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Draft Development and Flood Risk Supplementary Planning Document (SPD)

Ipswich Borough Council

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IPSWICH BOROUGH COUNCIL

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1. Purpose of the document and User Guide

1.1 Purpose of the Supplementary Planning Document

1.1.1 The purpose of this Development and Flood Risk Supplementary Planning Document (SPD) is to help developers and their agents to submit appropriate flood risk and flood risk management information with planning applications in Ipswich.

1.1.2 The SPD has been prepared by Ipswich Borough Council (IBC) in collaboration with the Environment Agency, Suffolk County Council in their capacity as the Lead Local Flood Authority (LLFA), Suffolk Joint Emergency Planning Unit and Anglian Water. It updates and replaces the Development and Flood Risk SPD published in 2013 and updated in 2016 and reflects the updated Ipswich Strategic Flood Risk Assessment (SFRA) October 2020 (Core Document Reference I34-I34.101).

1.1.3 The SFRA assesses the risk to Ipswich from flooding from all sources, now and in the future, taking account of the impacts of climate change. It also assesses the impact that land use changes and development will have on flood risk. The SFRA is a strategic document which has been used to inform the new emerging Ipswich Local Plan. It is also the starting point for considering flood risk on individual sites and includes some site level information in its Table 8-1 and Appendix F. The updated Ipswich SFRA takes account of:

- updated climate change forecasts;
- a new 2020 Environment Agency model for the River Gipping;
- the completion of the Ipswich tidal flood defences in 2019; and
- the updated National Planning Policy Framework February 2019 (subsequently further updated July 2021).

1.1.4 The Ipswich SFRA October 2020 is based on existing knowledge with respect to flood risk within the Borough. The Environment Agency review and update the Flood Map for Planning (Rivers and Sea) on a quarterly basis and a rolling programme of detailed flood risk mapping is underway. New information may influence future development management decisions within these areas. Therefore, the SFRA is a 'living' document and will be reviewed regularly. New Peak River Flow Climate Change Allowances will be published in mid-2021. It is expected that these will be marginally lower than those used for the 2020 Gipping model and, therefore, the outputs used for the SFRA remain robust and conservative estimates of future fluvial flood risk.

1.1.5 The Development and Flood Risk SPD is structured as follows:

- **Section 1: Policy context and information sources** – sets out the national and local policy framework for development and flood risk and identifies some key information sources;
- **Section 2: What is the risk of flooding in Ipswich?** – describes the main types of flooding and how they affect Ipswich;
- **Section 3: Development Vulnerability** – explains the national approach to categorising development according to its vulnerability to flooding;
- **Section 4: Is planning permission required?** - provides the national definition of development and explains permitted development;

- **Section 5: Is the Sequential test required?** – describes flood risk zones and the sequential approach to locating development;
- **Section 6: Is a Drainage Strategy required?** – identifies circumstances in which applicants may need to provide a drainage strategy;
- **Section 7: Is a Flood Risk Assessment required?** – identifies circumstances in which applicants may need to provide a site level Flood Risk Assessment;
- **Section 8: What should be included within a Flood Risk Assessment?** – explains the content expected in a site Flood Risk Assessment;
- **Section 9: Safety Framework and Flood Risk Management Measures** – sets out the approach to managing and mitigating flood risk within developments, covering:
  - Approach to Safe Development;
  - Ipswich BC Safety Framework;
  - Layout and Form of Development; and
  - Surface Water Management (including Sustainable Drainage Systems – 'SuDS').
- **Section 10: How should the exception test be applied?** – explains the circumstances in which the exception test will be required and how it should be carried out;
- **Section 11: Abbreviations and Glossary** – defines technical terms used within the SPD; and
- **Section 12: Appendices** – contains detailed information in support of the preceding sections.

1.2 Policy Context

1.2.1 There is an established body of national, regional and local policy and guidance which is relevant to development and flood risk in Ipswich and this is identified in Table 4-1 of the Strategic Flood Risk Assessment (SFRA) October 2020. Table 4-1 also provides links for where these documents can be found for further detail. The paragraphs below provide an overview.

National context

1.2.2 The Government's Flood and Coastal Erosion Risk Management Policy Statement[1] July 2020 sets out its long-term ambition to create a nation more resilient to future flood and coastal erosion risk, as part of a wider commitment to tackling climate change. This involves the twin goals of better protecting the Country to reduce the likelihood of flooding, and better preparedness to reduce the impacts of flooding when it happens. Flooding and its management cost the UK around £2.2 billion every year[2].

1.2.3 The National Flood and Coastal Erosion Risk Management Strategy for England[3] 2020 takes forward this theme. The Strategy seeks to better manage the risks and consequences of flooding from rivers, the sea, groundwater, reservoirs, ordinary watercourses, surface

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/903705/flood-coastal-erosion-policy-statement.pdf
[2] 'Flooding, and managing it, cost the UK around £2.2 billion each year: we currently spend around £800 million per annum on flood and coastal defences; and, even with the present flood defences, we experience an average of £1,400 million of damage.' Foresight Future Flooding https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/300332/04-947-flooding-summary.pdf
[3] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/920944/023_15482_Environment_agency_digitalAW_Strategy.pdf

water and sewers and coastal erosion. It seeks to achieve this through organisations and individuals working together to plan for and adapt to future flooding.

1.2.4 The context for planning for flood risk in relation to development and land use in Ipswich is provided nationally through Section 14 of the National Planning Policy Framework (NPPF), and Planning Practice Guidance (PPG) for Flood Risk and Coastal Change. The NPPF requires the planning system to support the transition to a low carbon future in a changing climate, including by minimising vulnerability and improving resilience. This translates into locating development away from areas at the highest risk of flooding (the 'sequential approach') and ensuring that, if vulnerable forms of development are necessary in such areas, they deliver sustainability benefits, are safe for their users over their lifetime and avoid increasing flood risk elsewhere (the 'exception test').

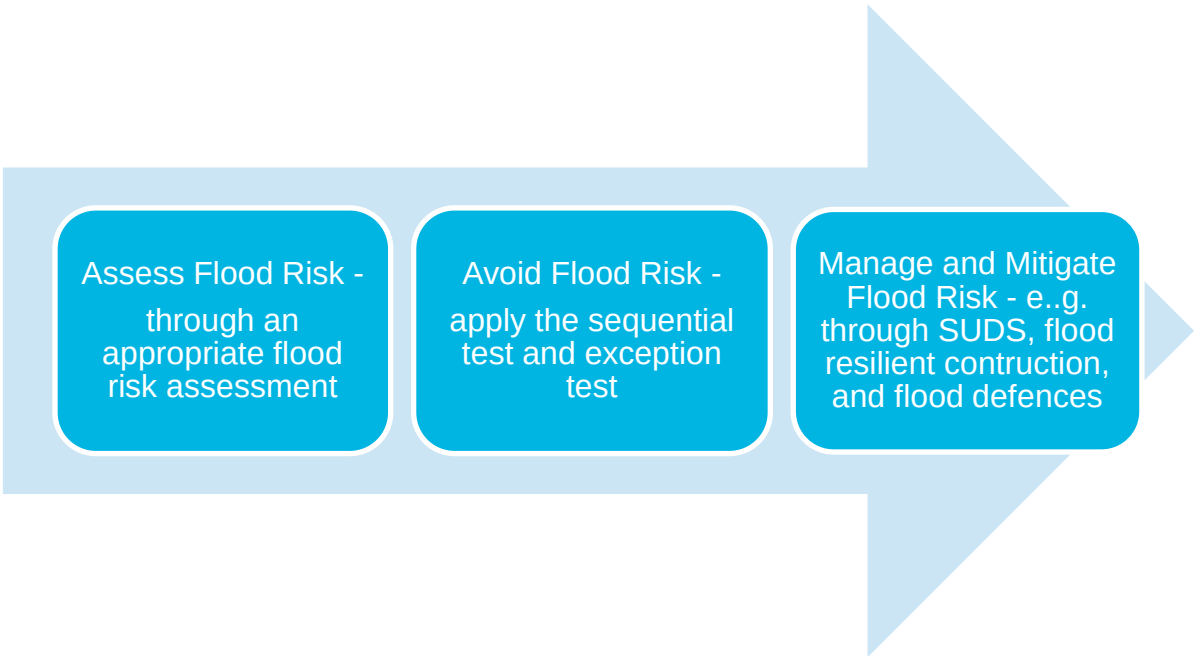
1.2.5 The PPG states:

'Developers and applicants need to consider flood risk to and from the development site, and it is likely to be in their own best interests to do this as early as possible, in particular, to reduce the risk of subsequent, significant additional costs being incurred. The broad approach of assessing, avoiding, managing and mitigating flood risk should be followed.' (Paragraph: 029 Reference ID: 7-029-20140306, 06 03 2014).

1.2.6 A hierarchy is used nationally to manage flood risk in relation to development:

The Flood Risk Management Hierarchy

Local Context



1.2.7 Local policy for land use and development and flood risk is contained in Local Plan policy DM4 'Development and Flood Risk'. Policy DM4 is set out in the box below. This SPD supplements, and should be read alongside, policy DM4 of the adopted Ipswich Local Plan (February 2017). A replacement Ipswich Local Plan (submitted in June 2020) is currently subject to independent examination. Public consultation on modifications to the emerging policy DM4 is scheduled for the summer of 2021[4]. The SPD is a material consideration in the determination of planning applications. It replaces the Development and Flood Risk SPD first adopted in 2013 and updated in 2016. This iteration of the Development and Flood Risk

[4] Please see the link to the modified 'emerging' policy DM4 from the SPD webpage.

SPD reflects the findings of the updated Ipswich Strategic Flood Risk Assessment (SFRA) October 2020.

Adopted Ipswich Local Plan, February 2017

POLICY DM4:
Development and Flood Risk

Development will only be approved where it can be demonstrated that the proposal satisfies all the following criteria:

a. it does not increase the overall risk of all forms of flooding in the area or elsewhere through the layout and form of the development and appropriate application of Sustainable Drainage Systems (SuDS);

b. it will be adequately protected from flooding in accordance with adopted standards wherever practicable;

c. it is and will remain safe for people for the lifetime of the development; and

d. it includes water efficiency measures such as rainwater harvesting, or use of local land drainage water where practicable.

