

Appendix F - Cumulative Impact Assessment

1 Background

1.1 Introduction

The cumulative impact of development should be considered at both the Local Plan making stage and the planning application and development design stages. Paragraph 166 of the National Planning Policy Framework (NPPF, 2023) states:

'Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.'

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume. Whilst the loss of storage for individual developments may only have minimal impact on flood risk, the cumulative effect of multiple developments may be more severe.

Conditions imposed by South Norfolk Council should allow for mitigation measures so any increase in runoff as a result of development is properly managed and should not exacerbate flood risk issues, either within, or outside of the Councils' administrative area.

The cumulative impact of development should be considered at both the Local Plan making and the planning application and development design stages. Appropriate mitigation measures should be undertaken to ensure flood risk is not exacerbated, and where possible the development should be used to reduce existing flood risk issues.

To understand the impact of future development on flood risk in South Norfolk, catchments were identified where development may have the greatest potential effect on flood risk, and where further assessment would be required within a Level 2 Strategic Flood Risk Assessment (SFRA) or site-specific Flood Risk Assessment (FRA). To identify the catchments at greatest risk, various factors were considered, including the potential change in developed area within each catchment and communities sensitive to increased risk of surface water and fluvial flooding, alongside evidence of historic flooding incidents. Where catchments have been identified as sensitive to the cumulative impact of development, the assessment sets out planning policy recommendations to help manage the risk.

1.2 Strategic flood risk solutions

1.2.1 Local solutions

South Norfolk Council are reviewing and updating their planning policies through a process known as the Local Plan Update (LPU). This will set an updated planning policy framework for the future management of flood risk and drainage in the area. This includes flood risk management, alongside wider environmental and water quality enhancements. Strategic solutions that the LPU may directly or indirectly help to shape include upstream flood storage, integrated major infrastructure/ flood risk management schemes, new defences, and watercourse improvements as part of regeneration and enhancing green infrastructure, with opportunities for Natural Flood Management (NFM) and retrofitting Sustainable Drainage Systems (SuDS).

Existing actions relevant in South Norfolk are set out in the Norfolk Local Flood Risk Management Strategy, available on the Norfolk County Council website, [here](#). The LFRMS aims to set out how flood risk will be reduced and managed across the County.

The relevant River Basin District (RBD) Flood Risk Management Plan (FRMP) also sets out local measures relevant to South Norfolk. South Norfolk falls within the Anglian RBD. Measures set out within the Anglian RBD FRMP that are applicable to South Norfolk mostly relate to partnership working and include:

- Work with Natural England, the Broads Authority, Broadland Catchment Partnership, the RSPB, and the Farming and Wildlife Advisory Group in the Broadland area.
- Work with Norfolk Rivers Trust, River Waveney Trust, water companies, landowners, Norfolk County Council, and IDBs (amongst others) in the Broadland Rivers Management Catchment.
- Work with landowners and a range of organisations in the Broadland Rivers Management Catchment.
- Work with other organisations to develop a long term strategy in the Broadland area.

Further details on strategic plans that exist for South Norfolk can be found in Section 2 of the Main Report.

1.2.2 National solutions

The Environment Agency is developing a new National Flood Risk Assessment (NaFRA2) which is expected to be published later in 2024 and will provide a wide range of new data to assess flood risk from rivers, the sea and surface water. This new assessment will provide an improved evidence base from which to inform our management of risk. However, this will only provide a starting point in the assessment and mitigation of cumulative risk.

Flood risk is likely to increase, perhaps substantially, as a result of climate change so planners, emergency planners, asset managers, and others will need to mitigate this

through a mix of collaborative working, planning policies, consideration of 'worst case' scenarios, development of contingency plans, and some detailed analysis.

1.2.3 Opportunities and projects in and/or affecting South Norfolk

The following sections address partnerships and project delivery schemes that affect South Norfolk.

1.2.3.1 Catchment Based Approach (CaBA)

The Catchment Based Approach (CaBA) was introduced by the Government to establish catchment partnerships throughout England to jointly deliver improved water quality and reduce flood risk, directly supporting achievement of many of the targets set out within the Government's 25-year Environment Plan. CaBA partnerships are actively working in all 100+ river catchments across England and cross-border with Wales. Further details are available on the CaBA website, [here](#).

