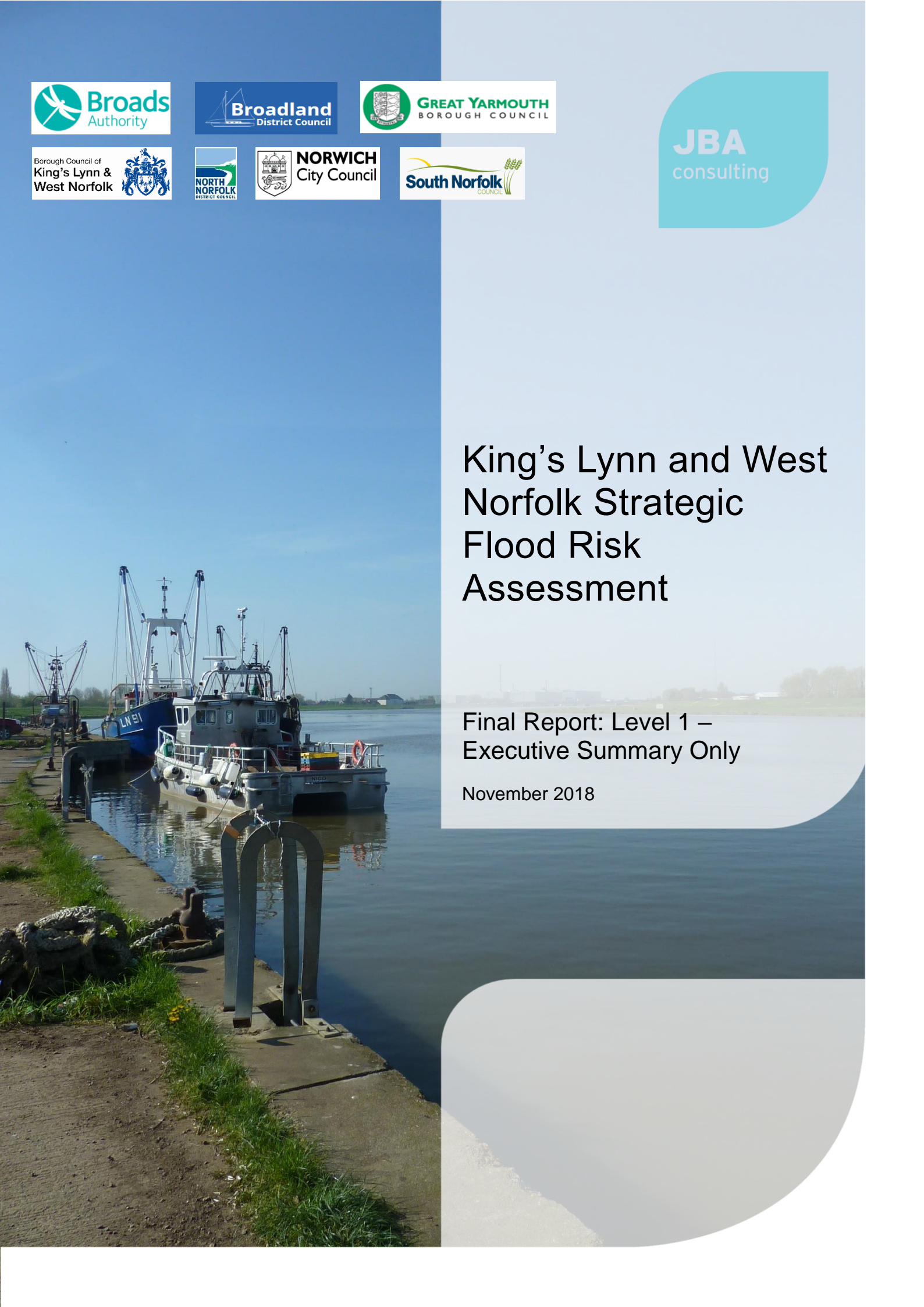




King's Lynn and West Norfolk Strategic Flood Risk Assessment

Final Report: Level 1 – Executive Summary Only

November 2018





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Revision History

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Contract

This report describes work commissioned on behalf of a consortium of local planning authorities in Norfolk:

- Broadland District Council
- Great Yarmouth Borough Council
- Borough Council of King's Lynn and West Norfolk
- Norwich City Council
- North Norfolk District Council
- South Norfolk Council
- Broads Authority

Each authority was represented as part of a steering group for the SFRA. The steering group's representative for the contract was North Norfolk's Policy Team Leader, Iain Withington. Sophie Dusting, Ffion Wilson, Freyja Scarborough and Roberta Whittaker of JBA Consulting carried out this work.