1.3 Sources of Information on Flood Risk in Ipswich

1.3.1 Responsibility for flooding is divided between several different organisations, which produce information that will be helpful to applicants. Key information sources on flood risk in Ipswich are listed below:

- The Environment Agency's Flood Map for Planning shows background flood risk from tidal and fluvial sources, but does not take into account climate change or flood defences (although it does identify locations which benefit from defences). It does not distinguish between Flood Zones 3a and 3b (see section 2 of the SPD for a description of the Flood Zones). Nevertheless, it is a useful starting point for checking a site;
- The Environment Agency also publishes a web-based map called 'The Risk of Flooding from Surface Water' on the gov.uk website
- The Environment Agency and Suffolk County Council prepare the Flood Risk Management Plan (FRMP) https://www.gov.uk/government/collections/flood-risk-management-plans-frmps-2015-to-2021 . Currently a draft FRMP2 2021-2027 is being prepared. Ipswich is identified as a Flood Risk Area.
- Suffolk County Council's Ipswich Surface Water Management Plan (published in 2012 and to be updated in line with FRMP2) identifies 34 catchment areas in Ipswich of which four are prioritised and addressed through an action plan;
- Ipswich Borough Council's Strategic Flood Risk Assessment, October 2020 is a strategic document prepared to inform the Ipswich Local Plan. It consists of a Main Report, a Sequential and Exception Test Report for Local Plan allocated sites, and detailed appendices as follows. It can be viewed in the Council's online Core Document Library, reference I34 through to I34.101:
    - Appendix A – Maps, including Figure 6 which maps the Flood Zones in Ipswich including Zone 3B, the functional flood plain in Ipswich;

- Appendix B – Data Register (this appendix is located within the main SFRA report);
- Appendix C – Extracts from the Ipswich Surface Water Management Plan;
- Appendix D – Speed of onset and duration of flooding;
- Appendix E – Guidance on producing flood plans for new buildings;
- Appendix F – Level 2 SFRA Site Proformas; and
- Appendix G – Breach hazard mapping.

- Anglian Water manages the foul drainage system and their adopted surface water infrastructure in Ipswich, which includes 15 pumping stations, a further 4 pumped tanks, at least 6 attenuation tanks and an open attenuation pond at Ransomes Europark. Anglian Water has “Infoworks” computer models to enable them to understand the operation of the sewer network and model possible improvement schemes in detail.
- The East Suffolk Internal Drainage Board deals with land drainage and holds information about non-main river tributaries along the course of the River Gipping, Belstead Brook, Mill River and River Fynn.
- The Suffolk Resilience Forum website – this includes the Suffolk Flood Plan, which provides an overview of the types of flooding that occur in Suffolk, as well as emergency procedures and advice about building in a Flood Zone.

1.3.2 The following chapters of this SPD explain the risk of different types of flooding in Ipswich and take applicants through the stages which need to be considered before making an application. There are several sources of advice relating to development and flood risk and these will be sign posted later in the SPD.

2. What is the risk of flooding in Ipswich?

2.1 Overview of flood risk

2.1.1 This Section of the SPD provides an overview of the main sources of flooding in Ipswich. The Strategic Flood Risk Assessment (SFRA) (Emerging Local Plan 2018-36 Core Document Ref. I34 to I34.101) should be viewed for further details. The SFRA is based on existing flood risk knowledge for Ipswich. It is a 'living' document and will be reviewed regularly in light of emerging policy directives, currently available flood risk datasets and an improving understanding of flood risk.

2.1.2 Flood risk is defined as, 'a combination of the probability and the potential consequences of flooding from all sources ....' (Planning Practice Guidance Flood Risk and Coastal Change, Paragraph: 002 Reference ID: 7-002-20140306.)

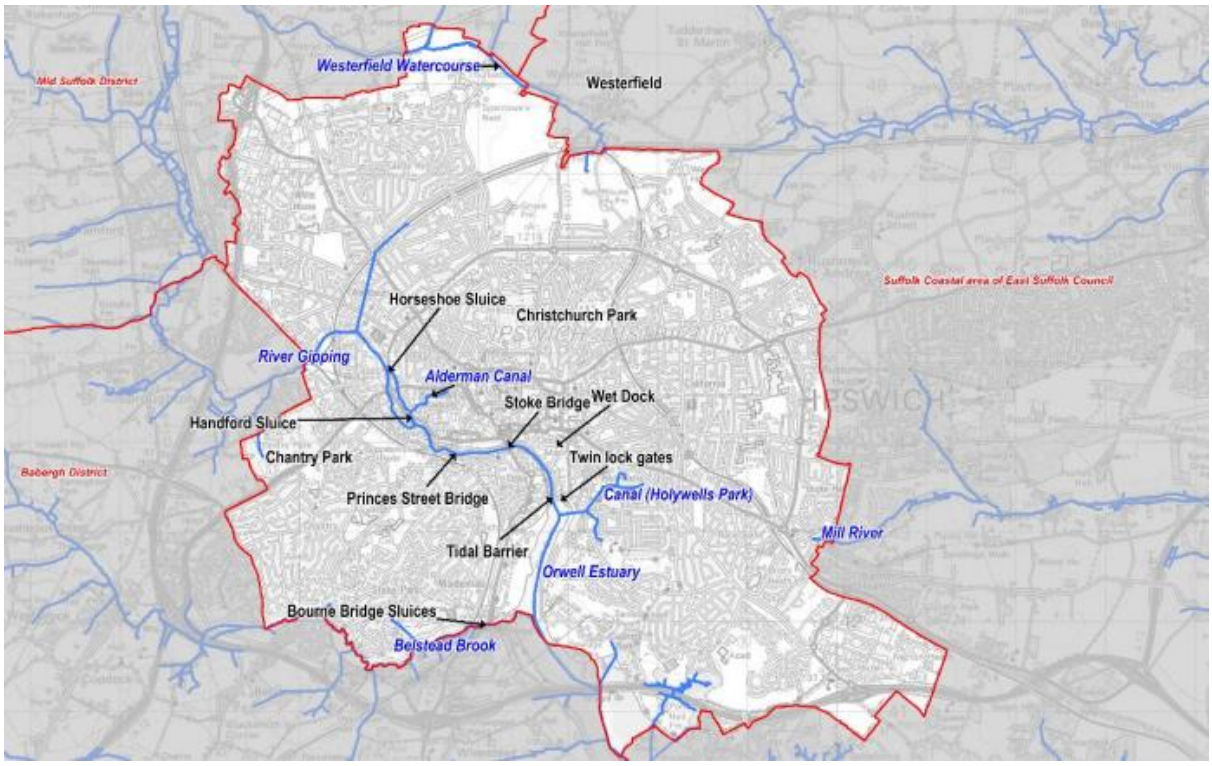
2.1.3 Flood risk is categorised into zones according to the probability of river or sea/tidal flooding (ignoring the presence of existing flood defences). Flood Zone 1 is an area at low risk; Flood Zone 2 is at medium risk; and Flood Zone 3 is at high risk. Flood Zone 3 is subdivided into Zones 3a and 3b, with Zone 3b being the functional flood plain where water needs to flow or be stored at times of flood. Flood Zone 3b is designated by Ipswich Borough Council through the SFRA, unlike the other Flood Zones which are designated by the Environment Agency. Appendix 1 provides the full definition of the Flood Zones. They are illustrated in the SFRA, Appendix A, Figure 6. They are also shown on the Environment Agency's Flood Map for Planning, but this mapping does not distinguish between Flood Zones 3a and 3b.

2.1.4 There are different sources of flood risk and several apply to Ipswich. These are as follows:

- Tidal flooding arising from a combination of high tides and stormy conditions – storm surges have caused tidal flooding in East Anglia on many occasions, the most recent serious flood being that of 1953;
- Fluvial or river flooding arising from rivers overflowing or bursting their banks;
- Surface water flooding occurs when heavy rainfall overwhelms local drainage systems - Ipswich has over 30 years of detailed records of local flooding resulting from heavy rainfall;
- Sewer flooding occurs when sewers become blocked or overwhelmed by heavy rain (made worse in Ipswich because of the high level of combined surface and foul water sewer pipes in many parts of Ipswich); and
- Groundwater flooding occurs when water levels in the ground rise above surface levels – in Ipswich this is mostly at the boundary between the crag and the clay geology types which are also associated with the presence of springs and the start of minor watercourses.

2.1.5 Each type of flooding is explored below in relation to Ipswich. Map 2-1 (Figure 3.1 from the SFRA) maps watercourses and flood management infrastructure in Ipswich. Appendix A of the SFRA shows the modelled extent of flooding associated with the Orwell (Figures 7A-B), Gipping (Figures 8A-8G), Belstead Brook (Figures 9A-9B), sewer flooding (Figures 10A-10B) and surface water flooding (Figures 11A-11B).

Map 2-1– map of water courses and flood management infrastructure in Ipswich (this is the same as Figure 3.1 from SFRA).



2.2 Tidal Flooding

2.2.1 The River Orwell is the source of potential tidal flooding in Ipswich. The River Orwell extends upstream from the coastal estuary to the point at which it meets the River Gipping at the Horseshoe Sluice, adjacent to Yarmouth Road. The western channel up to Horseshoe Sluice is the River Orwell, and the eastern channel between the Horseshoe Sluice and the Handford Sluice is the most downstream reach of the River Gipping. The two sluices form the tidal limits of the watercourse, and from this point downstream the River Orwell is tidally influenced.

2.2.2 The River Orwell channel is largely defended on either side by raised flood defences (mainly steel or concrete flood walls). In some sections, including the west bank terminal and parts of the east bank, there are no flood defences present. The Ipswich Barrier, which began operation in February 2019 is located on the River Orwell, in line with the southern end of the Wet Dock. This barrier and its lateral floodwalls now form the primary tidal flood defence for areas of the town to the west of the Wet Dock.

2.2.3 For tidal flooding, paragraph 055 of the flood and coastal change section of the Planning Practice Guidance defines flooding likely to occur with a 0.5% annual probability (a 1 in 200 chance in any year) as a ‘design flood’. An extreme flood is any flood that either exceeds the design flood or exceeds a flood risk management infrastructure design standard that provides a greater level of protection than the design flood level. In most flood risk assessments, the extreme flood is assessed for an event with a 0.1% annual probability (a 1 in 1000 annual chance of occurrence) over a development’s lifetime. Table 1 of the PPG defines the 0.1% annual probability event as the standard for demarcating boundaries between areas at medium and low risk.

2.2.4 In August of 2019 the final elements of the Ipswich Flood Defence Management Strategy (2005) were completed. These included a flood gate spanning the New Cut channel, a rail gate across the rail line at Griffin Wharf and the connection of the earlier east and west bank works with raised flood walls and manually operated flood gates. These works continue the 5.71m AOD defence level. When written in 2005, the Strategy aspired to provide a standard of protection against tidal and fluvial flooding, including combinations of 0.33 % annual exceedance probability (AEP) (1 in 300 years) allowing for increased sea

levels to the year 2109. The EA's latest estuary modelling for the Stour and Orwell estuary (JBA 2018) indicates that areas upstream of the Barrier are protected for the Design Tidal Flood (inclusive of climate change) and areas west of Stoke Bridge have a higher standard of protection from tidal flooding than the Ipswich Flood Defence Management Strategy (2005) aimed for. Areas of the West Bank, including the Riverside Industrial Estate, the West Bank terminal, sections of Wherstead Road, Bourne Bridge, the Strand and Cliff Quay are affected by tidal flooding during a design flood inclusive of climate change to 2118.

