the public aware about the hazards and likely impacts of emergencies and what the planned response to an emergency will be – further information and the Norfolk Community Risk Register can be accessed through www.norfolkprepared.gov.uk. It also offers information and guidance to individuals and communities about preparing for emergencies. The NRF is made up of a wide range of organisations and supporting agencies who are all involved with the community emergency planning activity in Norfolk. Members of the NRF Flood Risk Planning sub-group include the Environment Agency, Norfolk County Council, City, Borough and District Councils, Anglian Water, the Met Office, Norfolk Association of Local Councils, Broads Authority, Internal Drainage Boards, Norfolk Fire Service, Norfolk Constabulary, Flood Incident Management and the NHS.

2.6 Norwich Urban Area Surface Water Management Plan Steering Group

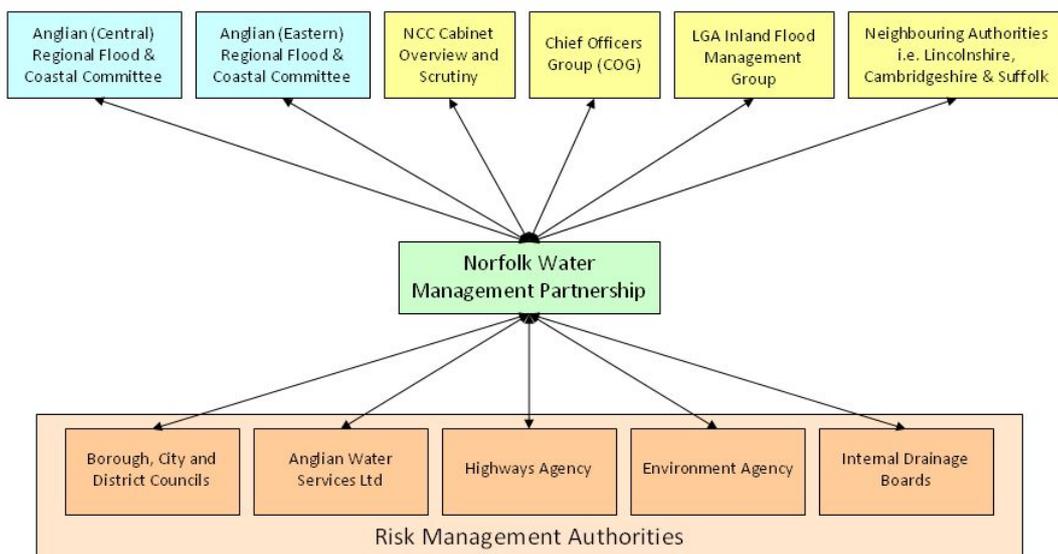
Set up to oversee and guide the Norwich Urban Area Surface Water Management Plan. The steering group consists of officers and members from Norfolk County

Council, Norwich City Council, Broadland District Council, South Norfolk District Council, IDBs, Drayton and Thorpe St. Andrew Parish Councils, the Environment Agency and Anglian Water.

2.7 King’s Lynn and West Norfolk Settlements Surface Water Management Plan Steering Group

Set up to oversee and guide the King’s Lynn and West Norfolk Settlements Surface Water Management Plan. The steering group consists of officers and members from Norfolk County Council, the Borough Council of King’s Lynn and West Norfolk, IDBs, the Environment Agency and Anglian Water.

Figure 2.1 Governance and Partnership Arrangements



3. Methodology and data review

The approach used for producing this PFRA was based upon the Environment Agency’s PFRA Final Guidance, which was released in December 2010. The PFRA is based on readily available or derivable data and with this in mind; the following methodology has been used to undertake the PFRA.

3.1 Past Flood Risk Methodology

Historical flood event data has been requested from Norfolk County Council climate change section, highways teams and emergency planners, all seven District Councils, Anglian Water, the Environment Agency and Norfolk Fire and Rescue Service.

Information in Strategic Flood Risk Assessments and River Basin Catchment Plans has also provided details of past flooding.

Due to the time constraints of the PFRA process only available and readily derivable information on past floods has been collected for this report. The data obtained varies considerably in timescales, detail and accuracy.

The process of collecting historical flood event data will continue past the submission of the PFRA and will help inform our Local Flood Risk Management Strategy and future Surface Water Management Plans.