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Purpose

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- Environment Agency;
- Internal Drainage Boards (Downham Market Group of IDBs, East Harling IDB, Middle Level Commissioners, Water Management Alliance, Waveney IDB);
- Anglian Water;
- Highways England; and,
- Planners at the neighbouring authorities and LLFAs

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Executive Summary

Introduction

Norfolk Local Planning Authorities (LPAs) have a long track record of cooperation and are working together on strategic cross-boundary planning issues, through the Norfolk Strategic Framework. One of the aims of the framework is to inform the preparation of future Local Plans, through shared objectives and strategic priorities.

Strategic Flood Risk Assessments (SFRAs) form part of the evidence base of the Local Plan and can be used to inform the Sustainability Appraisal. The requirement for the preparation of SFRAs is detailed in Section 14 Paragraph 156 of the **National Planning Policy Framework (NPPF)**.

A consortium of Norfolk LPAs, comprising Broadland District Council, Great Yarmouth Borough Council, the Borough Council of King's Lynn and West Norfolk, North Norfolk District Council, Norwich City Council, South Norfolk Council and the Broads Authority, have commissioned new Level 1 SFRAs to inform strategic planning decisions, the preparation of Local Plans and to inform development management decisions. These councils are local planning authorities for their respective administrative areas, with the exception of the Broads Executive Area, where the Broads Authority is the Local Planning Authority.

The Level 1 SFRAs comprise the following four reports:

- 2017 Greater Norwich Area SFRA, covering the Norwich City Council, Broadland District Council, South Norfolk Council and parts of the Broads Authority administrative areas
- 2017 North Norfolk SFRA covering the North Norfolk District Council and parts of the Broads Authority administrative areas
- 2017 Great Yarmouth SFRA covering the Great Yarmouth Borough Council and parts of the Broads Authority administrative areas
- 2018 King's Lynn and West Norfolk SFRA covering the Borough Council of King's Lynn and West Norfolk

Within this 2018 SFRA report, when reference is made to the 'combined study area' and this is the whole area covered by the four reports listed above.

The 2018 SFRA document replaces the previous King's Lynn and West Norfolk SFRA originally published in 2008. The main purpose of the 2018 SFRA is to inform the selection of options for the Local Plan allocations and support determination of planning applications for King's Lynn and West Norfolk Borough.

SFRA objectives

The key objectives of the 2018 Strategic Flood Risk Assessment are:

- To provide up to date information and guidance on flood risk for King's Lynn and West Norfolk Borough, taking into account the latest flood risk information and the current state of national planning policy;
- To determine the variations in risk from all sources of flooding in King's Lynn and West Norfolk Borough, taking into account climate change;
- To identify the requirements for site-specific flood risk assessments;
- To consider opportunities to reduce flood risk to existing communities and developments;
- To enable the Borough Council of King's Lynn and West Norfolk to apply the Sequential Test;
- To aid the Borough Council of King's Lynn and West Norfolk in identifying when the Exception Test is required and when a more detailed Level 2 SFRA will be required, when determining strategic site allocations; and,
- To inform the Sustainability Appraisal of the Borough Council of King's Lynn and West Norfolk Local Plan, so that flood risk is taken into account when considering strategic site allocations.



SFRA outputs

This report fulfils the Level One SFRA requirement.