2.2.5 A 'design flood' is significant when considering the safety of development under the exception test, which is addressed in section 10 of the SPD. It is the design flood for which mitigation measures such as finished floor levels and safe access/egress arrangements need to be considered. With respect to the extreme 0.1% AEP (1 in 1000 annual chance) tidal flood inclusive of climate change to 2118, the Stour and Orwell estuaries tidal modelling (JBA 2018) shows that areas upstream of Stoke Bridge are unaffected by tidal flooding once the operation of the new flood defences are taken into account. However, a residual risk of tidal flooding remains in those areas should defences be breached or in the unlikely event that the Ipswich barrier cannot be operated. This residual risk needs to be considered by developers when carrying out flood risk assessments and in the preparation of Flood Warning and Response Plans for the users of the development. Areas west of the New Cut and in the area of Hawes Street, Wherstead Road, Bourne Bridge, The Strand and sections of Cliff Quay on the east bank of the estuary are affected by this magnitude of event when the impact of climate change is considered.

2.3 Fluvial Flooding

River Gipping

2.3.1 The River Gipping is a 'main river[5]' with a catchment that includes the towns and villages of Stowmarket, Needham Market, Bramford and Claydon, located in Mid Suffolk. The River Gipping flows south east from Stowmarket towards Ipswich town where the freshwater River Gipping becomes the tidal River Orwell at the Horseshoe and Handford Sluices (located in Figure 3-1).

2.3.2 Modelling of the River Gipping[6] identifies that, during present day conditions, water remains in bank within the Ipswich study area during the 5% AEP (1 in 20 annual chance) event and 1% AEP (1 in 100 annual chance) event. For fluvial flooding, the Planning Practice Guidance defines flooding likely to occur with a 1% annual probability (a 1 in 100 annual chance) as a 'design flood'.

2.3.3 However, based on current predictions of climate change and the assumption that no upgrades to the flood defences will be made, there is potential for areas of Ipswich to be at *actual* risk of fluvial flooding from the River Gipping during the design flood event in the future. The 1% AEP event including 65% allowance for climate change leads to flooding in parts of the Portman Quarter (west of Ipswich town centre, in the vicinity of Portman Road) with flood levels between 3m and 4.8m AOD. The modelling results show that the 1% AEP event including the lower 25% and 35% allowances for climate change remain in bank.

2.3.4 With respect to the extreme flood, the modelling shows that a small area on the west bank of the River Gipping off Hadleigh Road is at risk of flooding during the extreme flood in the present day (0.1% AEP or one in 1,000 years). In the future, the risk of flooding during the extreme flood event (0.1% AEP including 25% climate change) extends throughout Ipswich town with flood levels between 3.97m and 4.97m AOD.

Belstead Brook

2.3.5 The Belstead Brook is a 'main river' to the southwest of Ipswich town. It flows southeast from its source near Naughton village to its confluence with the Orwell Estuary at Bourne

[5] From the 'Main River Map' designated by Defra. The Environment Agency has permissive powers to carry out flood defence works, maintenance and operational activities for Main Rivers only.
[6] Mott MacDonald, September 2020, River Gipping Modelling Study.

Bridge. The catchment is mainly a rural undeveloped floodplain and includes Copdock and the extreme southwest of Ipswich. The discharge of fluvial flows to the estuary is regulated by a flapped tidal sluice structure sited within a tidal flood embankment. The floodplain behind the sluice and embankment frequently functions for the purpose of fluvial flood storage at times when the flaps are closed by high tides on the estuary side of the sluice.

Mill River

2.3.6 The Mill River has not been modelled for inclusion on the Environment Agency Flood Map for Planning, because of the small size of catchment area, which falls under the 3km^2 threshold for modelling. Future development in this floodplain would require modelling.

2.3.7 The Environment Agency Long Term Flood Risk Map[7] shows the risk of flooding from surface water mapping (ROFSW) in this area and the overland flow paths at the upstream end of the Mill River. The areas of high risk to the south of the railway line are supported by the historic records of flooding held by Ipswich BC.

Westerfield Watercourse

2.3.8 The Westerfield Watercourse is shown on the Environment Agency Flood Map for Planning. The floodplain of the watercourse is largely rural, however there are some properties and highways located in the floodplain, including the junction between Henley Road and Lower Road and properties at Waterworks Cottage, Thurleston Lane. Flood Zone 3b Functional Floodplain has not been mapped in this location. In the absence of modelled Flood Zone 3b, and for the purposes of planning, Flood Zone 3a should be referred to as an indication of the Flood Zone 3b Functional Floodplain.

2.3.9 The Environment Agency Long Term Flood Risk Map[8] shows the risk of flooding from surface water mapping (ROFSW) in this area and the overland flow paths at the upstream end of the Westerfield Watercourse.

Alderman Canal

2.3.10 The risk of flooding posed by the Alderman Canal is a residual risk, in the event of a failure of the embankment. A simple assessment of the residual risk as a result of a failure of the embankment was carried out as part of the 2011 SFRA, assuming the whole contents of the canal spill into the counter drain and flood the recreation area. The volume of water in the canal is approximately 8,500 cubic metres. This would flood across the recreation area, flooding this area to a level of approximately 2.7 m AOD.

Other Watercourses, springs and land drains

2.3.11 Underlying geological conditions in the Borough, including the horizon of the Red Crag with London Clay create spring lines giving rise to many other smaller watercourses. As the town has been urbanised some spring lines have become fragmented, piped or only flow in exceptional conditions. During heavy rainfall, runoff and overflow from overloaded or blocked drainage systems inevitably makes its way towards the minor watercourses and then the low areas adjacent to the Orwell and Gipping, including the Wet Dock.

2.3.12 As Ipswich has developed, many of these watercourses were used for water supplies, or culverted where they flowed through streets – towards the Orwell. Examples are Northgate Street, Lower Brook Street, Spring Road and Upper Orwell Street.

2.3.13 Some watercourses have been used to create the ponds in Christchurch Park, Holywells Park and Chantry Park. Along the western boundary of Holywells Park, a canal, with water retained by an earth embankment up to 3m high, originally fed the Cliff Brewery. This is now drained via an old Anglian Water storm overflow Sewer to the Orwell. Problems have recently arisen with high water levels or falling trees threatening to breach the embankment,

[7] https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[8] https://flood-warning-information.service.gov.uk/long-term-flood-risk/

with leaks flooding across parking areas in adjacent premises. The canal embankment presents a residual flood risk to adjacent areas.

2.3.14 Land drainage systems (intended to drain ground water using porous pipes) have been installed in valley bottoms in several areas to help drain gardens. Examples can be found at Tuddenham Avenue, Cavendish Street, Ancaster Road, Gippeswyck Park and Cliff Lane.

2.3.15 Land drains were also incorporated in the main river flood defences – these drain ground on the land ward side and at intervals outfall through the sheet piled walls with flaps intended to prevent reverse flow.

2.4 Sewers and local drainage

2.4.1 During heavy rainfall, flooding from the local drainage network may occur if:

- The rainfall event exceeds the capacity of the sewer system/drainage system; or
- The system becomes blocked by debris or sediment; or
- The system surcharges due to high water levels in receiving watercourses.

Sewer Capacity

2.4.2 New sewer systems are typically designed and constructed to accommodate rainfall events with an annual probability of 1 in 30 (3.3% AEP) or greater. Therefore, rainfall events with an annual probability more than 1 in 30 (3.3% AEP) would not be expected to result in surcharging of the sewer system. However, in Ipswich, much of the sewer system is older and may not have been designed to a 1 in 30 year standard. Also, much of the east of Ipswich drains via combined sewers (taking foul water and surface water). While Anglian Water, as the sewerage undertaker within Ipswich, recognises the impact that more extreme rainfall events may have, it is not cost beneficial to construct sewers that could accommodate every extreme rainfall event. Anglian Water is working with the Council, Suffolk County Council and Environment Agency to seek other climate adaptation measures, for example surface water management improvements. These are required to be implemented as part of new development as set out in section 9.6 of the SPD, which includes advice on the use of sustainable drainage systems (SuDS) in new developments.

Debris and Sediment:

2.4.3 Over time there is potential for road gullies and drains to become blocked from fallen leaves, build-up of sediment and debris (e.g. litter).

System Surcharges

2.4.4 Within the study area there is potential for surface water outlets to become submerged due to high river and tidal levels. When this happens, water is unable to discharge. Once storage capacity within the sewer system itself is exceeded, the water will overflow into streets and potentially into houses. Where the local area is served by ‘combined’ sewers i.e. containing both foul and storm water, if rainfall entering the sewer exceeds the capacity of the combined sewer and storm overflows are blocked by high water levels in receiving watercourses, surcharging and surface flooding may again occur but in this instance floodwaters will contain untreated sewage.

2.4.5 During heavy rainfall, manhole covers can be at risk of being blown off, sometimes along with road surfacing, and there are records of foul debris being deposited on the streets in several areas.

2.4.6 Flooding particularly affects buildings with thresholds lower than adjacent roads, especially basements and subways. Some have been fitted with flood boards, non-return valves or pumps in an effort to alleviate the problem.

2.4.7 The most frequently flooded areas are the roads around the Wet Dock - Bridge Street, Key Street, College Street and Duke Street. However, the depth of floodwater is currently limited since it can easily overflow overland into the wet dock.

2.4.8 Deeper basements may be at increased risk of rapid, deep and potentially dangerous flooding from sewers or overland flows.

2.4.9 The probability of flooding from sewers and local drainage systems may increase in the future as a result of the impacts of climate change. Changes in rainfall patterns may put pressure on local drainage systems and increases in sea levels may prevent surface water systems from out falling into the tidal Orwell.

2.5 Surface water flooding

2.5.1 Ipswich has over 30 years of detailed records of local flooding resulting from heavy rainfall, not attributed to overtopping of river or tidal defences. Such flooding results from surface runoff, overloading of soakaways, SuDS, piped systems, ordinary watercourses (ditches, streams or valley bottoms) or groundwater.

2.5.2 The Environment Agency Risk of Flooding from Surface Water (RoFSW) mapping for Ipswich illustrates the risk of surface water flooding to be widespread across the Borough. The surface water follows the natural topography of the land and accumulates in the natural depressions. Additionally, surface water flow pathways are present along the road networks. In Ravenswood, it is noted that the SuDS basins are shown as areas at risk of flooding on the mapping.

2.5.3 The Surface Water Management Plan[9] (SWMP) identified a list of 10 priority areas for surface water flooding in Ipswich. The following four were prioritised for action plans:

- London Road to Lavenham Road and Hadleigh Road;
- Ancaster Road/Burrell Road;
- Lovetofts Drive to Lagonda Drive; and
- Worsley Close/ Ellenbrook Green.

2.5.4 The action plans set out measures for alleviating flooding in these areas and suggest ways to reduce the effects of urban creep (paving of gardens, small extensions, etc). Following the SWMP, Anglian Water have implemented a flood relief project to alleviate surface water flood risk at Lovetofts Drive.

2.6 Groundwater flooding

2.6.1 Due to the geology in the area, parts of Ipswich are at risk of groundwater flooding. These are mostly at the interface between the crag and the clay geology types which are also associated with the presence of springs and the start of minor watercourses.