3.2 Future Flood Risk Methodology

The assessment of future flood risk primarily relied on a technical review of the following documents and data:

Table 3.1 Documents and Data used in the Future Flood Risk Methodology

Title	Notes
The Annexes to the Final PFRA Guidance V2 – March 2011	Guidance provided by the Environment Agency to undertake this analysis
Property Points Layer (PPL)	This was included in the National Receptors Database (NRD) which was provided under licence by the Environment Agency. Each record has a geographical point with a code which indicates the category of the property (Residential, Police Station etc). An attribute called TOID links the record to polygons in the Mastermap layer
Mastermap topology layer	Ordnance Survey mapping provided under the Public Sector Mapping Agreement (PMSA)
Areas Susceptible to Surface Water Flooding January 2009. (AStSWF) – Intermediate thresholds	Provided under licence by the Environment Agency

Flood Map for Surface Water (FMfSW) version 1 - 1 in 200 chance of occurring in any year	Provided under licence by the Environment Agency
Places above Flood Risk Thresholds "Blue Squares Map"	Provided under licence by the Environment Agency

Stage 1: Preparing the property datasets

Mapping layers for each category of property were created by matching records in the PPL with polygons in the Mastermap layer. Each mapping layer was made up of polygons, each representing an individual property in the PPL.

Where a record in the PPL didn't have a corresponding Mastermap polygon, a 10m square around the point was included to ensure that all properties were represented in the layer.

Stage 2: Counting the properties within the flood risk areas

In line with the guidance, a layer of 1km Ordnance Survey National Grid squares was overlaid on the county. Properties in each category which intersected either the AStSWF or FMfSW datasets within the grid square were counted.

This resulted in the number of occurrences of each of the following property categories being recorded against each grid square:

- Residential
- People (this is equal to the number of residential properties multiplied by 2.34 (as per the guidance))
- Critical Infrastructure
- Non-Residential (including shops and businesses)

Stage 3: Results of analysis

The criteria used for the Environment Agency's "Blue Squares Map" were used to highlight those squares where a potential flood risk had been identified.

Table 3.2 Categories and Criteria

Category	Criteria
Residential	200 or more people
Critical Infrastructure	More than 1
Non-residential	20 or more

Stage 4: Further analysis

The guidance specified the use of 1km squares based on the Ordnance Survey National Grid. Using a single grid meant that some locations could be missed simply because they were not geographically located within a grid square i.e. they straddled 2 squares

To identify missed locations further analysis was carried out on 1km grids offset by 250, 500 and 750 metres in northerly and easterly directions. This resulted in 4 1km grids being analysed. A layer was created for each of the 3 offsets showing the results of this additional analysis. This highlighted some areas which met the criteria but which were not identified using the Ordnance Survey National Grid.

Stage 5: Final output

The following data and documents were produced:

Table 3.3 Final Output

Grid_Int200deep	A GIS layer of polygons forming a 1km Ordnance Survey Grid with the number of occurrences of each category
Grid_Int200deep_250	A GIS layer of polygons forming a 1km Grid that is offset from the Ordnance Survey grid by 250 metres with the number of occurrences of each category
Grid_Int200deep_500	A GIS layer of polygons forming a 1km Grid that is offset from the Ordnance Survey grid by 500 metres with the number of occurrences of each category
Grid_Int200deep_750	A GIS layer of polygons forming a 1km Grid that is offset from the Ordnance Survey grid by 750 metres with the number of occurrences of each category
Future Flood Risk Map	A layered PDF document presenting the results based on the Ordnance Survey grid
Future Flood Risk Map – alternative grids	A layered PDF document presenting the results based on the Ordnance Survey grid and including the 3 alternative grids.