To meet the objectives, the following outputs have been prepared:

- Assessment of all potential sources of flooding (see Sections 5 and 6)
- Assessment of the potential impact of climate change on flood risk (see Sections 4 and 5)
- Mapping of all potential sources of flooding including climate change (see Appendix A)
- Mapping of location and extent of functional floodplain (see Appendix A)
- Mapping of “dry islands” (see Appendix A)
- Assessment of standard of protection provided by existing flood risk management infrastructure (see Section 7)
- Mapping of areas covered by Environment Agency Flood Warnings (see Section 6.10.2 and Appendix C)
- Review of opportunities to reduce flood risk to existing communities and development (see Section 10)
- Guidance for developers including requirements for site-specific flood risk assessments and general advice on the requirements and issues associated with Sustainable Drainage Systems (SuDS) (see Sections 8 and 9)
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk (see Section 3).

Summary of the SFRA

Appraisal of flood risk

- There have been a number of recorded flood incidents across the Borough, from a combination of sources. The predominant source of flooding is from tidal sources, although recent flooding has been largely from surface water. Under Section 19 of the Flood and Water Management Act, Norfolk County Council in their role as Lead Local Flood Authority, have published two reports within the Borough of King's Lynn and West Norfolk; one investigation concerning the event on 6th November and 23rd December 2012 at Sutton Road, Walpole Cross Keys and another investigation concerned the rainfall events that caused 42 properties to flood in the Borough between early June and late November 2014. Section 19 reports are available to download from Norfolk County Council's [website](#). A total of 47 flood incidents along the A47 highway have been recorded since July 2008, by Highways England. Most recently, surface water flooding affected the Borough in July 2018. Historic flooding is discussed further in Section 6.1.
- Fluvial flooding is one of the primary sources of flood risk within the Borough of King's Lynn and West Norfolk. The most significant watercourse in terms of fluvial risk is the River Great Ouse; however, there are several other watercourses that pose a significant risk. Due to their low-lying elevations, many settlements across the Fens area are at risk of flooding from watercourses that are substantially influenced by high tide levels. In addition, fluvial/tidal flooding also gives rise to the risk of flooding in the event of overtopping / breach from embanked watercourses that are higher than the adjacent land. As water levels in the Fens area are heavily managed by Internal Drainage Boards (IDBs), a mechanical or structural failure of engineering installations such as land drainage pumps, sluice gates, lock gates, outfall flap valves etc. or their support infrastructure (i.e. power supplies in the case of drainage pumps) could exacerbate flooding. Fluvial flooding is discussed further in Section 6.4.
- The low-lying areas in the west and south of the Borough that belong to the Fens are highly susceptible to tidal flooding. The actual tidal flood risk within the Great Ouse catchment is generally considered to be low, due to the defences in place and the standard of protection provided. Tidally influenced water levels have the potential to rise over embankments and inundate the land behind them in the Nene catchment. The greatest risk related to tidal flooding in the Borough would be if a spring tide coincided with a major storm surge event.



Tidal flood defences are essential to preventing the inundation of the Fens and with them a significant portion of the study area. Tidal flooding is discussed further in Section 6.5.