2.6.2 Groundwater flooding has affected gardens in many areas including: Tuddenham Avenue, Spring Road, Springfield Close, Cavendish Street / Back Hamlet Allotments, Birkfield Drive, Heatherhayes, Pembroke Close, Lavender Hill, Coltsfoot Road, Lavenham Road, Worsely Close, Manchester Rd and Ritabrook Rd. Basement and subway flooding has also occurred. Locations of groundwater flooding have been mapped by Ipswich BC (SFRA Appendix A, Figure 13).

[9] Suffolk Flood Risk Management Partnership, June 2012, Ipswich Surface Water Management Plan, Phase 3 Report

3. Development and Flood Risk

3.1 Flood Risk Vulnerability

3.1.1 The policy approach to development and flood risk, both nationally and locally, is to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. This is known as the 'sequential approach' to the location of development. The 'Sequential test' is applied to ensure that the sequential approach is followed. It is applied by using the Flood Zones 1, 2 3a and 3b described in Section 2.1 and Appendix 1 (see also Table 1 of the Planning Practice Guidance (PPG), Flood Risk and Climate Change).

3.1.2 New development should be located in Flood Zone 1. If there are no reasonably available sites in Flood Zone 1, then the vulnerability of the proposed land use needs to be taken into account and reasonably available sites in Flood Zone 2 considered. Only if there are no reasonably available sites in Flood Zones 1 and 2 should locations within Flood Zone 3 be considered, again taking account of the vulnerability of the development. Advice on the sequential and exception tests is available on the Government's website: https://www.gov.uk/guidance/flood-risk-assessment-the-sequential-test-for-applicants and here:- https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zones-2-and-3 .

3.1.3 The vulnerability of land uses is explained in Appendix 2 (the appendix reproduces Table 2 of the Flood Risk and Climate Change PPG).

3.1.4 If it is not possible to locate vulnerable forms of development in zones with lower risk of flooding, the exception test should be applied. Guidance from the PPG on the exception test can be found here: https://www.gov.uk/guidance/flood-risk-and-coastal-change#The-Exception-Test-section . Section 14 of the NPPF states that, for the exception test to be passed, it should be demonstrated that both:

a) The development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) The development will be safe for its lifetime taking into account the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

3.1.5 Appendix 3 to this SPD identifies flood risk vulnerability and flood zone compatibility and clearly indicates where development is appropriate and where it should be refused, and the circumstances in which the exception test will be required (the appendix reproduces Table 3 of the Flood Risk and Climate Change PPG).

3.1.6 The remainder of the SPD takes applicants through the process of considering flood risk in relation to development proposals based on the development's type and therefore vulnerability, its location in relation to flood risk in Ipswich and its size.

3.2 Pre-application advice

3.2.1 The Environment Agency and IBC each offer bespoke pre-application advice services which it is advisable to use to discuss particular requirements for specific planning applications. Both are charged services, although the Environment Agency may also initially provide free, written preliminary advice.

- Environment Agency: https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion
- Ipswich Borough Council: https://www.ipswich.gov.uk/services/planning-applications

3.2.2. Ipswich Borough Council encourages applicants to seek pre-application advice, to help make sure that the proposed development is of a high quality and that planning applications contain the correct information and comply with the relevant planning policies.

3.2.3 The Flood and Water Management team at Suffolk County Council also encourage developers to contact them as early as possible in the planning process for advice on how to create an application which meets minimum operational standards and is beneficial for all concerned organisations and individuals. The team can be contacted on floods@suffolk.gov.uk . Developers may need to seek bespoke advice if their proposed development is located within a Critical Drainage Area (CDA) identified by the SWMP.

3.2.4 If applicants use the Ipswich Borough Council pre-application advice service, the Council will undertake certain internal and external consultations and report responses received to the applicant. Consultations exclude the Environment Agency, as it is a charged service. Therefore, applicants would still need to seek advice directly from the Environment Agency. Development Management consult the Local Lead Flood Authority Flood Risk Team on pre-application discussions and include comments in the IBC formal response. The Council aims to provide a written response within six weeks.

3.2.5 If applicants choose not to use the Council's pre-application service, they should involve appropriate Risk Management Authority[10] consultees at the earliest stage in order to ensure that their application comprehensively addresses any flood issues. Advice on other non-flood-related consultees can be found in other Ipswich Supplementary Planning Documents. Likely flood risk consultees are identified in Appendix 4 Table 0-2 and will depend on the following factors:

- The flood zone the development is in and whether it's within 20 metres (m) of a main river. Refer to the Environment Agency Flood Map for Planning;
- Whether the development is in an area with critical drainage problems on data.gov.uk. Currently there are no such areas within Ipswich Borough;
- The size of the development, including whether it's major development as defined on legislation.gov.uk and whether it is an area at risk of surface water flooding;
- The vulnerability classification of the development, as defined in the Planning Practice Guidance and in Appendix 4 of the SPD.

3.2.6 Table 8-1 of the Ipswich SFRA lists sites considered through the Ipswich Strategic Housing and Economic Land Availability Assessment which fall within a flood zone. This includes sites allocated for development through the Ipswich Local Plan. Against each site, it identifies:

- how much of the site falls within each flood zone;
- whether it is within 300m of a Main River or an Ordinary Watercourse;
- the risk of surface water flooding; and
- whether it is in an area subject to groundwater flooding.

3.2.7 Appendix F of the SFRA also provides detailed site information for allocated development sites within a flood zone and is organised in Local Plan site reference number order from IP003 to IP355.

3.2.8 For sites which are not identified through table 8-1, applicants should check the mapped information in the appendices to the Ipswich SFRA, the information available through the links provided above, and information from the Surface Water Management Plan as bespoke advice may be needed if the proposed development is located within a Critical Drainage Area. All applicants are advised to check the information available through both the Ipswich SFRA and the links provided in the paragraphs above. Flood risk data can

[10] Risk Management Authorities are defined through the Flood and Water Management Act, 2010.

change over time, and whilst the SFRA is a ‘living document’, there could be lags between respective updates between organisations.

4. Is planning permission required?

4.1 When permission is required

4.1.1 The Planning Practice Guidance (PPG) states that planning permission is only required if the work you want to carry out meets the statutory definition of development. This includes:

- building operations, such as structural alterations, construction, rebuilding and most demolition;
- making a material change of use to your land or building;
- engineering works, including groundworks, or mining operations;
- other operations normally undertaken by a builder; and
- the subdivision of a building used as a home into two or more separate homes.

4.1.2 Full details can be found on the planning portal and by contacting Ipswich BC development.management@ipswich.gov.uk / 01473 432913.

4.1.3 Some types of work do not meet the definition of development, including (this list is not exhaustive):

- interior alterations (except mezzanine floors which increase the floorspace of retail premises by more than 200 square metres);
- building operations which do not materially affect the external appearance of a building; and
- a change in the primary use of land or buildings, where the before and after use falls within the same use class as defined through the Town and Country Planning (Use Classes) Order 1987 (as amended).

4.1.4 However, other approvals may apply, such as Building Regulations. Land Drainage Consent is required for alterations to ordinary watercourses (Land Drainage Act 1991 S23), and if it is a 'Main River' then EA consent may be required. Applicants are responsible for checking other permissions which may be required for the proposed work. The Planning Portal provides advice on additional types of permission.

4.2 Permitted development rights

4.2.1 All work meeting the definition of development needs planning permission, but the Town and Country Planning (General Permitted Development) (England) Order 2015 allows certain building works and changes of use to be carried out without having to make a planning application. These are called "permitted development". The Planning Portal website has a useful interactive guide which will help you decide whether or not you need planning permission.

4.2.2 It should be noted that even where some types of development are classed as permitted development, applicants may be required to apply for a permitted development prior approval to the local planning authority, which allows the Council to take account of flood risk in the same way as development that does require a planning application.

4.2.3 If you are still in doubt please seek advice by emailing development.management@ipswich.gov.uk

4.3 Paving front gardens

4.3.1 You will not need planning permission if a new or replacement driveway of any size uses permeable (or porous) surfacing which allows water to drain through, such as gravel, permeable concrete block paving or porous asphalt, or if the rainwater is directed to a lawn or border to drain naturally.

4.3.2 If the surface to be covered is more than five square metres planning permission will be needed for laying traditional, impermeable driveways that do not provide for the water to run to a permeable area. More detailed practical advice can be found in Guidance on the permeable surfacing of front gardens.

5. Is the sequential test required?

5.1 Developments that need a sequential test

5.1.1 A sequential test must be undertaken as part of the planning process if both of the following apply:

- the development is in flood zone 2 or 3 – (find out which flood zone a site is in and see also SFRA Appendix A, Map 6); and
- a sequential test has not already been completed for development of the same type on the proposed site. The sequential test has been carried out for Local Plan allocations within the flood zone as reported in the Flood Risk Sequential and Exception Test Statement October 2020 (Emerging Ipswich Local Plan 2018-2036 Core Document reference I34.1).

5.1.2 Planning Practice Guidance on applying the sequential test is available here. https://www.gov.uk/guidance/flood-risk-assessment-the-sequential-test-for-applicants

5.2 Developments that do not need a sequential test

5.2.1 A sequential test does not need to be carried out if there has been one carried out as part of the Local Plan process, provided flood risk and development circumstances have not changed. In this case, you need to ask Ipswich BC for the site allocation reference in the Local Plan or look online at the Ipswich Local Plan Site Allocations and Policies (incorporating IP-One Area Action Plan) Development Plan Document (Core Document reference A2) or the Policies Map and IP-One Area Action Plan Inset Policies Map (Core Document references A3 and A3.1) and include it in your planning application.

5.2.2 A sequential test does not need to be carried out if either of the following apply:

- The proposed development is a minor development, or
- The proposed development involves a change of use (e.g. from commercial to residential) unless your development is a caravan, camping chalet, mobile home or park home site.

5.2.3 Developers do not need to provide a sequential test for a development wholly located in flood zone 1 unless the Strategic Flood Risk Assessment (REF I34), or other more recent information, indicates there may be flooding issues now or in the future (for example, through the impact of climate change). The current 2021 information does not identify areas within the Borough in Flood Zone 1 that will be at risk from the Gipping or Orwell in future as a result of climate change. This could change in future as climate change forecasts are updated.

5.2.4 The flow chart below summarises the sequential test process for developers, once it has been identified that the sequential test is necessary. The following paragraphs describe the steps which need to be followed. It should be noted that highly vulnerable development, such as basement dwellings, will not be permitted in flood zone 3a or 3b, irrespective of a sequential test. Development vulnerability is set out in Appendix 3 to the SPD.

Figure 5-1 Summary of the Sequential Test Process

5.3 Applying the sequential test

5.3.1 If the sequential test is required, the developer needs to include in the sequential test the name and location of the site proposed for development and an explanation of why that specific site was selected. Developers will need to agree with Ipswich BC an appropriate area of search for, and list of, reasonably available alternative sites, against which to test the proposed development site, following the guidance provided below.