4. Past flood risk

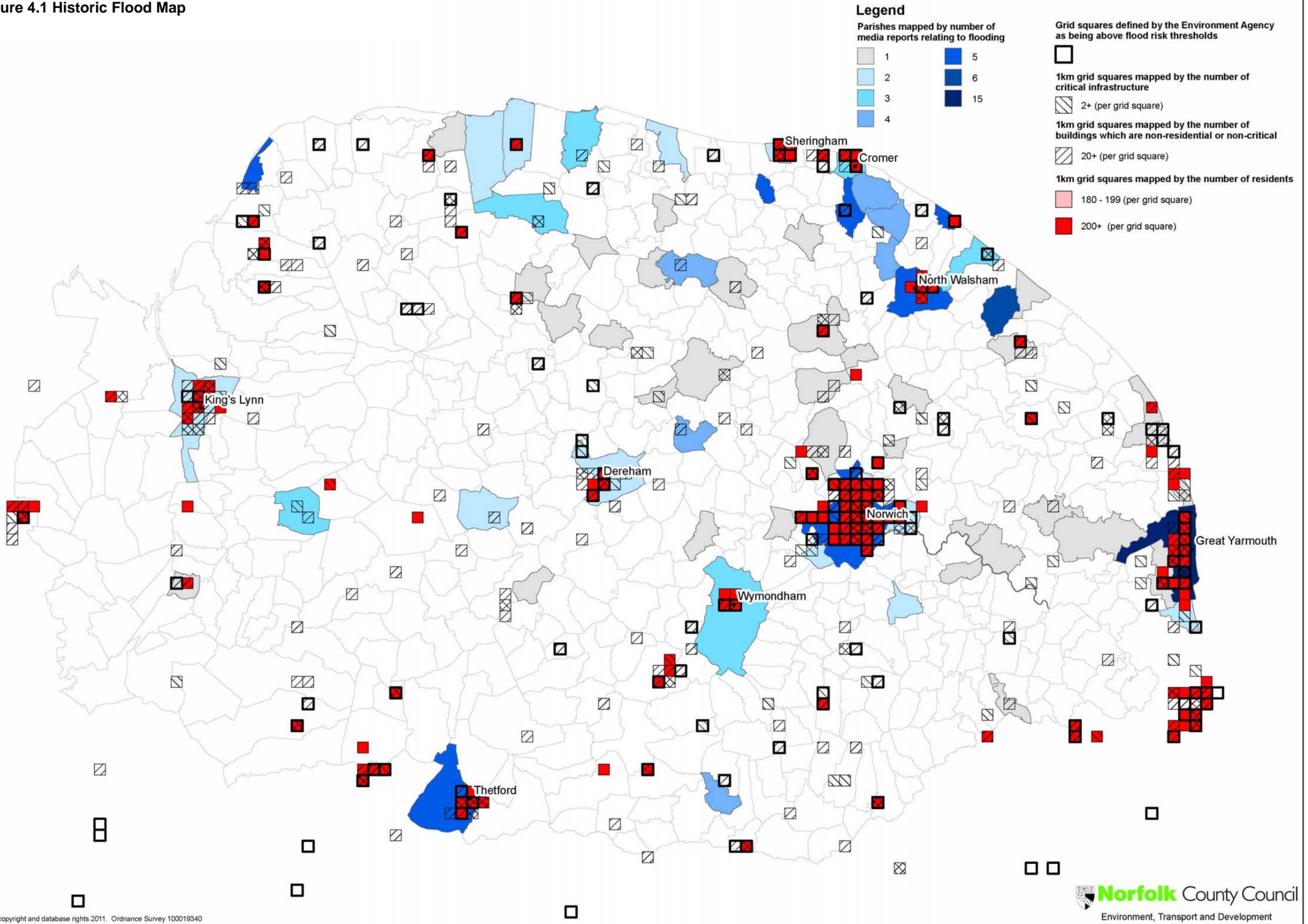
For the purpose of reporting historical flooding events in the PFRA Report, 'significant harmful consequences' have been set to match the criteria for the Indicative Flood Risk Areas. Due to the lack of information available and scale of recent flood events, no historic flood events have been considered to have had 'significant harmful consequences' and therefore none will be recorded in Annex 1 of the Preliminary Assessment Spreadsheet.

Local historical flood information has been collated and summarised from the last twelve years. Flood events that have affected more than one property or main roads have been detailed in [Annex ...](#)

Annex 6 Past Flood Risk Table

Figure 4.1 Historic Flood Map

Figure 4.1 Historic Flood Map



5. Future flood risk

As detailed in 'Future Flood Methodology' a single GIS layer was created out of the AStSWF(intermediate) and FMfSW(1:200 deep) and applied over the Mastermap and Property Point GIS layers to provide a consistent basis for prioritising local Future Flood Risk.