South Norfolk lies within the Broadland Catchment Partnership, which is co-hosted by the Broads Authority and Norfolk Rivers Trust. Initiatives that the Broadland Catchment Partnership are promoting include Rural Sustainable Drainage, Water Sensitive Farming, and Natural Flood Management (NFM). Further information about the Broadland Catchment Partnership can be found on their website, [here](#).

Actions that the Broadland Catchment Partnership are working to meet are set out in the Broadland Rivers Catchment Plan, available from their website [here](#).

1.2.3.2 Norfolk Wildlife Trust

Norfolk Wildlife Trust (NWT) manage two nature reserves within South Norfolk. These are:

- Hethel Old Thorn - the smallest of the NWT reserves which consists of one thorn, believed to be one of the most ancient hawthorns in England.
- Lower Wood, Ashwellthorpe - an ancient woodland particularly noted for large oak trees. Supports a rich array of flora including wood anemone, wood spurge, herb-paris, twayblade, purple orchids, and more than 200 species of fungi.

NFM techniques could be encouraged to aid flood storage and improve natural habitats.

Further information on their reserves and the work they do is available on the Wildlife Trust website [here](#).

1.2.3.3 Norfolk Strategic Flooding Alliance

The Norfolk Strategic Flooding Alliance (NSFA) was founded in February 2021 following significant surface water flooding issues in December 2020. The NSFA brings together all agencies and partners involved in planning for and responding to flooding in Norfolk. The NSFA Strategy is available on their website, [here](#).

1.2.3.4 Reclaim the Rain

Reclaim the Rain is a joint initiative between Suffolk and Norfolk County Councils. It is one of 25 successful projects within Defra's six-year long Innovation Resilience Fund Programme. The project is exploring unique ways of managing floodwater as climate change is increasing the amount and the likelihood of flooding and coastal change. Further information is available on the project website, [here](#).

1.3 Assessment of Cross Boundary Issues

South Norfolk is bordered by Norwich City and Broadland District to the north, Great Yarmouth Borough to the northeast, East Suffolk District to the south east, Mid Suffolk District to the south, and Breckland District to the west. The neighbouring authorities are shown in Figure 1-1.

Catchments under the potential influence of development within South Norfolk and that could impact flood risk or have their flood risk impacted upon by development within South Norfolk, extend into two districts beyond those listed above: North Norfolk District to the north and West Suffolk District to the southwest.

The majority of rivers within the study area join the Rivers Waveney, Yare and Bure and flow into the sea through the Borough of Great Yarmouth. The River Waveney flows along the southern district boundary from Mid Suffolk District. The River Yare flows along the northern boundary of the study area from Breckland District to the east. As such, future development both within and outside South Norfolk can have the potential to affect flood risk to development and surrounding areas, depending on the effectiveness of SuDS and drainage implementation.

The watercourses within the study area that flow into neighbouring authorities comprise the headwater tributaries of the River Thet, such as the River Wittle, Buckenham Stream and Stow Bedon Stream. However, most catchments within the region are tributaries to the River Yare and River Waveney, which form the majority of the northern and southern district boundaries; the watershed between these two major catchments lies east to west through the south of the district.

Although outside of the South Norfolk study area, the River Bure flows through and forms a significant proportion of The Broads, to which the lower River Yare is also connected. Therefore, impacts to this catchment should also be considered.

As such, future development, both within and outside the South Norfolk can have the potential to affect flood risk to existing development and surrounding areas, depending on the effectiveness of SuDS and drainage implementation.

Development control should ensure that the impact on receiving watercourses from development has been sufficiently considered during the planning stage. The National Planning Policy Framework (NPPF) sets out how developments should demonstrate they will not increase flood risk elsewhere. Therefore, providing developments near watercourses in neighbouring authorities comply with the latest planning policy, guidance and legislation relating to flood risk and sustainable drainage, they should result in no increase in flood risk within the study area.