Area of search

5.3.2 The area over which to apply the sequential test will be defined by local circumstances relating to the catchment area for the type of development proposed. For some developments this may be clear, for example, the catchment area for a school. In other cases, it may be identified from other Local Plan policies, such as a specific area identified for regeneration. For example, where there are large areas in Flood Zones 2 and 3 (medium to high probability of flooding) and development is needed in those areas to sustain the existing community, sites outside them are unlikely to provide reasonable alternatives.

5.3.3 For Ipswich, normally the area of search will be the whole Borough, or the IP-One Area if the proposal falls within the IP-One Area Action Plan area and relates to urban regeneration. It may be reduced in discussion with IBC to a bespoke area, depending on the functional needs and objectives of the proposed development or whether there is an identified and unmet need for the type of development proposed. Developers should agree the geographical area for the search with Ipswich BC before undertaking the search and include the justification at the start of the report. For nationally or regionally important infrastructure, the area of search to which the sequential test could be applied will be wider than the local planning authority boundary. The area of search may be reduced to a bespoke area to accommodate requirements for development for carbon reduction, energy, engineering and capacity requirements by utilities such as Anglian Water and other infrastructure providers.

Reasonably available alternative sites

5.3.4 When applying the sequential test, a pragmatic approach to the availability of alternatives will be taken. For example, in considering planning applications for extensions to existing business premises, it might be impractical to suggest that there are more suitable alternative locations for that development elsewhere.

5.3.5 The PPG states that reasonably available alternative sites within the areas of search should be drawn from the Local Plan and its supporting evidence. They must meet the functional requirements of the proposed development and be considered reasonably available. Sources of such sites would include:

- Local Plan allocations (for the same use);
- Sites with planning permission for the same use but not yet developed; or
- The Strategic Housing and Economic Land Availability Assessment.

5.3.6 For residential applications, reasonably available alternative sites will be considered to be those falling within the Council's five-year housing land supply. This is reported annually through the Authority Monitoring Report (see the 'housing trajectory' appendix to the Authority Monitoring Report). In order to be considered a reasonably available alternative site, the site will need to be:

- within the agreed area of search (whole Borough or the IP-One Area or other such area as agreed with Ipswich BC); and
- suitable for the proposed use in Local Plan policy terms; and
- not affected by constraints that cannot be overcome.

5.3.7 Applicants should list the addresses of the reasonably available alternative sites considered and explain how they were selected, listing the supporting documentation used. Applicants will need to check the approximate capacity of each alternative site, e.g. how many houses can be built per hectare on the site. If the site has planning permission or is a Local Plan allocation, the capacity stated may be used. If a capacity estimate is needed, this should take into account the Local Plan density policy (Policy DM23 'The Density of Residential Development', found in the Core Strategy and Policies DPD, which requires higher densities of development in the more accessible parts of the Borough). Applicants will only be expected to consider alternative sites of a broadly similar size or capacity to their own.

Comparing flood risk

5.3.8 The risk of all types of flooding at the proposed development site should be compared with the risk of flooding at the alternative sites identified. Developments should be located within areas with the lowest flood risk, and if possible in Flood Zone 1. Existing flood defences should not be taken into consideration when applying the Sequential Test and nor should the potential for on-site mitigation of flood risk. The following resources are available to use to compare flood risk:

- the Environment Agency's Flood Map for Planning;
- the Environment Agency's Long Term Flood Risk Information;
- the Ipswich BC Strategic Flood Risk Assessment (document reference I34);
- the Suffolk County Council Surface Water Management Plan;
- existing flood risk assessments on the sites - contact Ipswich BC to get these or use the Planning Online tool if you have a planning application reference number for the site; and
- any other source of flooding information (e.g. documents from SCC as the lead local flood authority).

5.3.9 The conclusion of the sequential test will identify whether any of the alternative sites identified have a lower risk of flooding than the proposed site. If there are found to be other reasonably available sites at a lower risk of flooding, then the development has failed the sequential test, and this could lead to refusal of planning permission. Applicants may appeal refusal of planning permission if the local planning authority does not accept the sequential test.

5.3.10 If, however there are no other reasonably available sites, then the development has passed the sequential test. The exception test may also need to be undertaken at this point (if required – see Section 10). If an exception test is required, applicants will also need to show that the development will deliver the wider sustainability benefits that outweigh the flood risk, will be safe for its lifetime taking into account the vulnerability of its users and that it will not increase flood risk elsewhere.

Submission

5.3.11 A sequential test should be included within the site-level flood risk assessment and submitted to Ipswich BC as part of the planning application process. It is advised to seek a suitably qualified engineer to undertake the flood risk assessment for the site and therefore apply the sequential and exception test as appropriate to the proposal.

5.3.12 An applicant or their appointed consultant can agree with Ipswich BC an appropriate area of search and a list of reasonably available alternative sites, prior to the submission of the sequential test. Contact development.management@ipswich.gov.uk if necessary.

6 Is a drainage strategy required?

6.1.1 The revised National Planning Policy Framework, July 2021 (NPPF), Section 169, requires that all major development incorporate Sustainable Drainage Systems (SuDS) unless there is clear evidence that this would be inappropriate, for example, particular soil types that are unsuitable. In this context major development means:

- for residential development, the provision of 10 or more dwellings, or a site of 0.5 hectares or more; and
- for non-residential development, new floorspace of 1,000 square metres or more, or a site of 1 hectare or more (see the glossary).

6.1.2 The Flood and Water Management team at Suffolk County Council (SCC) is a statutory consultee for surface water drainage proposals for major developments. This is part of SCC's responsibility as the Lead Local Flood Authority (LLFA). SCC should be consulted in the following circumstances:

- the number of dwellings to be provided is 10 or more, or the development is to be carried out on a site having an area of 0.5 hectares or more (and it is not known if 10 or more dwellings are to be provided);
- the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more;
- development is to be carried out on a site having an area of 1 hectare or more; and
- any minor applications in areas at risk of surface water flooding. (You can determine whether a site may be at risk of surface water flooding using these maps created by the Environment Agency).

6.1.3 There is standing advice that developers/landowners/consultants should refer to first on the SCC website, available at: https://www.suffolk.gov.uk/roads-and-transport/flooding-and-drainage/guidance-on-development-and-flood-risk/ Developers should contact SCC as early as possible in the planning process for advice on how to create an application which meets minimum operational standards and is beneficial for all concerned organisations and individuals.

6.1.4 The Suffolk Flood Risk Management Partnership has created a number of useful documents which clarify what is required of developers and why. The definitive link to documents is via the same web address as that provided above: https://www.suffolk.gov.uk/roads-and-transport/flooding-and-drainage/guidance-on-development-and-flood-risk/. The Suffolk Flood Risk Management Strategy can provide developers some context into flood management for Suffolk on a larger scale, including links to and extracts from key national guidance documents. The strategy document has a number of appendices:

- Appendix A - The local SuDS guide to assist developers in creating sustainable drainage systems on proposed development sites. **NB – Changes to Appendix A Section 3 – 'What We Expect to See'.** Interim additional guidance **has been issued with respect to the information required to be submitted with Outline Planning Applications.** See also section 9.6 of the SPD for information on SuDS.
- Appendix B - A consenting policy which aims to provide clarification of the policy towards works affecting a watercourse, particularly culverts. Further information can be found on SCC's working on a watercourse page.
- Appendix C - A protocol for advising local planning authorities (LPAs) exactly what is required from developers in terms of surface water drainage. This includes a section clearly summarising the developer's responsibilities.
- Appendix D - Guidance on how Suffolk County Council deals with flooding reports .

7 Is a site-specific flood risk assessment required?

7.1 When a flood risk assessment is required

7.1.1 The PPG states that you need to prepare a flood risk assessment for most developments within flood zones 2 and 3. Guidance on how to carry out an FRA in FZ2 or FZ3 is provided here. Flood risk assessments are required to form part of planning applications for development in the following situations:

- in flood zone 2 or 3 including minor development and change of use ;
- involving sites of more than 1 hectare (ha) in flood zone 1;
- sites of less than 1 ha in flood zone 1 where proposed development includes the change of use to a more vulnerable use class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example ground water, surface water drains or canals);
- sites in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency. The EA locally has not designated any "areas with critical drainage problems" in Essex, Norfolk or Suffolk. Please note that these should not be confused with the "Critical Drainage Areas" identified by Suffolk County Council in its Surface Water Management Plan, which are different in context. Therefore, in Ipswich Borough, the EA has not designated any area of flood zone 1 as having critical drainage problems; and
- Development in a 'critical drainage area' as identified in the Ipswich Surface Water Management Plan.

7.1.2 In addition, the SCC Local Flood Risk Management Strategy (Appendix C) requires FRAs for:

- Development in areas shown on 'flood risk from surface water' maps online (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map);
- Development in basements[11] and on lowered ground levels;
- Development which involves land raising where this impacts on surface water flood risk - the applicant would need to assess the impact of displacing surface water by ground raising. If the ground raising is in a mapped or known flood risk area, then it will have some impact, and an FRA will determine the scale and nature of the impact;
- Sites adjacent to roads with no drainage – drainage and flooding of highway issues should be resolved as part of the planning application; or
- Any other specific areas that may be listed in SFRAs.

7.1.3 A planning application may be refused by the IBC if it does not include a flood risk assessment when it is required, or the contents are not satisfactory. The sequential and exception test (if required) can be included as part of the site-specific Flood Risk Assessment.

7.2 When to follow standing advice

7.2.1 You should follow the Environment Agency's standing advice if you're carrying out a flood risk assessment of a development classed as:

- a minor extension (household extensions or non-domestic extensions less than 250 square metres) in flood zone 2 or 3;

[11] See section 9.2 regarding basement dwellings proposed within flood zones 2 and 3, which Table 2 of the PPG classifies as 'highly vulnerable' development.

- ‘more vulnerable’ in flood zone 2 (except for landfill or waste facility sites, caravan or camping sites);
- ‘less vulnerable’ in flood zone 2 (except for agriculture and forestry, waste treatment, mineral processing, and water and sewage treatment); or
- ‘water compatible’ in flood zone 2.

7.2.2 You also need to follow standing advice for developments involving a change of use into one of these vulnerable categories or into the water compatible category.

7.2.3 More information can be found on the gov.uk website relating to:

- Flood Risk Assessment in Flood Zones 2 and 3;
- Site Specific Flood Risk Assessment; and
- Site Specific Flood Risk Assessment checklist.

8 What should be included within a flood risk assessment?

8.1 Site-specific flood risk assessment: Objectives

8.1.1 A site-specific flood risk assessment is carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where a flood risk assessment is necessary, the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users (see PPG Table 2 – Flood Risk Vulnerability).

8.1.2 The PPG states that the objectives of a site-specific flood risk assessment are to establish:

- whether a proposed development is likely to be affected by current or future flooding from any source;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate;
- the evidence to enable the local planning authority to apply (if necessary) the Sequential test; and
- whether the development will be safe and pass the exception test, if applicable.

8.1.3 A site-specific flood risk assessment checklist is included in Table 8-1 at Appendix 5. Applicants are required to follow the checklist to ensure that Food Risk Assessments provide all the information the Council needs in order to determine the application.