This detailed analysis of the Environment Agency mapping datasets has produced a locally agreed priority list of settlements and infrastructure that will inform the Local Flood Risk Management Strategy.

Surface Water Management Plans are in progress for the Norwich Urban Area and King's Lynn and West Norfolk Settlements. The more detailed data from these reports will be used when they become available.

The top thirty nine settlements are grouped into four priority bands, based primarily on the potential numbers of people at risk from flooding.

Table 5.1 Settlement Priority Ranking

Priority Ranking	Settlement	Potential impact within the Places above the Flood Risk Thresholds		
		Number of people	Critical Infrastructure	Non residential properties
1	Norwich (inc. Drayton, Taverham and Cringleford)	22,273	58	1,909
2	Gt. Yarmouth (inc. Gorleston and Bradwell)	6,875	31	720
	King's Lynn (inc North and South Wootton)	3,707	25	686
3	Dereham	1,964	12	279
	Thetford	1,812	11	286
	Cromer	1,690	0	294
	North Walsham	1,565	4	157
	Sheringham	1,505	2	75
	Wymondham	1,381	0	177
4	Snettisham	1,021	6	66
	Attleborough	832	6	183
	Caister	747	7	46
	Diss	534	2	111
	Long Stratton	264	3	79
	West Runton	274	0	80
	Heacham	208	2	37
	Downham Market	204	0	65
	Ormesby St. Margaret	281	2	445
	Aylsham	339	2	84
	Feltwell	393	2	118
	Burnham Market	459	0	242
	North and South Creake	257	0	132
	Fakenham	323	6	75
	Stalham	229	0	100
	Mundford	211	2	23
Harleston	597	2	23	

Wells	283	0	48
Mundesley	234	0	0
Spixworth	241	2	0
Ludham	218	2	0
Kenninghall	213	0	51
Terrington St. Clement	290	2	81
Weeting	234	0	0
Winterton	321	0	31
Narborough	328	2	0
Watlington	335	0	0
East Harling	276	0	0
Swaffham	206	0	0
Buxton	260	0	0

100 separate settlements and locations have been identified with critical infrastructure and non-residential properties at risk of flooding and been detailed in:

Annex 7 Future Flood Risk Table

Figure 5.1 Future Flood Risk Map

Further analysis of the offset 1km grids has highlighted 13 settlements that would fall into the 4th Priority Ranking. These are: Ellingham, Great Massingham, Hemsby, Hethersett, Horsford, Hunstanton, Mulbarton, Necton, North Creake, Poringland, Sporle, West Rudham and Weybourne

This analysis has also highlighted 46 separate settlements and locations with critical infrastructure and non-residential properties at risk of flooding and these have been detailed in:

Annex 7 Future Flood Risk Table

3 settlements fall just below the threshold of 200 or more people at risk of flooding. These are: Clenchwarton, Gayton and Mattishall.