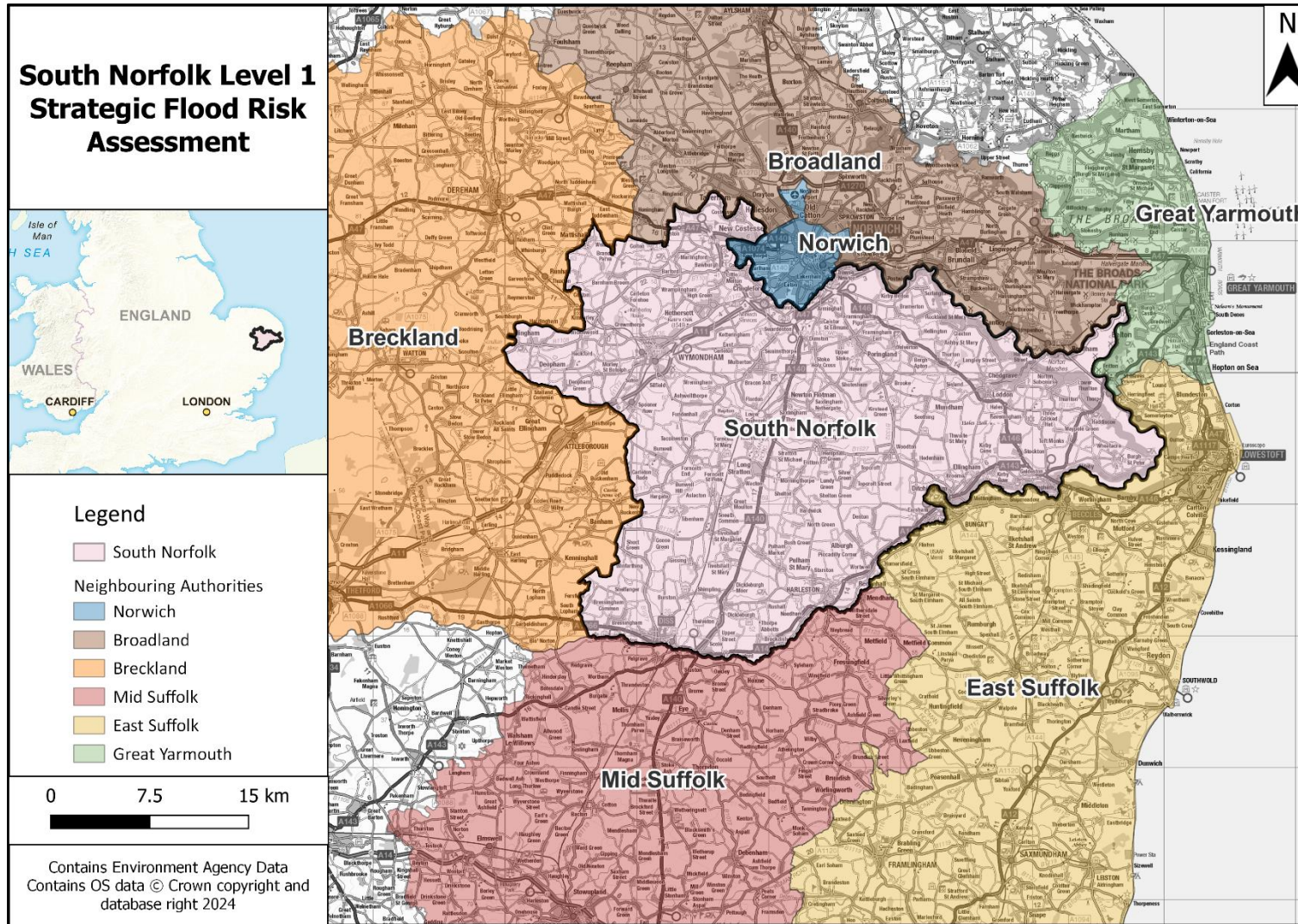


Figure 1-1: South Norfolk District and its neighbouring authorities.

The following Local Plans have been adopted by the neighbouring local authorities and include policies relevant to flood risk and drainage, with hyperlinks to the documents provided:

- [Breckland District Council Local Plan \(2019 - 2036\)](#) adopted in September 2023
- [East Suffolk Council - Waveney Local Plan 2014 - 2036](#) adopted March 2019
- [Great Yarmouth Borough Core Strategy \(Local Plan Part 1 - 2015\) and Local Plan Part 2 \(2021\)](#)
- [Babergh and Mid Suffolk Joint Local Plan Part 1 \(2018 - 2037\)](#) adopted in November 2023. This is due to be followed by a Part 2 Plan.

Broadland District Council and Norwich City Council worked with Norfolk County Council and South Norfolk Council to prepare the Greater Norwich Local Plan, for the plan period up to 2038. This builds on the existing partnership working which established the current Joint Core Strategy which plans for the housing and job needs of the area to 2026. The GNLP was adopted by South Norfolk Council on 25 March 2024.

The GNLP documents are available [here](#).