- Coastal erosion is a predominant process along Hunstanton Cliffs causing potential threats to settlements and coastal defences. The emerging **Hunstanton Coastal Management Plan** will address these issues by defining a plan to manage the coastline at a local level. The (2010) **North Norfolk Shoreline Management Plan** (SMP) covering Hunstanton to Kelling and the (2010) **The Wash SMP** covering Gibraltar Point to Old Hunstanton describe the high level strategy and coastal policies. It should be noted that the policies described in the SMPs do not always focus on the “hold the line” approach. For example, at Hunstanton Cliffs, in the short and medium term the strategy of no active intervention will be used, allowing the cliffs to erode naturally. Section 2.9 outlines the SMP strategies in the Borough and coastal flood risk is discussed further in Section 6.6.
- Watercourses in IDB districts are managed for water level and flood risk management. There are 18 IDBs which operate in the Borough of King's Lynn and West Norfolk; the IDBs are administered by four organisations: Downham Market Group of Internal Drainage Boards, Ely Group of Internal Drainage Boards, Middle Level Commissioners and Water Management Alliance. The full list of IDBs in the Borough is contained in Section 2.12.4; the coverage of IDB districts is shown in Appendix B. The IDB policy statements on flood protection and water level management have been used to determine the general standard of flood protection provided to each IDB District:
 - Downham Market Group: The policy statements for **Downham and Stow Bardolph, the East of Ouse, Polver and Nar, the Northwold, the Southery and District, the Stoke Ferry and Stringside** IDBs state that the board seeks to maintain a general standard of protection for agricultural land and developed areas of 1 in 20-years and 1 in 100-years respectively. The policies acknowledge that the likely return period cannot be taken literally and should be considered as a chance of some over-spilling from the system taking place each year as being 5% and 1% respectively.
 - The Ely Group of Internal Drainage Boards: The Burnt Fen **policy statement** and the Littleport and Downham **policy statement** state that, the board seeks to maintain for agricultural land and developed areas of land, a standard of protection of 1 in 20-years and 1 in 100-years respectively. The policies acknowledge that the return period cannot be taken literally and should be considered as a chance of some over-spilling from the system taking place each year as being 5% and 1% respectively.
 - Middle Level Commissioners: The **Churchfield and Plawfield, Euximoor, Hundred Foot Washes, Hundred of Wisbech, Manea and Welney, Needham and Laddus, Nordelph** and **Upwell** policy statements provide varying standards of protection levels and should be referred to separately.
 - Water Management Alliance: The King's Lynn IDB **policy statement** and the Norfolk Rivers IDB **policy statement** states that the Boards will seek to maintain a general standard of protection against flooding of 1 in 10-years with 600mm of freeboard to agricultural land and 1 in 100-year with 300mm freeboard to developed areas. The policy statement acknowledges that the standards cannot be taken literally and that some over-spilling from the systems may occur during these events.
- The Risk of Flooding from Surface Water (RoFfSW) dataset shows that surface water predominantly follows topographical flow paths of existing watercourses or dry valleys, with some isolated ponding located in low-lying areas. The Stage 1 **King's Lynn and West Norfolk Settlements Surface Water Management Plan** (SWMP) initially addressed several localities that had suffered surface water flooding or carry a high surface water flood risk. The Stage 2 work focused on producing surface water flood risk mapping for the four highest priority areas: King's Lynn, Downham Market, Heacham and Snettisham. The SWMP identified six critical drainage catchments in King's Lynn, two critical drainage catchments at Downham Market and a critical drainage catchment at Wimbotsham, Snettisham and Heacham. Surface water flood risk is discussed further in Section 6.7.
- Groundwater plays a role in coastal erosion, as water within the rock strata can create instabilities within coastal cliffs. The Areas Susceptible to Groundwater flooding (ASStGWf) dataset shows that areas more susceptible to groundwater flooding are generally



associated with the valleys of watercourses and along coastline areas. The AStGWf dataset is shown in Appendix A. Due to the characteristics of The Wash and the underlying Chalk features there is the potential for groundwater flooding. The lowest lying areas however tend to be the Fens and are highly managed, so it is reasonable to assume that the pumping infrastructure operated by the Internal Drainage Board maintains a low water table. This reduces the probability of groundwater flooding. Groundwater flooding is discussed further in Section 6.8.

- Historical incidents of flooding are detailed by Anglian Water in their sewer flooding register. This database records incidents of flooding relating to public foul, combined or surface water sewers and identifies which properties suffered flooding. A total of 118 recorded flood incidents have been identified on the sewer flooding register for the Borough of King's Lynn and West Norfolk. Flood risk from sewers is discussed further in Section 6.9.1.
- There are no records of flooding from reservoirs impacting properties inside the study area. Flood risk from reservoirs is discussed further in Section 6.9.2 and is mapped in Appendix A.
- Currently there are 14 Flood Alert Areas and 31 Flood Warning Areas (FWAs) covering the study area. Mapping showing the coverage of the Flood Alert Areas and FWAs is provided in Appendix C.
- A high-level review was undertaken to identify the main settlements where flood risks / extents are more prominent; this is shown in Table 6-6. If a settlement is not listed in this table this does not mean that the settlement is not at flood risk. The mapping provided in Appendix A can be used as a high-level screening exercise, to identify whether a location or site has a potential risk of flooding.
- The mapping of all potential sources of flooding including climate change is provided in Appendix A.