Figure 5.2 Future Flood Risk Map – alternative grids

Figure 5.1 Future Flood Risk Map

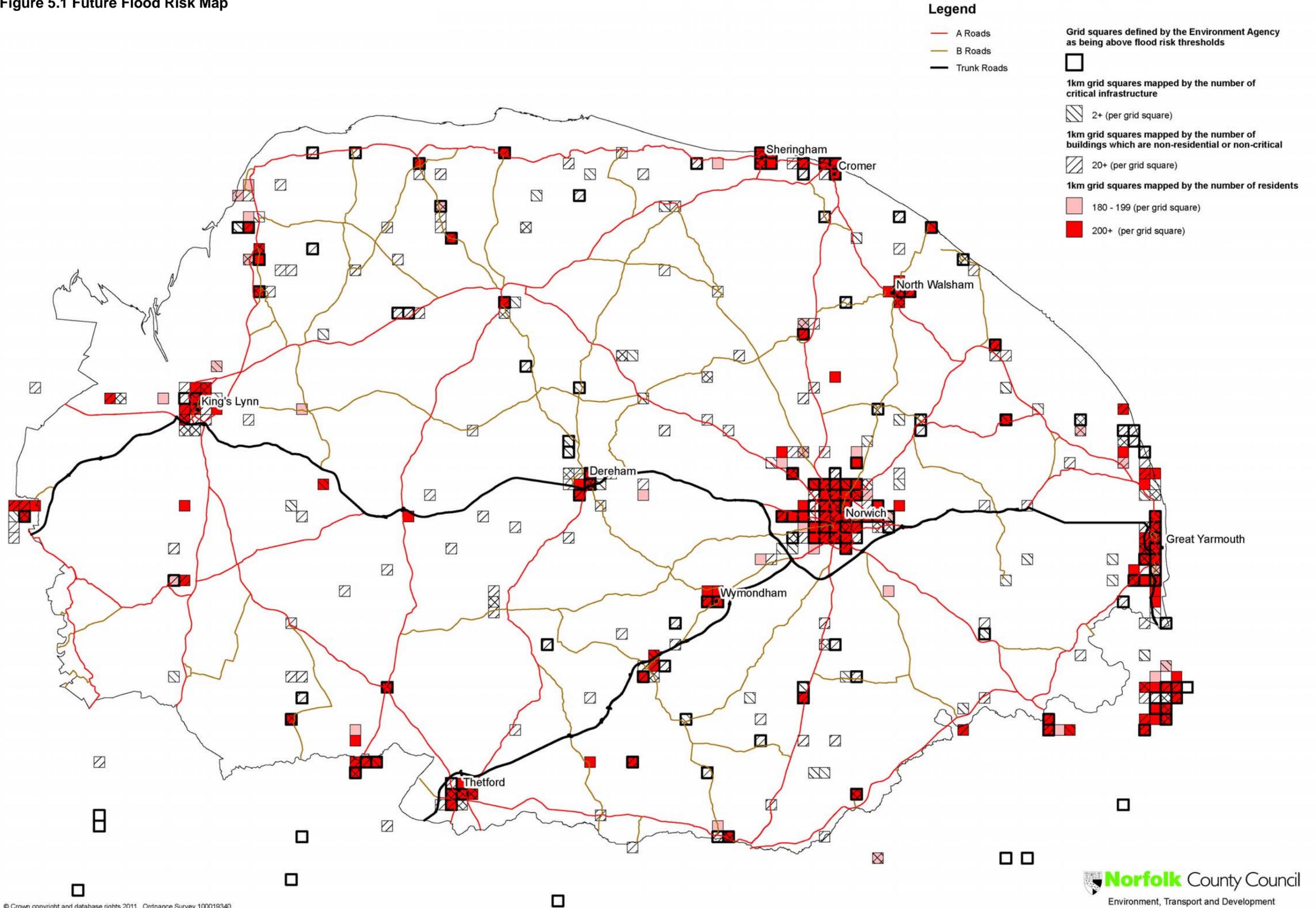
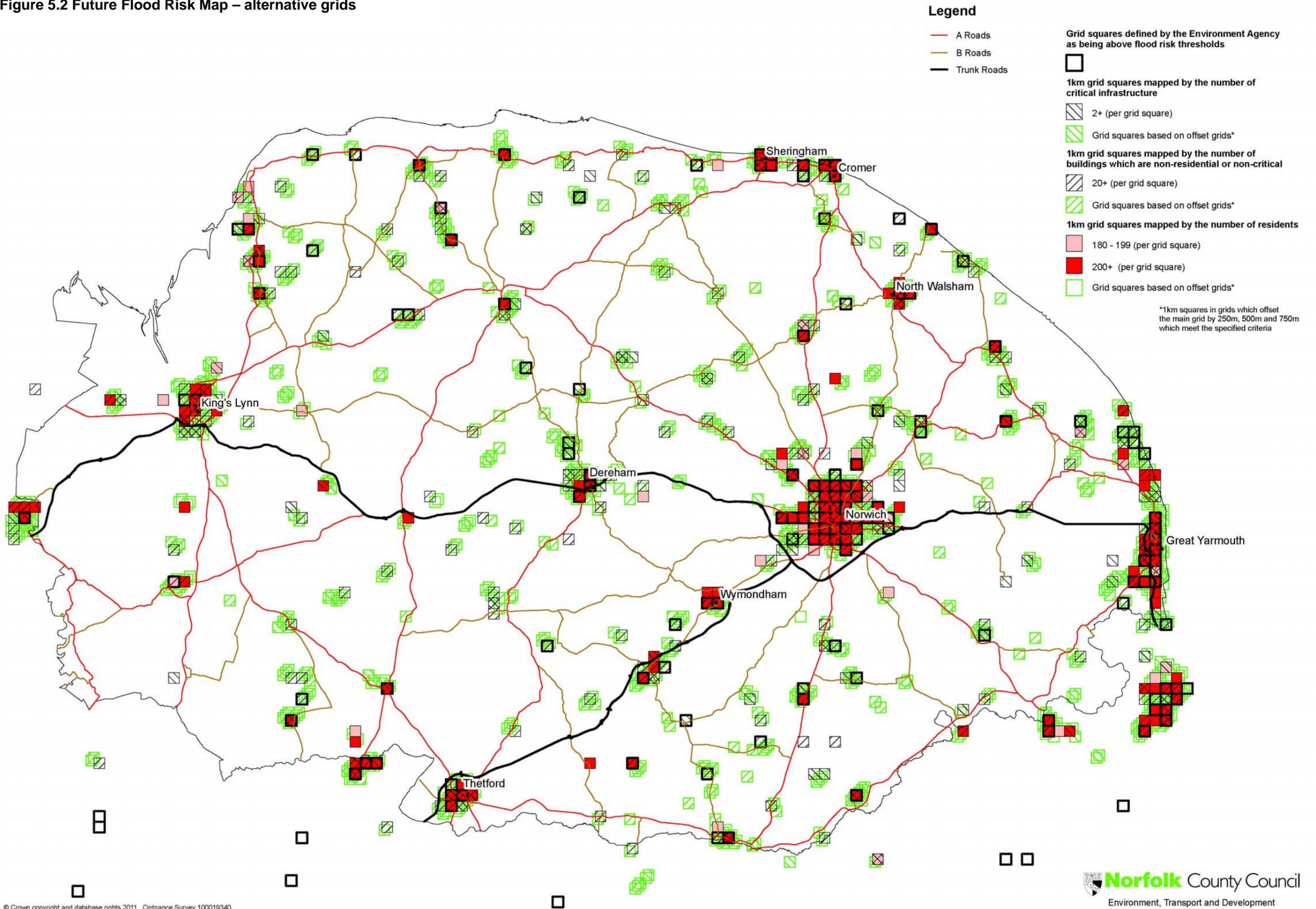