1.4 Cumulative Impact Assessment Methodology

The broadscale assessment determines where the cumulative impacts of development may have the biggest effect on flood risk based on historic and predicted flood risk. Catchments at the highest risk are taken forward to a catchment-level analysis.

Table 1-1 provides a summary of the data used within this assessment. Catchments within South Norfolk study area were ranked on four metrics: sensitivity to increased fluvial flood risk, sensitivity to increased risk of surface water flooding, prevalence of recorded historic flooding incidences, and area of new development proposed within the catchment.

Figure 1-2 shows the catchments considered for the purpose of preparing the assessment.

The results of this assessment provide a rating of low, medium, or high risk for each metric, for each catchment within the study area, the boundaries of which were derived from WFD. The rating of each catchment in each of these assessments was combined to give an overall ranking.

Table 1-1: Summary of datasets used in the Broadscale Cumulative Impact Assessment.

Dataset	Coverage	Source of data	Use of data
Water Framework Directive Catchments	South Norfolk and cross-boundary catchments	Environment Agency	Assessment of susceptibility to cumulative impacts of development by catchment.

Dataset	Coverage	Source of data	Use of data
National Receptor Dataset (2014)	South Norfolk and most of the cross-boundary catchments	South Norfolk Council	Assessing the number of properties at risk of fluvial and surface water flooding within each catchment.
Risk of Flooding from Surface Water Map	South Norfolk and cross-boundary catchments	Environment Agency	Assessing the number of properties at risk of surface water flooding within each catchment.
Flood Map for Planning Fluvial Flood Zones 2 and 3	South Norfolk and cross-boundary catchments	Environment Agency	Assessing the number of properties at risk of fluvial flooding within each catchment
Future development areas (recently built out sites/sites under construction/sites with planning permission/previously allocated sites/currently allocated sites)	South Norfolk	South Norfolk Council	Assessing the impact of proposed future development on risk of flooding.
Historic Flooding Incidents	South Norfolk Study Area	South Norfolk Council	Assessing incidences of historic flooding within the study area.