8.1.4 Ipswich BC has set out particular requirements for FRAs in specific areas in Table 8-1, which are additional to the requirements set out in the checklist in Appendix 5.

Table 8-1 Guidance for flood risk assessments in specific areas

Area	Special requirements for FRA	Purpose
Areas susceptible to surface water flooding	FRAs required considering overland flows through and from off site. Will affect site layout, floor levels and need for resilient design. SWMP update being prepared by Suffolk County Council.	To ensure development does not worsen surface water flooding, nor is flooded by the overland flows.
Adjoining and close to flood defence walls.	Breach of defences - The SFRA provides hazard maps for certain breach locations. For other locations it should be possible to infer hazard ratings from the SFRA. Breach modelling helps to inform both structural and non-structural measures to bring about safe development. If rapid and highly hazardous characteristics, then design of the development might need to reflect this. The EA carry out Breach modelling so applicant needs to consider this in the impacts on the development. If the onset of flooding to a site is over a longer period and transition from low	To check that the structure of the building would be capable of withstanding hydrostatic and hydrodynamic forces of floodwater where positioned close to defence walls and structures that are effectively acting as dams. Also to provide evidence for Exception Test that the design of the building is safe for its users with specific regard to the nature of the inundation characteristics

Area	Special requirements for FRA	Purpose
	hazard to a higher hazard is longer then there may be more reliance on non-structural measures to facilitate safety i.e. evacuation and flood response plans. FRAs for development adjoining defences should also focus on how the development itself will not affect the integrity of the flood defence, or potentially modify a flood flow path to the detriment of other areas.	should adjacent defences fail or be overtopped. In most case it is envisaged that Ground level sleeping accommodation will not be appropriate in these areas if the flooding characteristics could result in a rapid transition to high flood hazard with deep flooding depths. Sleeping accommodation should therefore be set above the maximum tidal breach inundation level (0.5% AEP) including climate change. Flood Risk Assessments should clearly present the site inundation characteristics in the event of a breach (available from the SFRA) to clearly demonstrate that the design of the development will prevent future occupants of the development from being placed directly in danger from assessed flood hazards. Paras 9.2.7 to 9.2.9 of the SPD provide more information on the setting of floor levels in areas of residual tidal risk The information from the modelled breaches in the SFRA should be used to inform the developer's FRA.
Holywells Road area	Need to consider: • the Holywells canal embankment stability & risk of overtopping. • Canal outlet/highway drainage. • Highway drainage investigation. • Surface runoff from frontage development. • Combined sewer flooding from Cliff Lane. • Tidal flooding. • Sewerage system surcharging.	Highway drainage system not recorded.

Area	Special requirements for FRA	Purpose
	• AW tunnel overflow via Ship Launch Rd if overloaded or if outfall penstock malfunctions.	
Wet Dock frontages - Sites South of Key St, Fore St	There should be no increase in ground level (paving). Ground floor levels to be set above likely 1% AEP local surface water flood levels.	To avoid worsening flooding of low-lying properties by overland flows.
Lowest parts of Zone 3	Surface water flood storage, groundwater. Foul & surface water drainage.	
Green field sites with permeable soils	Foul drainage availability / capacity. BRE365 Soakaway tests, ground water levels, ground water protection. Layout and levels of proposed development to have space to retain 100 year event runoff on site allowing for adequate clearance from infiltration systems to buildings. Maintenance arrangements.	To ensure layouts allow sufficient space for adequate SuDS and ensure SuDS are maintained in the future.
Greenfield sites with impermeable soils	Foul drainage, Soakage tests or ground investigations required to prove ground unsuitable for infiltration type SuDS. If not suitable - Greenfield runoff rates, outfall capacity, suitability or route. Layout and levels of proposed development to have space to retain 100-year event runoff on site in lower parts of site. Land drainage – pipes and or ditches.	To ensure combined sewer flooding and pollution of watercourses is not worsened.
Brownfield Sites	SuDS to reduce off site discharges. Soakage tests in permeable areas. Contamination /remediation may affect drainage.	
Sites adjacent to roads with no drainage e.g. Humber Doucy Lane site 30, Whitton Church lane, Norwich Rd North of Ipswich	Drainage or flooding of highway to be resolved as part of the development.	
Sites within the countryside north of Ipswich with no readily available FW or SW drainage.	Foul Water – consider draining wider area – some existing properties served by unsatisfactory septic tanks etc. SW drainage, greenfield runoff, land drainage.	No readily available foul sewer; probable capacity issues.
Sites along the south east boundary of Ipswich.	Foul Water, Surface Water.	No readily available foul sewer.

9 Safety framework and flood risk management measures

9.1 Approach to safe development

9.1.1 The PPG states that after applying a sequential approach so that, as far as possible, development is located to where there is the lowest risk of flooding, new development can be made safe by:

- designing buildings to avoid flooding by, for example, raising floor levels;
- providing adequate flood risk management infrastructure which will be maintained for the lifetime of the development, for example, using Community Infrastructure Levy or planning obligations, or Partnership Funding where appropriate;
- leaving space in developments for flood risk management infrastructure to be maintained and enhanced; and
- mitigating the potential impacts of flooding through design and flood resilient and resistant construction.

9.1.2 The PPG emphasises that, when considering safety, specific local circumstances need to be taken into account, including:

- the characteristics of a possible flood event, e.g. the type and source of flooding and frequency, depth, velocity and speed of onset;
- the safety of people within a building if it floods and also the safety of people around a building and in adjacent areas, including people who are less mobile or who have a physical impairment. This includes the ability of residents and users to safely access and exit a building during a design flood and to evacuate before an extreme flood;
- the structural safety of buildings (see Table 8-2 in the previous section in relation to considering structural safety in the event of a breach); and
- the impact of a flood on the essential services provided to a development.

9.1.3 While safety considerations are always very important, local planning authorities should seek to ensure that communities are sustainable, including ensuring that certain sections of society, such as the elderly and those with less mobility, are not unnecessarily excluded from areas where there is a risk of flooding. (PPG Paragraph: 054 Reference ID: 7-054-20150415). Areas at risk of flooding may also be the most accessible and sustainable places to live in the Borough. Applicants will need to demonstrate that equality considerations have been applied where appropriate to the design of flood mitigation measures, such as safe refuges within buildings or evacuation plans.

Design flood and extreme flood

9.1.4 When considering the safety of proposed developments and design of mitigation measures two terms are used:

9.1.5 The **design flood** is a flood event of a given annual probability, against which the suitability of a proposed development is assessed, and mitigation measures, if any, are designed.

- For fluvial flooding, the design flood is the 1% AEP (1 in 100 annual chance) event, taking account of the presence of defences and including an appropriate allowance for climate change.
- For tidal flooding, the design flood is the 0.5% AEP (1 in 200 annual chance) event, taking into account the presence of defences and including an appropriate allowance for climate change.

9.1.6 It is the design flood for which mitigation measures such as finished floor levels and safe access/egress arrangements need to be considered.

9.1.7 The **extreme flood** event is the 0.1% AEP (1 in 1000 annual chance) event, against which flood response procedures are considered, or the residual risk of flooding from a breach in flood defence infrastructure.

9.2 Ipswich Borough Council Safety Framework (IBCSF)

9.2.1 Guidance for what is considered 'safe' in Ipswich has been developed over the years in collaboration with Suffolk Resilience Forum, Ipswich BC's Emergency Planning Officer and the Environment Agency. With the specific local circumstances for Ipswich in mind, this section provides the Safety Framework based on the updated SFRA, the current PPG and other relevant guidance documents. Appropriate mitigation should be covered in the planning application flood risk assessment where required.

9.2.2 The Safety Framework for Ipswich is being updated because it was written before the tidal barrier was constructed.

9.2.3 The IBCSF safety framework covers the following:

- Suitable Finished floor levels;
- Self-contained basement development;
- Safe access/egress;
- Safe refuge;
- Flood warning and response plans;
- Structural safety of buildings; and
- Special measures and information to assist emergency services.

Finished floor levels

9.2.4 Where development in Flood Zones 2 or 3 is unavoidable, the recommended method of mitigating flood risk to people is to ensure internal floor levels are raised a freeboard level above the design flood level. A freeboard is used to account for residual uncertainty within design; often an extra 300mm or 600mm added to finished floor level above the design flood level to account for any uncertainty in flood levels as a safety factor.

In areas of fluvial flood risk:

9.2.5 All development (Less Vulnerable, More Vulnerable and Highly Vulnerable) should set finished floor levels 300mm above the fluvial design flood level (1% AEP) including an appropriate allowance for climate change.

In areas of tidal flood risk:

9.2.6 All development (Less Vulnerable, More Vulnerable and Highly Vulnerable) should set finished floor levels 300mm above the tidal design flood level (0.5% AEP) including an appropriate allowance for climate change.

In areas of <u>residual</u> tidal flood risk:

9.2.7 Much of central Ipswich is protected from tidal flooding by the IFDMS for the design event (0.5% AEP including climate change) and finished floor levels do not need to be raised.

9.2.8 In order to mitigate the residual risk of flooding in the event of a failure of the tidal flood defence infrastructure, <u>sleeping accommodation</u> should be set above the maximum tidal breach level (0.5% AEP) including climate change. This would mean that in areas at residual risk of tidal flooding, single storey residential developments would not normally be permitted

unless they could comply with this requirement. Ground floor flats are deemed an unsuitable use in areas at residual risk of tidal flooding.

9.2.9 The maximum breach flood level varies considerably depending on the flood compartment and will be highest closest to the breach location. The flood compartments are shown in Figure 9-1. The maximum breach flood levels for each compartment are presented in Table 9-1 and Figures 9-2 and 9-3.