Figure 5.2 Future Flood Risk Map – alternative grids



5.1 The impacts of climate change

Section 1 – Common to all River Basin Districts

The Evidence

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

Over the past century around the UK we have seen sea level rise and more of our winter rain falling in intense wet spells. Seasonal rainfall is highly variable. It seems to have decreased in summer and increased in winter, although winter amounts changed little in the last 50 years. Some of the changes might reflect natural variation; however the broad trends are in line with projections from climate models. Greenhouse gas (GHG) levels in the atmosphere are likely to cause higher winter rainfall in future. Past GHG emissions mean some climate change is inevitable in the next 20-30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080s.

We have enough confidence in large scale climate models to say that we must plan for change. There is more uncertainty at a local scale but model results can still help us plan to adapt. For example we understand rain storms may become more intense, even if we can't be sure about exactly where or when. By the 2080s, the latest UK climate projections (UKCP09) are that there could be around three times as many days in winter with heavy rainfall (defined as more than 25mm in a day). It is plausible that the amount of rain in extreme storms (with a 1 in 5 annual chance or rarer) could increase locally by 40%.

Section 2 – River Basin District Specific

Key Projections for Anglian River Basin District

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

- Winter precipitation increases of around 14% (very likely to be between 3 and 31%)
- Precipitation on the wettest day in winter up by around 14% (very unlikely to be more than 29%)
- Relative sea level at Felixstowe very likely to be up between 10 and 41cm from 1990 levels (not including extra potential rises from polar ice sheet loss)
- Peak river flows in a typical catchment likely to increase between 8 and 16%

Implications for Flood Risk

Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability.

Wetter winters and more of this rain falling in wet spells may increase river flooding. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers, so we need to be prepared for the unexpected.

Drainage systems in the district have been modified to manage water levels and could help in adapting locally to some impacts of future climate on flooding, but may also need to be managed differently. Rising sea or river levels may also increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses. Even small rises in sea level could add to very high tides so as to affect places a long way inland.

Where appropriate, we need local studies to understand climate impacts in detail, including effects from other factors like land use. Sustainable development and drainage will help us adapt to climate change and manage the risk of damaging floods in future.