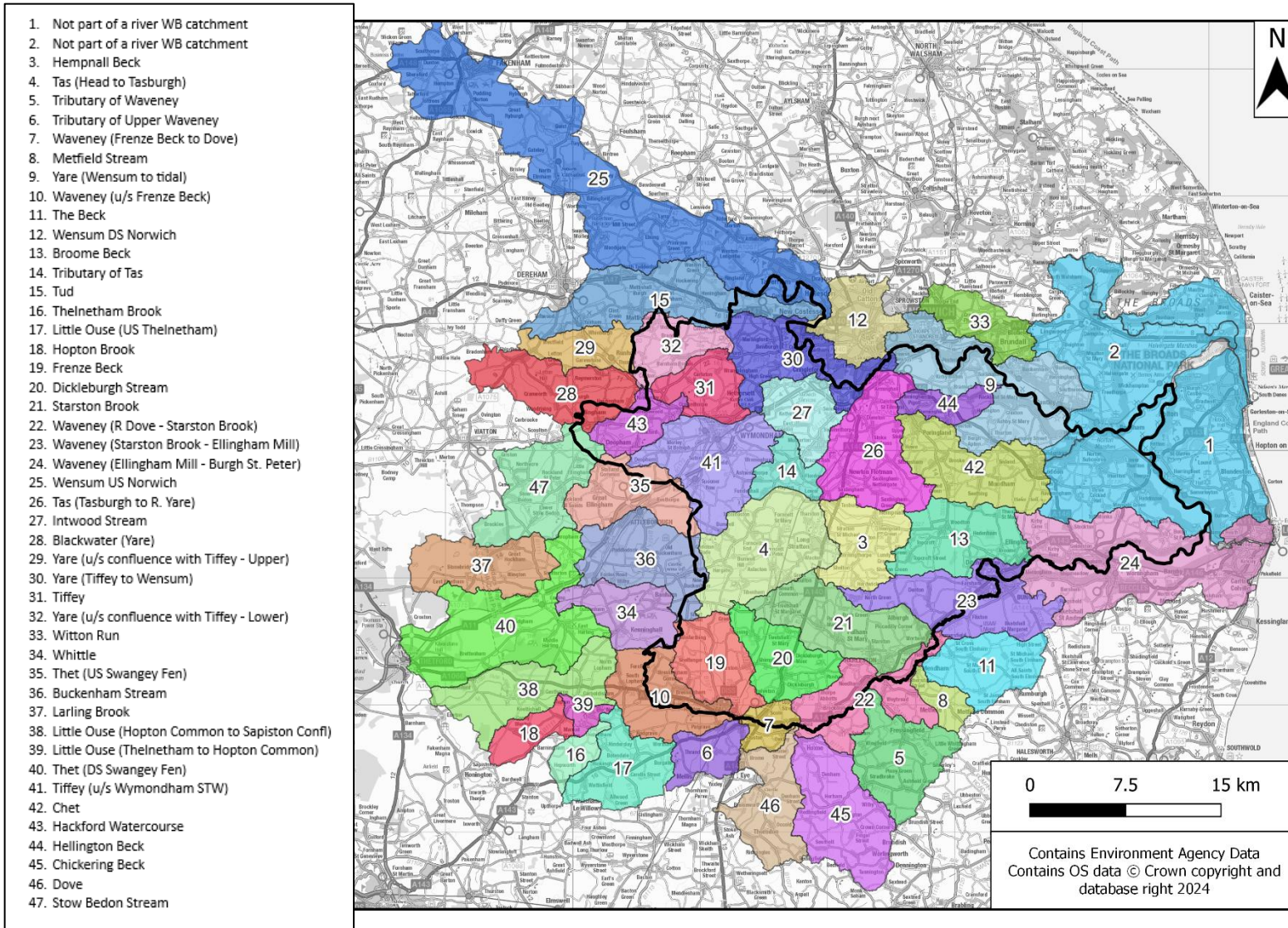


Figure 1-2: Catchments within South Norfolk.

1.5 Broadscale methodology

1.5.1 Overview

This broadscale assessment was undertaken by JBA in 2022. Only minimal changes have been made to available data since the initial broadscale assessment, therefore, the assessment was not updated as part of this Level 1 SFRA.

However, catchments where new development sites have been proposed since the original assessment are discussed in Section 1.6.2 with recommendations given for development within these catchments.

1.5.2 Catchment information

Two catchments that are partly within South Norfolk District are not classified as river waterbodies as they comprise part of the tidal Norfolk Broads, though these waterbodies are formed of the lower catchments of the River Yare and River Bure.

Other catchments have been included in this assessment that are outside of the Study Area but are tributaries of catchments that are within South Norfolk. Therefore, any proposed development within these catchments by neighbouring authorities is likely to impact flood risk within South Norfolk, however no neighbouring authority's proposed development site data was submitted for inclusion within this assessment.

The surface water sensitivity has been calculated for catchments within the South Norfolk boundary only.

1.5.3 Sensitivity to increases in fluvial flooding

This is the measure of the increase in the number of properties at risk of fluvial flooding from the 1% AEP to the 0.1% AEP event. It is an indicator of where local topography makes an area more sensitive to increases in flood risk that may be due to any number of reasons, including climate change, new development etc. It is not an absolute figure or prediction of the impact that new development will have on flood risk.

Catchments with greater than 1% of properties at increased risk were considered high risk and are listed in Table 1-2.

Table 1-2: Catchments considered highly sensitive to increased fluvial flood risk in future.

Catchment	Percentage of properties sensitive to increased fluvial flood risk	Rank
Not part of a river WB Catchment (Tidal Bure)	3.80	1
Waveney (Starston Brook – Ellingham Mill)	3.28	2
Waveney (u/s Frenze Beck)	3.06	3
Wensum d/s Norwich	3.06	4

Catchment	Percentage of properties sensitive to increased fluvial flood risk	Rank
Waveney (Frenze Beck to Dove)	2.74	5
Waveney (R Dove – Starston Brook)	2.06	6
Yare (u/s confluence with Tiffey – Lower)	1.09	7

1.5.4 Sensitivity to surface water flooding

This is the measure of the increase in the number of properties at risk of surface water flooding in a 1% AEP event to a 0.1% AEP event. These properties are considered sensitive to increased flood risk as a result of climate change.

Catchments with greater than 4% properties at increased risk were considered high risk and are listed in Table 1-3.

Table 1-3: Catchments considered highly sensitive to increased surface water flood risk in future.

Catchment	Percentage of properties sensitive to increased surface water flood risk	Rank
Tributary of Tas	6.10	1
Dickleburgh Stream	5.89	2
Broome Beck	5.71	3
Starston Brook	5.31	4
Tas (Tasburgh to R. Yare)	4.77	5
Hempnall Beck	4.56	6
Tas (Head to Tasburgh)	4.56	7
Frenze Beck	4.15	8

1.5.5 Prevalence of historic flooding incidents

South Norfolk Council provided a list of historic flood incidents and the number of flood incidents in each catchment was identified. Catchments with more than 800 recorded incidents were considered high risk and are listed in Table 1-4. Two of these however comprise the tidal Norfolk Broads and thus are not considered as part of any particular river catchment.