Climate change

The NPPF and accompanying Planning Practice Guidance set out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. The Environment Agency published **updated climate change guidance** on 19 February 2016 (further updated on 3 February 2017), which supports the NPPF and must now be considered in all new developments and planning applications. UK Climate Predictions are currently being updated and are due for release in late 2018. Following this, the Environment Agency guidance will be updated.

The climate change allowances used in the Strategic Flood Risk Assessment are detailed in Sections 4 and 5. Climate change modelling for watercourses and coastal areas across the combined study area was undertaken where detailed models exist and were available and supplied at the time of preparing this SFRA. Where existing detailed models were not re-run and mapped for climate change, this is documented in Appendix D. Further details and guidance for developers is contained in Section 4 and 8. The mapping of all potential sources of flooding including climate change is provided in Appendix A.

Flood defences

There are a number of Environment Agency assets throughout King's Lynn and West Norfolk Borough. The assets comprise a mixture of embankments, dunes, bridge abutments, demountable defences, walls and Flood Storage Areas. The standard of protection provided by these assets varies, as does the condition. The flood risk analysis in Section 7 indicates that much of the Borough is heavily dependent on flood defences to protect settlements from flooding, particularly from tidal / coastal sources. For example, the 2015 breach modelling of the Great Ouse shows that significant areas of the Borough of King's Lynn and West Norfolk are at risk should the defences breach.

Further information on flood defences and schemes in the Borough is provided in Section 7. Mapping showing the location, type and condition flood defences across the Borough is provided in Appendix E; this also displays the design standard of protection offered by the defences.

Development and flood risk

The Sequential and Exception Test procedures for both Local Plans and Flood Risk Assessments (FRAs) are documented in Section 3, along with guidance for planners and developers throughout



the report. Links are provided to various relevant guidance documents and policies published by other Risk Management Authorities, such as the LLFA and the Environment Agency.

Dry Islands

Dry islands can present specific hazards, primarily the provision of safe access and egress during a flood event. The results show that there are 564 dry islands in the Borough of King's Lynn and West Norfolk. These are mainly in the southern and western areas of the Borough and a few dry islands cross administrative boundaries into neighbouring districts.

Dry islands are discussed in Section 6.10.3; this section expands further on the assumptions used to map dry islands and further considerations. Dry islands are mapped in Appendix A.

Relevant studies

There are many relevant regional and local studies which complement the SFRA and have been considered, such as the Catchment Flood Management Plan, River Basin Management Plan, the Preliminary Flood Risk Assessment, Local Flood Risk Management Strategies and SMPs. Other policy considerations have also been incorporated, such as sustainable development principles, climate change and flood risk management. Relevant policy is discussed in Section 2 and policy considerations have been referenced throughout the report.

Policy Recommendations

The following policy recommendations are to be considered by the Borough Council of King's Lynn and West Norfolk in the development of the Local Plan.

Development and planning considerations

Sequential approach to development

It is recommended that the sequential approach is adopted for all future developments within the Borough of King's Lynn and West Norfolk.

New development and re-development of land should wherever possible seek opportunities to reduce overall level of flood risk at a site.

Sequential and Exception tests

The SFRA has identified that areas of King's Lynn and West Norfolk Borough are at high risk of flooding from tidal, coastal, fluvial and surface water sources. Therefore, proposed development sites will be required to satisfy the Sequential and, where necessary, Exception Tests in accordance with the NPPF. The Borough Council of King's Lynn and West Norfolk should use the information in the 2018 SFRA when deciding which development sites to take forward in their Local Plan.

Site-specific Flood Risk Assessments

Local Planning Authorities should steer all development to Flood Zone 1 and take a sequential approach to development. If this is not possible, developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances), to inform the sequential approach within the site and prove, if required, whether the Sequential and Exception Tests are satisfied (for windfall sites not included in the plan evidence on the Sequential Test must be submitted in FRAs).