Section 3 – Common to all River Basin Districts

Adapting to Change

Past emission means some climate change is inevitable. It is essential we respond by planning ahead. We can prepare by understanding our current and future vulnerability to flooding, developing plans for increased resilience and building the capacity to adapt. Regular review and adherence to these plans is key to achieving long-term, sustainable benefits.

Although the broad climate change picture is clear, we have to make local decisions against deeper uncertainty. We will therefore consider a range of measures and retain flexibility to adapt. This approach, embodied within flood risk appraisal guidance, will help to ensure that we do not increase our vulnerability to flooding.

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."⁷

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. Review of indicative Flood Risk Areas

No nationally significant indicative Flood Risk Areas have been identified in Norfolk by the Environment Agency.

7. Identification of Flood Risk Areas

We are not proposing to identify any new nationally significant indicative Flood Risk Areas.

8. Next steps

The settlements and locations identified through the PFRA process will require detailed studies to enhance the understanding of potential flood risk and the nature of the consequences of future flooding. The Pitt Review and Planning Policy Statement 25 (PPS25) recommend the use of Surface Water Management Plans to gain this understanding and lead to work to mitigate flood risk and protect properties and structures.

8.1 Surface Water Management Plans

The following quote from Sir Michael Pitt's Review into the flooding of 2007 highlights the role of Surface Water Management Plans in attaining a greater understanding of the potential risk and consequences of flooding from sources of local flood risk, (i.e. flooding from surface water, groundwater and ordinary watercourses).

"Surface Water Management Plans (SWMPs) are referred to in PPS25 as a tool to manage surface water flood risk on a local basis by improving and optimising co-ordination between relevant stakeholders. SWMPs will build on Strategic Flood Risk Assessments (SFRAs) and provide the vehicle for local organisations to develop a shared understanding of local flood risk, including setting out priorities for action, maintenance needs and links into local development frameworks and emergency plans.⁴"

Through the SWMP process a detailed model, using topographical, land use and drainage data, is created and utilised to simulate extreme rainfall events. The mapped results from the model provide a vital tool to explain the potential flood risk to residents and property owners. The model can also be used to examine the suitability of mitigation measures such as flood water storage or flood flow routes and thereby inform appropriate and commensurate action.

SWMPs also enable important aspects of community engagement through the interpretation of local flood risk priorities within affected communities. This aims to bring the wider community including local members, businesses, property owners and residents to a similar appreciation of the risk posed to their community by sources of localised flooding. This affords the assessment of the predictive models against the knowledge of historic flood events existent within the community. This process has worked very well as part of the Norwich Urban Area SWMP which has led to high levels of community involvement throughout the development of the plan.

8.2 Settlements in priority ranking 1 and 2

Work started on the Norwich Urban Area SWMP in January 2010 after an allocation of Defra Early Action funding. The SWMP all of the Norwich City Council area; Cringleford, New Costessey and Trowse Newton in South Norfolk and Drayton, Hellesdon, Old Catton, Sprowston, Taverham and Thorpe St. Andrew in Broadland. Current work includes mitigation options and public engagement. It is scheduled to complete at the end of June 2011.

Work started on the King's Lynn and West Norfolk Settlements SWMP in July 2010 with funding from the Borough Council of King's Lynn and West Norfolk. Current work includes detailed assessment and pluvial modelling. It is scheduled to complete at the end of October 2011.

Work is underway to gather agreement and progress a SWMP for Great Yarmouth Borough. This SWMP would cover the Yarmouth urban area, Caister on Sea, Hemsby, Ormesby, California and Hopton.

8.3 Settlements in priority ranking 3 and 4

Phase 1 SWMP studies will be carried out on these settlements to determine their suitability for further work.

Agreement will be sought to progress SWMPs earlier in settlements with predicted growth in housing such as Thetford, Wymondham and Attleborough; where settlements have an existing flood risk issue such as North Walsham and Dereham; and where clusters of settlements have potential flooding risk such as Corner, West Runton and Sheringham.

Snettisham, Heacham Downham Market, Feltwell, Burnham Market, North and South Creake and Terrington St. Clement are already being studied in the King's Lynn and West Norfolk Settlements SWMP.