Table 1-4: Catchments with the highest number of recorded historic flood incidents.

Catchment	Number of recorded incidents	Rank
Not part of a river WB catchment (Tidal Yare)	1574	1
Wensum u/s Norwich	1417	2
Not part of a river WB catchment (Tidal	1305	3

Catchment	Number of recorded incidents	Rank
Bure)		
Yare (Wensum to tidal)	950	4
Wensum d/s Norwich	842	5

1.5.6 Area of proposed development

South Norfolk Council provided a list of likely new development sites and the total area of new development in each catchment was measured, as a percentage of catchment area. No development data was available for the neighbouring authority areas. Development proposals overall are comprised of small site areas in relation to catchment areas. Therefore, catchments with more than 0.2% area earmarked for development were considered high risk, although the extent of proposed development is negligible in comparison to the catchment area. The high risk catchments are listed in Table 1-5.

Table 1-5: Catchments with the highest percentage cover of proposed development.

Catchment	Area of proposed development (ha)	Rank
Yare (u/s confluence with Tiffey – Lower)	7.1	1
Chet	12.34	2

1.6 Overall rankings

As can be seen from the above tables, there are catchments that are at high risk in multiple categories. Rankings from each assessment have been combined to give an overall ranking. A Red-Amber-Green (RAG) rating was then applied to the catchments, with red being high risk, amber being medium risk, and green being low risk. The results of the RAG assessment are shown in Figure 1-3. The catchments with a combined ranking score between 30 and 50 were deemed high risk.

The catchments rated as high-risk in the broadscale assessment are:

- Tas (Head to Tasburgh)
- Starston Brook
- Waveney (u/s Frenze Beck)
- Yare (u/s confluence with Tiffey – Lower)
- Tiffey (u/s Wymondham STW)
- Chet
- Frenze Beck
- Broome Beck

It should be noted that the general risk of cumulative impacts of development across the catchment is low due to the small extent of proposed development compared with catchment area, as discussed in Section 1.5.6. These rankings provide a relative assessment of the catchments within South Norfolk and are not comparable across other boroughs/districts.

1.6.1 Discussion of rankings

The Hellington Beck and Intwood Stream catchments are ranked as medium because of low rankings of historic events and medium and low increased risk from fluvial flooding ranking respectively. However, these catchments ranked high risk for development and medium risk for surface water flooding. Consideration should therefore still be made in these catchments with regards to surface water attenuation and the potential loss of natural surface storage in the catchment as a consequence of proposed new development, despite their final ranking score of medium.

The two tidal zones of the rivers Yare and Bure are ranked high for historic flooding incidents and fluvial flooding (as the dataset used considers coastal flooding within its extent), however this is due to their tidal proximity which skewed the ranking results and is considered to reflect the sensitivity to changes in mean sea level rather than upstream contributing flow. The catchments have been ranked low for proposed development and surface water flooding.

Some catchments that border the South Norfolk Study area or are within neighbouring catchments were discounted from the final RAG Assessment outputs as their results were not applicable due to their being no countable data for one or more assessment criteria, as well as them being located outside of the study area.

1.6.2 Updated development sites

Recent updates to potential development sites across South Norfolk have not been incorporated into the assessment, as the development sites across the district are small in comparison to the catchment areas. However, this section highlights the key catchments where changes in development sites may need to be considered if these are taken forward. Additional potential site allocations have been identified in the following two catchments, which did not have any proposed development sites when the broadscale CIA was undertaken:

- Tiffey (proposed development area covers 0.27% of the total catchment area).
- Waveney (Frenze Beck to Dove) (proposed development covers 1.21% of the total catchment area).

The Dickleburgh Stream catchment is the only other catchment to have a development area of more than 1%, with an increase from 0.05% to 1.09%.

Waveney (Frenze Beck to Dove) has been identified as being at a high risk of increases in fluvial flooding. The Dickleburgh Stream catchment has been identified as being at high risk of increases in surface water flooding. Although not identified as high risk catchments, consideration should therefore still be made in these catchments with regards to the potential loss of natural surface storage in the catchment as a consequence of proposed new development to ensure any development does not exacerbate existing flooding issues. It is recommended that the high risk catchments recommendations in Section 2.2 are also considered for these catchments, as the catchments with the greatest areas of development now proposed.