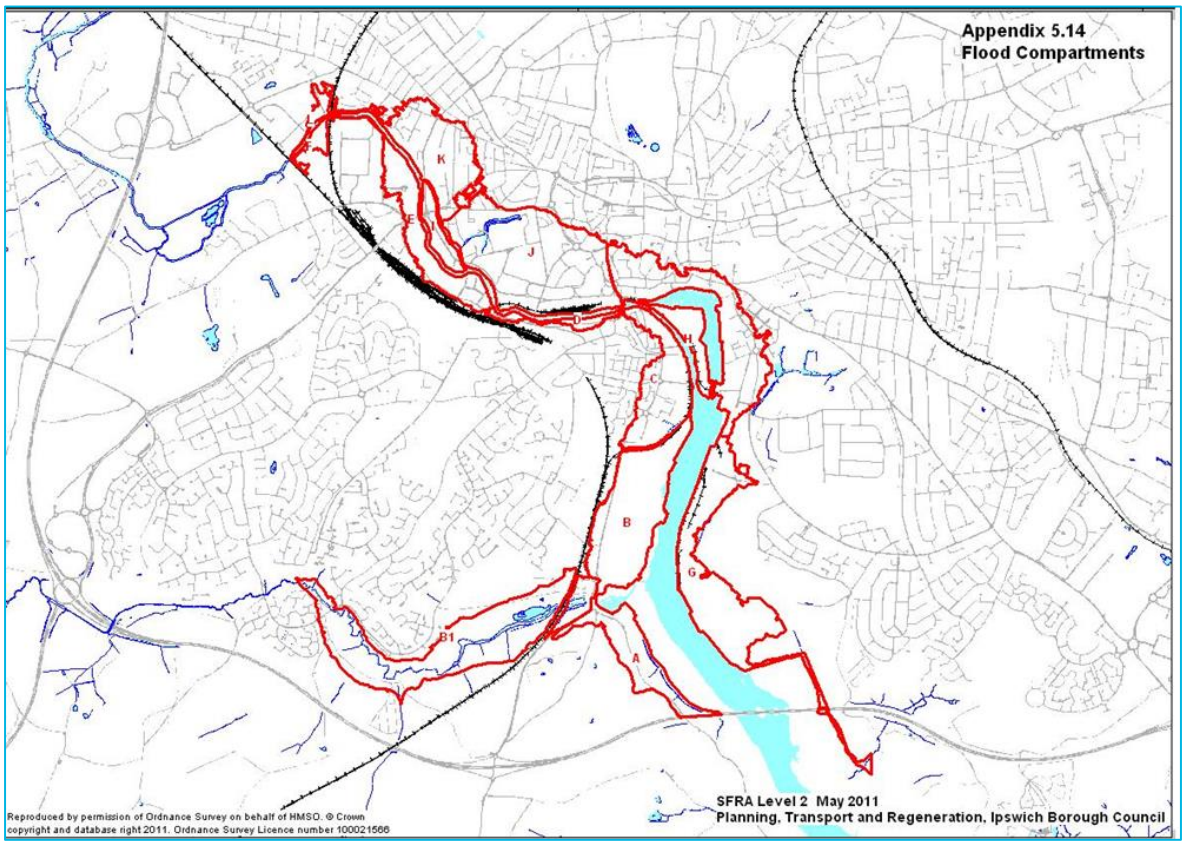


Figure 9-1 Flood compartments

Table 9-1 Maximum flood levels

Flood compartment	Maximum flood level reached in 0.5% AEP event with breach 05 or 07 with Barrier.
A	5.3 m AOD
B	5.3 m AOD
C	Mostly 3.5m AOD but locally up to 5.3 close to Breach 07 (gate across Wherstead Rd, Error! Reference source not found.).
D	4 m AOD - No relevant breach modelled - this is the maximum water level in the Orwell upstream of the barrier before flooding into compartment H occurs. The IFDMS is designed to prevent this in a 300 year RP event.
E	No relevant breach modelled. Either undertake a site-specific model or use 4m AOD as suggested above.
F	Not currently in Flood Zones 2 or 3, refer to flood levels from River Gipping model.
G	5.3 m AOD
H Wet Dock area	Mostly 4m AOD but locally up to 5.3 close to Breach 05 (Error! Reference source not found.).
I Island @West End Rd	Most of the island at West End Road has ground levels between 5.5m AOD and 4 m AOD. The 1% AEP fluvial level including 65% climate change allowance is 4.8m AOD. Finished floor levels to be 300mm above i.e. 5.2m AOD.

J “Village” / Portman Quarter/ Cardinal Park	3.6 m AOD ignoring backflow through sewers from compartment H – safe to assume 4 m AOD but 3.6 m AOD is consistent with Hazard map.
K	Land here is not in Flood Zone 3. GL is >4m AOD and <5.3m AOD

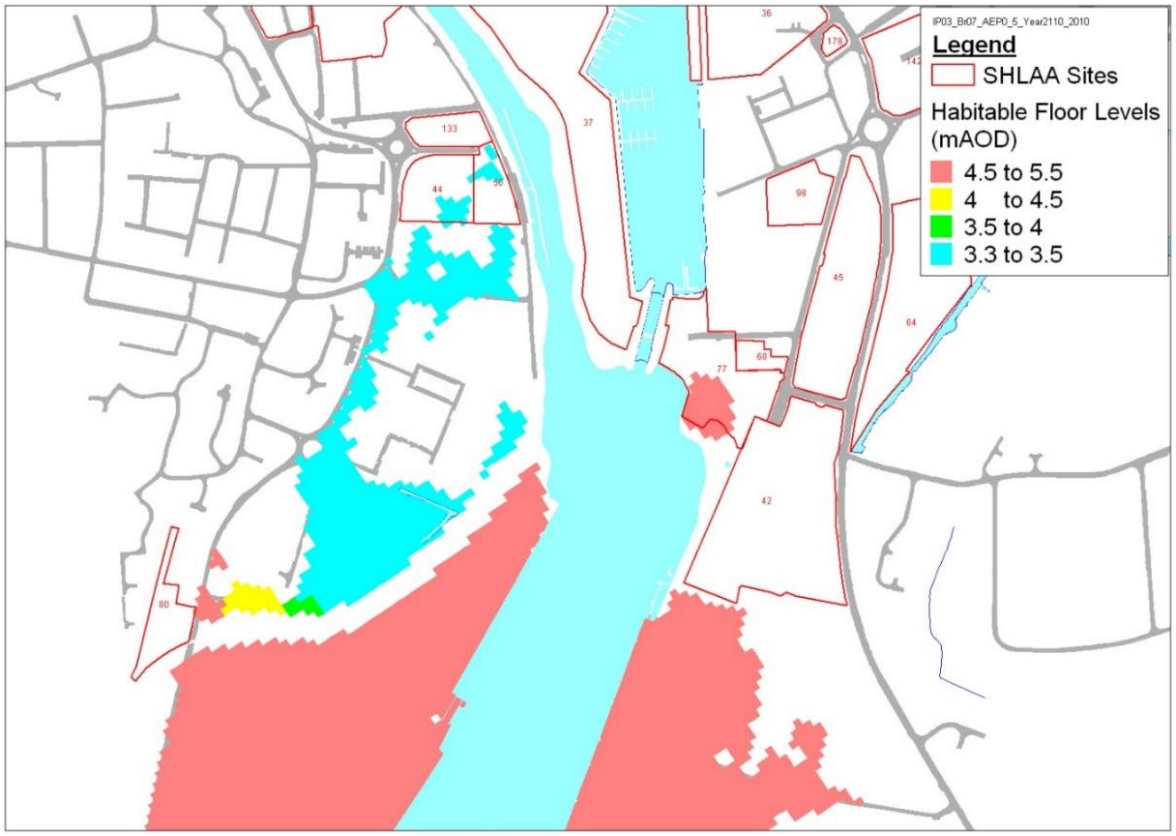


Figure 9-2 Design flood levels for sleeping accomodation, compartment C (breach 7, barrier in place)

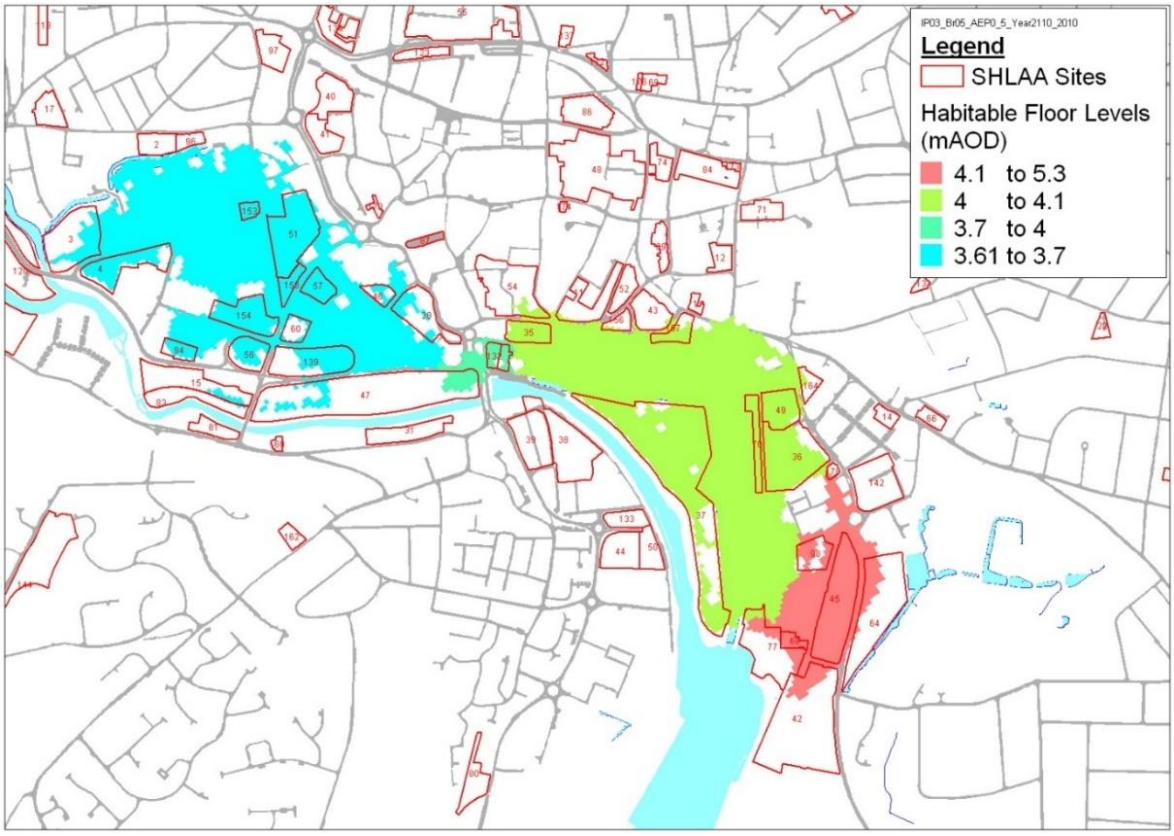


Figure 9-3 Design flood levels for sleeping accommodation, compartments H +J (breach 5, barrier in place)

Self - Contained Basement Developments

9.2.10 Basements can be defined as self-contained where there is no free internal access upstairs, in an event of flood water coming down outside access routes.

9.2.11 Basement dwellings are defined as 'Highly Vulnerable'. Surface water flooding can pose a serious risk to users of basements, but other forms of flooding, such as groundwater flooding, can be equally dangerous. Basements are at high risk because they are likely to flood first, inundate rapidly, and escape may be difficult, particularly for people with mobility impairments. If basements flood, there is not only the risk of damage to the property, but also a risk to life. Resilient design may also be difficult to implement, for example, locating a useable electricity supply above predicted flood levels.

9.2.12 The NPPF does not permit habitable basements in Flood Zone 3 and the exception test is required for basements in Flood Zone 2.

9.2.13 In some locations basements located in Flood Zone 2 (or 1) could still be flooded by tidal or fluvial flooding via the sewerage system. Basement dwellings should therefore not be permitted where the floor level is below the undefended 0.1% AEP *tidal* level in 100 years' time or below the undefended 0.1% AEP *fluvial* flood level in 100 years' time.

9.2.14 Basements dwellings should not be permitted in areas susceptible to surface water flooding.

9.2.15 Basements in Flood Zone 1 should only be permitted subject to adequate FRAs, which must address groundwater, sewer and overland flood sources.