The Flood Zones, whilst generally accurate on a large scale, are not provided for land where the catchment of the watercourse falls below 3km². There are a number of small watercourses and field drains which may pose a risk to development. Therefore, whilst these smaller watercourses may not be shown as having flood risk on the flood risk mapping, it does not necessarily mean that there is no flood risk. As part of a site-specific FRA the potential flood risk and extent of flood zones should be determined for these smaller watercourses. The Risk of Flooding from Surface Water map can be a useful starting point for identifying floodplains in small catchments.

Where a site-specific FRA has produced modelling outlines which differ from the EA's Flood Map for Planning (Rivers and Sea) then the model can be submitted to the EA for an Evidence Based Review.. Where the modelling and results are deemed acceptable to the EA, amendments to the Flood Map for Planning (Rivers and Sea) may take place.

Where the watercourses are embanked, the effect of overtopping and breach must be considered and appropriately assessed.



All new development within the 1% Annual Exceedance Probability (AEP) flood extent including an allowance for climate change (for the lifetime of the development) must not normally result in a net loss of flood storage capacity. Annual Exceedance Probability is the probability (expressed as a percentage) of a flood event occurring in any given year. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage. Where proposed development results in a change in building footprint, the developer should ensure that it does not impact upon the ability of the floodplain to store or convey water and seek opportunities to provide floodplain betterment. Similarly, where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain should normally be provided to ensure that the total volume of the floodplain storage is not reduced.

There are a number of guidance documents which provide information on the requirements for site-specific FRAs:

- **Standing Advice on Flood Risk (Environment Agency);**
- **Flood Risk Assessment for Planning Applications (Environment Agency);** and,
- **Site-specific Flood Risk Assessment: CHECKLIST (NPPG, Defra).**

The Environment Agency has also produced a guidance document called "Flood risk assessment: Climate Change allowances" which details the application of current climate change allowances and local considerations in East Anglia. This document, alongside other flood risk guidance, is available from: <https://www.norfolk.gov.uk/rubbish-recycling-and-planning/flood-and-water-management/information-for-developers>.

Developers are further advised to refer to policies DM 18 and DM 21 in the **Site Allocations and Development Management Policies Plan**. This details requirements for sites located in coastal flood risk hazard zone (Hunstanton to Dersingham) as defined in the Council's Policies Map (DM 18) as well as for sites in areas at risk of flooding (DM 21). Developers should note that changes may have been made to these policies since the publication of this document and that they should seek the most up to date guidance to refer to. Developers are also advised to consult the Council's webpage called: "**Information for planning agents**" which provides further information on flood risk and design guidance.

Developers should consult with the Borough Council of King's Lynn and West Norfolk, Norfolk County Council, the Environment Agency, Anglian Water and, where necessary, relevant IDBs at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling, and drainage assessment and design. If applications cross administrative boundaries, the neighbouring LLFAs, Suffolk County Council, Cambridgeshire County Council and Lincolnshire County Council may need to be approached.

Further guidance for developers can be found in Section 8.

Surface water management and SuDS

- Developers should consult Norfolk County Council's guidance for developers: Norfolk County Council, **Lead Local Flood Authority, Statutory Consultee for Planning, Guidance Document (2017)**. The guidance provides information on how SuDS proposals for new developments will be considered by the LLFA, when to consult the LLFA, how to screen applications based on local flood risk and records, LLFA standing advice (for Ordinary Watercourse consenting, major development below LLFA thresholds and minor development), the levels of information required for planning applications and technical guidance. The technical guidance is split into the following themes:
 - Local flood risk guidance
 - Drainage hierarchy
 - Infiltration testing guidance
 - Runoff rates
 - Runoff volumes
 - Climate change
 - Management and maintenance
 - Flood exceedance management
- Planners should be aware of local conditions and requirements set by either the Downham Market Group of IDBs, Ely Group of IDBs, Middle Level Commissioners or the Water



Management Alliance. Further details regarding their policies for development and SuDS can be found on their websites:

- <http://www.downhammarketidbs.org.uk>
 - <http://www.elydrainageboards.co.uk>
 - <https://middlelevel.gov.uk/>
 - <https://www.wlma.org.uk/>
- Developers who wish to have their SuDS schemes considered for adoption by Anglian Water should refer to the **Anglian Water SuDS Adoption Manual¹**. Anglian Water also expect national guidance (i.e. **the CIRIA C753 SuDS Manual**) to be referred to in addition to Anglian Water's guidance.
 - It should be demonstrated through a Surface Water Drainage Strategy, that the proposed drainage scheme, and site layout and design, will provide an appropriate standard of protection from surface water flooding to properties and critical infrastructure from flooding from surface water both on and off site. A detailed site-specific assessment of SuDS would be needed to incorporate SuDS successfully into the development proposals. All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff. The 2015 **DEFRA non-statutory technical standards for sustainable drainage systems** should be followed, alongside the LLFA guidance note and national guidance.
 - For proposed developments, geotechnical investigations should be undertaken to determine whether the ground at the site has infiltration potential. This information should be representative of on-site conditions. If the ground at the site is found to have infiltration potential, detailed infiltration testing should be undertaken in line with BRE 365 to establish representative infiltration rates. The LLFA have published information relating to infiltration tests within their **guidance document**.
 - A number of Groundwater Source Protection Zones have been identified throughout King's Lynn and West Norfolk Borough (see Section 9.4.1). Where sites lie within or close to aquifers (see Section 6.2), treatment steps may be required ahead of discharge to the ground, sewers etc. Development proposals at sites across the area should assess the pollution risk to receiving waterbodies and include appropriate treatment steps ahead of any discharge to surface or groundwaters. The CIRIA C753 SuDS manual provides further guidance on this issue.
 - A management and maintenance plan of sustainable drainage and surface water systems covering the lifetime of the development will be required. Consideration must also be given to the residual risks associated with the use of SuDS.

Further information on surface water and SuDS is provided in Section 9.

Council review of planning applications

The Council should consult the Environment Agency's '**Flood Risk Standing Advice (FRSA) for Local Planning Authorities**', last updated 15 April 2015, when reviewing planning applications for proposed developments at risk of flooding. The Council will consult the relevant statutory consultees as part of the planning application assessment and they should also contact non-statutory consultees (e.g. IDBs or Anglian Water) that have an interest in the planning application.

Infrastructure and safe access

Finished floor levels and safe access and egress

Finished floor level guidance has been established through consultation with the Environment Agency.

Minimum finished floor levels for development should be above whichever is higher of the following:

- a minimum of 600mm above the 1% AEP fluvial event plus an allowance for climate change.
- a minimum of 600mm above the 0.5% AEP tidal event plus an allowance for climate change.

¹ At the time of preparing this SFRA, Anglian Water's current manual is expected to be revised to take account of national guidance published after the manual and Anglian Water's position regarding health and safety matters associated with open SuDS features.



- 300mm above surrounding ground levels

A 300mm freeboard is only applicable where detailed modelling is available which is deemed to be reliable. If no detailed and reliable modelling is available, the Environment Agency may require a 600mm freeboard to be applied when setting minimum finished floor levels.

There is specific design flood level guidance relating to the application and use of the Tidal Hazard Mapping Models for the River Nene and River Great Ouse (see Section 8.2.6) which considers the impact of a breach of tidal defences. Developers are advised to consult the flood design guidance relating to the application and use of this modelling on the Council webpage called: **“Information for planning agents”**.

With regards to LLFA guidance and surface water flood risk, finished floor levels are recommended to be set to a minimum of 300mm above the 1% AEP plus an allowance for climate change flood levels (including anticipated flood levels within the drainage system). If there is an uncertainty in flood levels, the freeboard level should be increased from 300mm to 600mm. The LLFA would also expect a minimum of at least 150mm freeboard between proposed external ground levels and the property finished floor level. Further information can be found in the **LLFA guidance document**.

Safe access and egress to a locally identified refuge area will need to be demonstrated at all development sites. Ideally, waterproof construction techniques used. If safe access and egress to a locally identified refuge area cannot be achieved, the **Defra/EA Technical Report: FD2320: Flood Risk Assessment Guidance for New Development** should be referred to, to determine the hazard to people posed along the access route. This can also be used to inform a Flood Warning and Evacuation Plan for the site. Emergency vehicular access should be possible during times of flood.