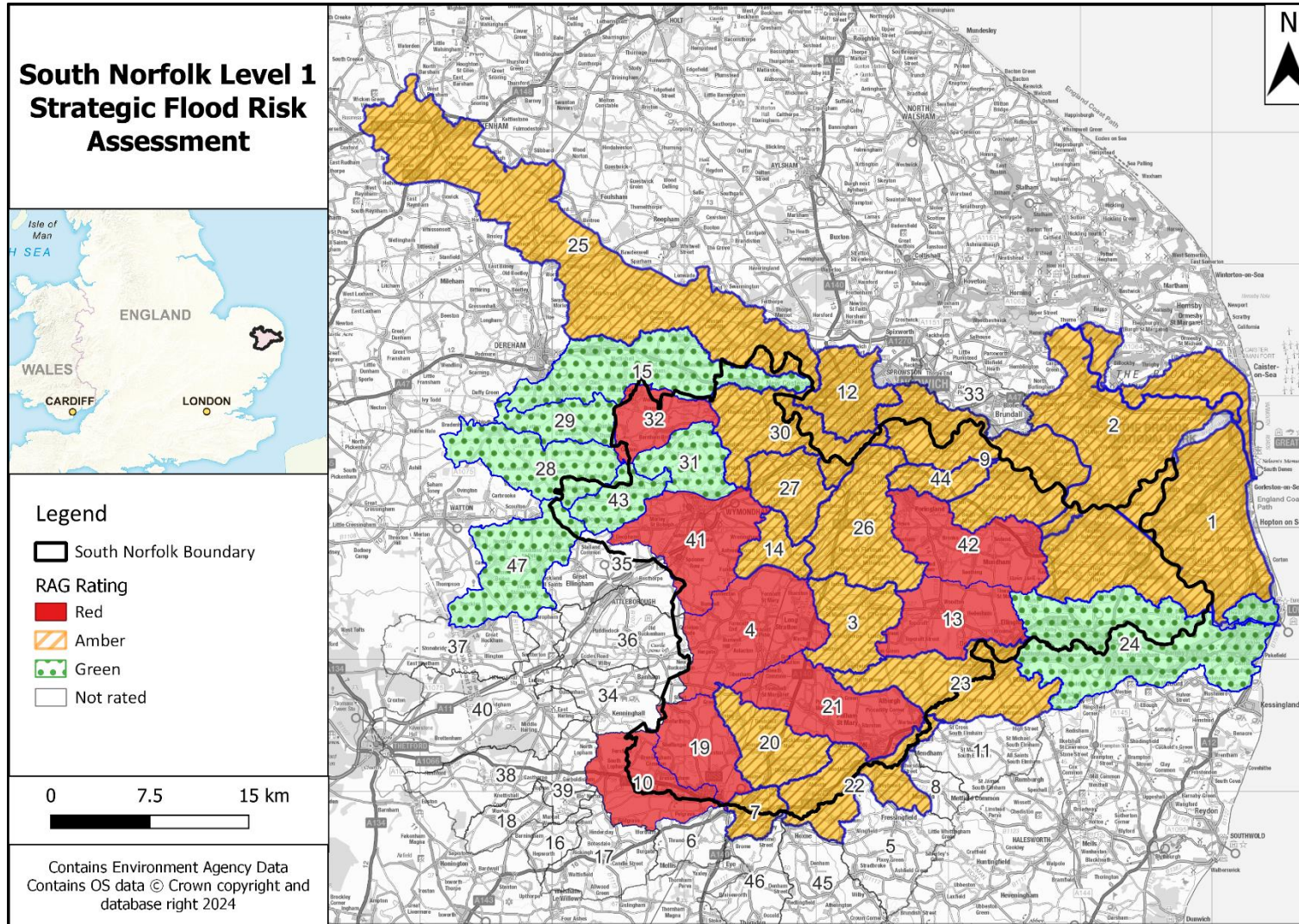


Figure 1-3: RAG ratings for catchments across South Norfolk.

2 Level 1 SFRA Policy recommendations

2.1 Broadscale recommendations

All developments are required to comply with the NPPF and demonstrate they will not increase flood risk elsewhere. Therefore, providing developments comply with the latest guidance and legislation relating to flood risk and sustainable drainage, and appropriate consideration is given to surface water flow paths and storage proposals, they should not normally increase flood risk downstream.