8.4 Settlements and locations below priority ranking 4

The 100 separate settlements and locations that have been identified with critical infrastructure and non-residential properties at risk of flooding require further study into their significance. This might be through a SWMP if the settlements and locations fall within a SWMP study area or through a separate county-wide study working with the property owners, businesses or utility companies.

Further work is also required to understand the impact of flooding from local sources on important historical and environmental sites.

Norfolk County Council has studied the resilience to flooding of the Trunk, A and B Roads in the County. However, this work concentrated on potential flooding from the main rivers and the sea. A more detailed study, drawing from the data provided in the PFRA and including the rail network will need to be undertaken. The affects of surface water flooding on the road and rail network have and will be considered in areas studied in Surface Water Management Plans.

Due to the high level of this assessment no information on major areas of drainage capacity failure was available or readily derivable. Further study of the drainage capacity will be carried out through Surface Water Management Plans in the priority settlements.

8.5 Flood reporting and investigations

Under the Flood and Water Management Act 2010 (FWMA), Lead Local Flood Authorities (LLFAs) have a duty to investigate flooding incidents across their area (where appropriate or necessary) to identify the role and response of Flood Risk Management Authorities. As part of this duty where a formal investigation is undertaken there is an expectation that its findings will be published.

In addition, work as part of the Norwich Surface Water Management Plan (SWMP) has identified the need to ensure consistency in the recording of flooding incidents. This is due to the large number of organisations that have a role in Local Flood Risk Management but also due to the lack of a coordination function existing before the commencement of the FWMA. As such it is likely that the initial capturing of flood information will still remain a function of individual Risk Management Authorities within their administrative areas. It is however appropriate to the requirements of the Act that Norfolk County Council collate this information to inform future assessments and reviews for input into strategies and projects.

8.6 Monitoring and review

Rainfall and, where applicable, flow monitoring will take place in areas that are identified as 'Critical Drainage Areas' CDAs in the SWMP studies. This monitoring will provide valuable data to support the development and funding of potential mitigation measures.

Actions and agreements that stem from the completion of these SWMPs and studies will feed into the Local Flood Risk Management Strategy and provide a list of priorities for future policy, projects and engagement.

The formal review of this PRFA Report will occur every 6 years from June 2011, but it will be reviewed internally on an annual basis and updates on progress and studies will be provided to all future NWMP meetings.

8.7 Scrutiny procedures

The draft PFRA Report was submitted to the EA for review on the 22 June 2011 after consultation with the Norfolk Water Management Partnership and review by the NCC Flood and Water Management Team.

Following a review by the local EA team the final PFRA Report has been approved by the Portfolio Holder for Environment and Waste at Norfolk County Council.

The EA will publish all PFRA reports and Flood Risk Areas by 22 December 2011.

References

1. Norfolk County Council - Norfolk Insight
<http://www.norfolkinsight.org.uk/population>
2. Environment Agency - PFRA Final Guidance report – GEHO1210BTGH-E-E
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3. Making Space for Water HA4a pilot
4. Sir Michael Pitt - Lessons Learnt from the 2007 Summer Floods
<http://www.environment-agency.gov.uk/research/library/publications/33889.aspx>
5. Flood and Water Management Act 2010
<http://www.legislation.gov.uk/ukpga/2010/29/contents>
6. DEFRA – Selecting and reviewing Flood Risk Areas for local sources of flooding.
<http://ww2.defra.gov.uk/environment/flooding/>
7. PPS25 – Planning Policy Statement 25
<http://www.communities.gov.uk/publications/planningandbuilding/pps25floodrisk>

Other sources:

Norwich City Council - Strategic Flood Risk Assessment; Level 2

Kings Lynn & West Norfolk - Strategic Flood Risk Assessment

Great Yarmouth and Gorleston - Strategic Flood Risk Assessment

Broadland, North Norfolk, South Norfolk District Councils, Norwich City Council and the Broads Authority - Strategic Flood Risk Assessment; Inception Report

Breckland - Strategic Flood Risk Assessment

Great Ouse - Catchment Flood Management Plan

Broadland Rivers - Catchment Flood Management Plan

North Norfolk - Catchment Flood Management Plan

Norfolk County Council, Norwich City Council, Broadland and South Norfolk District Council – Norwich Urban Area Surface Water Management Plan