Resistance and resilience measures will be required if buildings are situated in the flood risk area, and as applicable in all cases of flood risk, opportunities to enhance green infrastructure and reduce flood risk by making space for water should be sought. Further information is provided in Section 8.5 and 8.6 and in the publications **“Improving the flood performance of new buildings”** and **“Prepare your property for flooding.”**

Local requirements for finished floor levels should be discussed with the LPA, LLFA and EA taking into account the individual circumstances of the application.

Dry islands

It is recommended that emergency planners at the local authorities review the outputs of the 2018 SFRA and the areas identified as being located in a dry island. A site-specific Flood Risk Assessment and / or Flood Warning and Evacuation Plan may be required if a proposed development is located within a dry island (even for sites less than 1 hectare and in Flood Zone 1).

Residual risk

Residual risk is the risk that remains after mitigation measures are considered. The residual risk includes the consideration of flood events that exceed the design thresholds of the flood risk management measures or circumstances where there is a failure of defences, e.g. flood banks collapse, reservoir failure etc. The flood risk analysis in Section 7 and Appendix E demonstrates that much of the Borough is heavily dependent on flood defences to protect settlements from flooding. The Environment Agency breach model extents covering the King's Lynn and West Norfolk Borough show that residual risk from breach is significant. This risk is especially relevant in the west of the Borough and comes from both fluvial and tidal sources. Residual risks should be considered as part of site-specific Flood Risk Assessments.

Where the watercourses are embanked, the effect of overtopping and breach must be considered and appropriately assessed. There is specific guidance relating to the application and use of the Tidal Hazard Mapping Models for the River Nene and River Great Ouse (see Section 8.2.6) which considers the impact of a breach of tidal defences. Developers are advised to consult the flood design guidance relating to the application and use of this modelling on the Council webpage called: **“Information for planning agents”**.

Further, any developments located within an area protected by flood risk management measures, where the standard of protection is not of the required standard, or where the failure of the intended level of service gives rise to unsafe conditions, should be identified and appropriate responses prepared, as necessary.



Future flood management in the Borough of King's Lynn and West Norfolk

Green Infrastructure and Water Framework Directive

Developments should demonstrate opportunities to create, enhance and link green assets. Development that may adversely affect green infrastructure assets should not be permitted.

Strategic flood risk solutions

The information provided in the SFRA should be used as a basis for investigating potential strategic flood risk solutions within the Borough of King's Lynn and West Norfolk (see Section 10 for further information). Opportunities could consist of the following:

- Future improvements and maintenance of existing flood defences;
- Catchment and floodplain restoration;
- Flood storage areas;
- Opening up culverts, weir removal, and river restoration; and
- Green infrastructure.

Cross-boundary partnership working

For successful future flood risk management, it is recommended that local planning authorities adopt a partnership working approach to flood risk management and consider the cumulative impact of development within a catchment.

Use of Strategic Flood Risk Assessment data

SFRAs are high-level strategic documents and, as such, do not go into detail on an individual site-specific basis. The 2018 SFRA has been developed using the best available information, supplied at the time of preparation, taking into account the latest flood risk information and the current state of national planning policy. This relates both to the current risk of flooding from fluvial, tidal, pluvial, groundwater, sewers and reservoirs as well as the potential impacts of future climate change. It is this data that guidance singles out as the most appropriate for forward planning.

At the time of writing, this report was developed using the best available information. However, the 2018 SFRA should be a **'living document'** and as a result should be updated when new information on flood risk, flood warning or new planning guidance or legislation becomes available. The Environment Agency regularly reviews their hydrology, hydraulic modelling and flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA. The information used in this SFRA is detailed in Appendix D.

Please note that the Environment Agency are in the process of updating the River Burn model. This model is due for completion in late 2018 and developers should request the latest information from the Environment Agency.

Level 2 SFRA

A separate Level 2 SFRA has been undertaken and is available from the Borough Council. This considers the site risk at a community level in more detail and is intended to be used to apply the Sequential and Exception Tests at planning allocation stage.

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