The broadscale cumulative impact assessment for South Norfolk has highlighted that the potential for development to have a cumulative impact on flood risk is relatively low across the area, as the proposed development sites are small compared with the catchment areas. Catchments have been identified as high, medium, or low risk, shown in Figure 1-3. This provides a spatial illustration of the locations in the respective catchments that are potentially sensitive to changes in the flood risk and where more detailed assessment might be appropriate to assess the potential effect of all proposed development within a catchment.

Flood risk will potentially be affected by proposed development and thus it is appropriate that provisions for incremental action and betterment in flood risk terms across all of South Norfolk is supported.

The following policy recommendations therefore apply to all catchments within the study area:

- South Norfolk Council should work closely with neighbouring local authorities to develop complementary Local Planning Policies for catchments that drain into and out of the South Norfolk authority area to other local authorities in order to minimise cross boundary issues of cumulative impacts of development.
- Developers should incorporate SuDS and provide details of adoption, ongoing maintenance, and management on all development sites. Proposals will be required to provide reasoned justification for not using SuDS techniques, where ground conditions and other key factors show them to be technically feasible. Preference will be given to systems that contribute to the conservation and enhancement of biodiversity and green infrastructure where practicable. Developers should refer to the relevant Lead Local Flood Authority (LLFA) guidance for the requirements for SuDS in the study area. Further guidance on SuDS can be found in Section 9 of the main report.
- Norfolk County Council as LLFA will review Surface Water Drainage Strategies in accordance with their local requirements for major and non-major developments. These should consider all sources of flooding to

ensure that future development is resilient to flood risk and does not increase flood risk elsewhere.

- Where appropriate, that the opportunity NFM in rural areas, SuDS retrofit in urban areas and river restoration should be maximised. Culverting should be opposed, and day-lighting existing culverts promoted through new developments. Careful consideration should be given to proposals that affect the natural storage and flow of surface water so that the existing capacity to absorb and convey surface water runoff is not compromised.
- Runoff rates from all development sites must be limited to greenfield rates (including brownfield sites) unless it can be demonstrated that this is not practicable. If it is demonstrated that greenfield rates are not practicable then the runoff rates should be restricted to the closest rate that is practicable. Developers should refer to the relevant LLFA guidance for the requirements for SuDS in the study area.
- Where required, site-specific FRAs should explore opportunities to provide wider community flood risk benefits through new developments. Measures that can be put in place to contribute to a reduction in flood risk downstream should be considered. This may be either by the provision of additional storage on site e.g. through oversized SuDS, NFM techniques, green infrastructure, and green-blue corridors, and/ or by providing a Partnership Funding contribution towards any flood alleviation schemes.

Section 8 of the main report details the local requirements for mitigation measures. Catchment-specific recommendations are made for highly sensitive catchments below.

2.2 Recommendations for high-risk catchments

From analysing the results produced above, high-level recommendations for flood storage and betterment have been proposed for sites in each of the high-risk catchments. These recommendations should be considered by developers as part of a site-specific assessment, but more detailed modelling must be undertaken by the developer to ascertain the true storage needs and potential at each site at the planning application stage. Particular attention should be paid to the effect of all proposed development in a plan at the location of existing sensitive receptors and included as appropriate in the assessments performed for the respective sites in the plan (but this also applies to “windfall” sites within these catchments).

The following recommendations are also made for development in high risk catchments:

- Developers should include a construction surface water management plan to support the Construction Drainage Phasing Plan. This should provide information to the Environment Agency, LLFA and the LPA regarding the

proposed management approach during the construction phase to address surface water management during storm events.

- The LLFA and LPA should consult with Local Non-For-Profit organisations such as wildlife trusts, rivers trusts and catchment partnerships (Broadland Catchment Partnership) to understand ongoing and upcoming projects where NFM, flood storage and attenuation, and environmental betterment may be possible alongside developments and aid in reducing flood risk.
- LPAs should work closely with the EA and the LLFA to identify any areas of land that should be safeguarded for any future flood alleviation schemes and NFM features. Investigations should seek to determine where developments have the potential to contribute towards works to reduce flood risk and enable regeneration in catchments as well as contributing to the wider provision of green infrastructure.
- There is the potential for development in these catchments to contribute towards works to reduce flood risk and enable regeneration as well as contributing to the wider provision of green infrastructure.