9.2.16 The above also applies to changes of use of existing basements.

Basement car parking

9.2.17 Long-term and residential car parking is unlikely to be acceptable in areas which regularly flood to a significant depth, due to the risk of car owners being away from the area and being unable to move their cars when a flood occurs. Like other forms of development, flood risk should be avoided if possible. If this is not feasible, the FRA should detail how the design makes the car park safe. This is particularly important for areas behind raised flood defences where flood hazard and rapidity of inundation would be extreme should the defences fail when loaded.

Safe access/egress

9.2.18 As set out in the PPG, access considerations for new development should include the voluntary and free movement of people during a '**design flood**', as well as the potential for evacuation before a more '**extreme'** flood. Access and egress must be designed to be functional for changing circumstances over the lifetime of the development. Specifically:

- Access routes should allow occupants to safely access and exit their dwellings in **design** flood conditions. Vehicular access to allow the emergency services to safely reach the development during design flood conditions will also normally be required. The design flood for fluvial flooding (i.e. from the River Gipping) is the 1% AEP event assuming defences are in place and including climate change, and for tidal flooding is the 0.5% AEP event with defences in operation and including an allowance for climate change.
- Wherever possible, safe access routes should be provided that are located above design flood levels and avoiding flow paths. Where this is not possible, limited depths of flooding may be acceptable, provided that the proposed access is designed with appropriate signage to make it safe. The acceptable flood depth for safe access will vary depending on flood velocities and the risk of debris within the flood water. Even low levels of flooding can pose a risk to people in situ (because of, for example, the presence of unseen hazards and contaminants in floodwater, or the risk that people remaining may require medical attention). Where access is required through limited depths of flooding, appropriate signage should be provided to make it safe.

9.2.19 Guidance prepared by the Environment Agency[12] uses a calculation of flood hazard to determine safety in relation to flood risk. Flood hazard is a function of the flood depth and flow velocity at a particular point in the floodplain along with a suitable debris factor to account for the hazard posed by any material entrained by the floodwater. The derivation of flood hazard is based on the methodology in Flood Risks to People FD2320, the use of which for the purpose of planning and development control is clarified in the abovementioned publication.

Table 9-2 Hazard to people rating (HR=d x (v +0.5) + DF) (Table 13.1 FD2320/TR2)

Flood Hazard (HR)	Description
Less than 0.75	Low hazard – Caution
0.75 to 1.25	Moderate: Dangerous for some – includes children, the elderly and the infirm
1.25 to 2.0	Significant: Dangerous for most – includes the general public
More than 2.0	Extreme: Dangerous for all – includes the emergency services

9.2.20 Flood hazard mapping for the risk of flooding associated with the River Gipping is presented within the SFRA Appendix A.

[12] Environment Agency, HR Wallingford, May 2008, Supplementary note on Flood hazard ratings and thresholds for development planning and control purpose. Clarification of Table 13.1 FD2320/TR2 and Figure 3.2 FD2321/TR1. http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/FD2321_7400_PR_pdf.sflb.ashx

9.2.21 For developments located in areas at risk of tidal or fluvial flooding, safe access and egress must be provided for new development in **design flood** conditions (0.5% AEP (tidal) or 1% AEP (fluvial) including climate change) as follows, in order of preference:

- Safe, dry route for people and vehicles.
- Safe, dry route for people.
- If a dry route for people is not possible, a route for people where the flood hazard (in terms of depth and velocity of flooding) is low and should not cause risk to people.
- If a dry route for vehicles is not possible, a route for vehicles where the flood hazard (in terms of depth and velocity of flooding) is low (see the hazard mapping in the SFRA Appendix A) to permit access for emergency vehicles. However, the public should not drive vehicles in floodwater.

9.2.22 For fluvial flooding, a 'dry' access/egress is a route located above the 1% annual probability design flood level (1 in 100 annual chance) including an allowance for climate change.

9.2.23 For tidal flooding, a 'dry' access/egress is a route located above the 0.5% annual probability design flood level (1 in 200 annual chance) including an allowance for climate change.

9.2.24 As a result of the IFDMS, development proposed in much of central Ipswich is protected from tidal flooding during the **design** flood (0.5% AEP event taking account of defences and including climate change). Safe access and egress are therefore available during this **design** event. However, the flood hazard mapping provided for the breach events (i.e. the **extreme** flood) can usefully be used to determine the availability of safe routes during an **extreme** event and this information used to inform flood response plans for managing the residual risk. In those areas where there is a **residual risk** of deep or hazardous flooding with a rapid speed of onset in the event of a breach or failure of the tidal flood defences, the most appropriate management measure will be provision of a place of safe refuge.

Safe refuge

9.2.25 A place of safe refuge is an internally accessible and suitably sized and designed place above predicted flood levels, where occupants can seek temporary refuge for the duration of flooding including non-electrical light sources, food and blankets as appropriate.

9.2.26 In areas at risk of fluvial or tidal flooding, safe refuge should be provided above the **extreme** flood level (0.1% AEP) including climate change. This will provide a safe place in the event that occupants fail to evacuate prior to the onset of flooding, or a flood warning not being received.

9.2.27 The risk of tidal flooding in much of central Ipswich is a residual risk, in the unlikely event of a failure of flood defence infrastructure. In such an event, the resultant speed-of-onset of flooding may prevent safe evacuation away from the area of risk, and the depth and duration of flooding may prevent vehicular access by the emergency services. As a result, in order to manage this **residual** risk, safe refuge should be provided above the **extreme** flood level (0.1% AEP breach flood level including climate change to 2118, which is 5.7m AOD).

9.2.28 The quality of refuge (provision of facilities, communications, warm clothes etc.) required must be suitable and sufficient for the likely duration of flooding assuming there is no mains power or telephone services. Landings and stairwells are not suitable for planned temporary refuges. Along with safe refuge, a Flood Response Plan would also be required to advise future users what they should do in the event of flooding affecting the site, for which no warning has been received (see section titled 'Flood warning and evacuation' starting at paragraph 9.2.40).

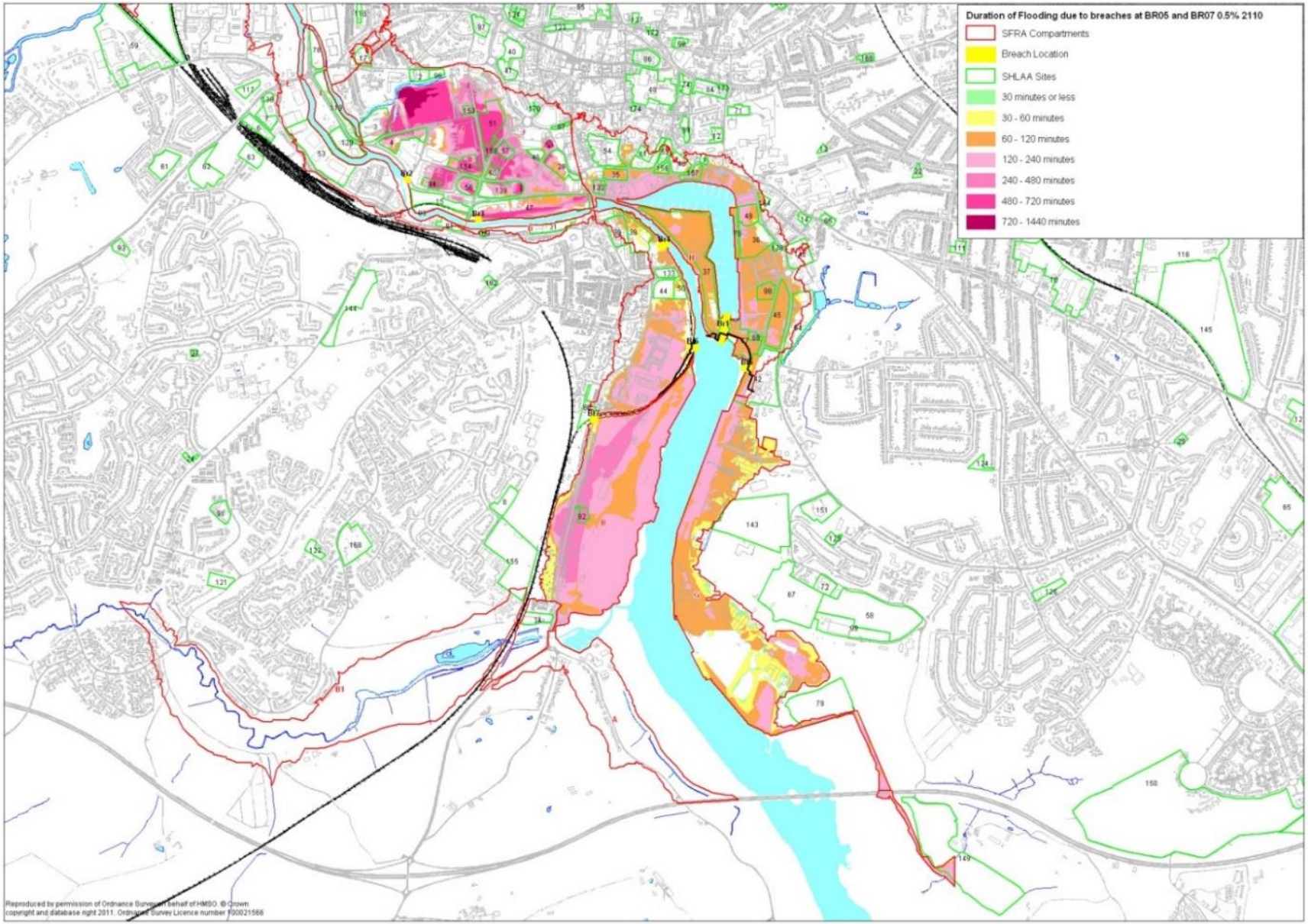


Figure 9-4 Tidal flood duration

9.2.29 Figure 9-4 shows how the duration of flooding varies across Flood Zone 3 in the event of a sudden collapse of 20m of defence to ground level at high tide during a 0.5% AEP event. It assumes the barrier is operational and combines the effects of Breach 5 (flooding compartments J and H) and Breach 7 (flooding compartment C).

Structural safety of buildings

9.2.30 All buildings should be designed to remain standing and resist moving floodwater. In some cases, structural damage to buildings might best be avoided by allowing water to enter and pass through buildings, rather than by resisting the ingress of floodwater. This is an important consideration for residual (breach) risk as well as design and other extreme Flood scenarios.

9.2.31 The Government has published a document 'Improving the Flood Performance of New Buildings, Flood Resilient Construction[13]', the aim of which is to provide guidance to developers and designers on how to improve the resistance and resilience of new properties to flooding through the use of suitable materials and construction details. Reference should also be made to the Planning Practice Guidance (PPG). Figure 9-5 provides a summary of the Water Exclusion Strategy (flood resistance measures) and Water Entry Strategy (flood resilience measures) which can be adopted depending on the depth of floodwater that could be experienced.

[13]DCLG, Defra, Environment Agency, May 2007, Improving the Flood Performance of New Buildings – Flood Resilient Construction https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/7730/flood_performance.pdf

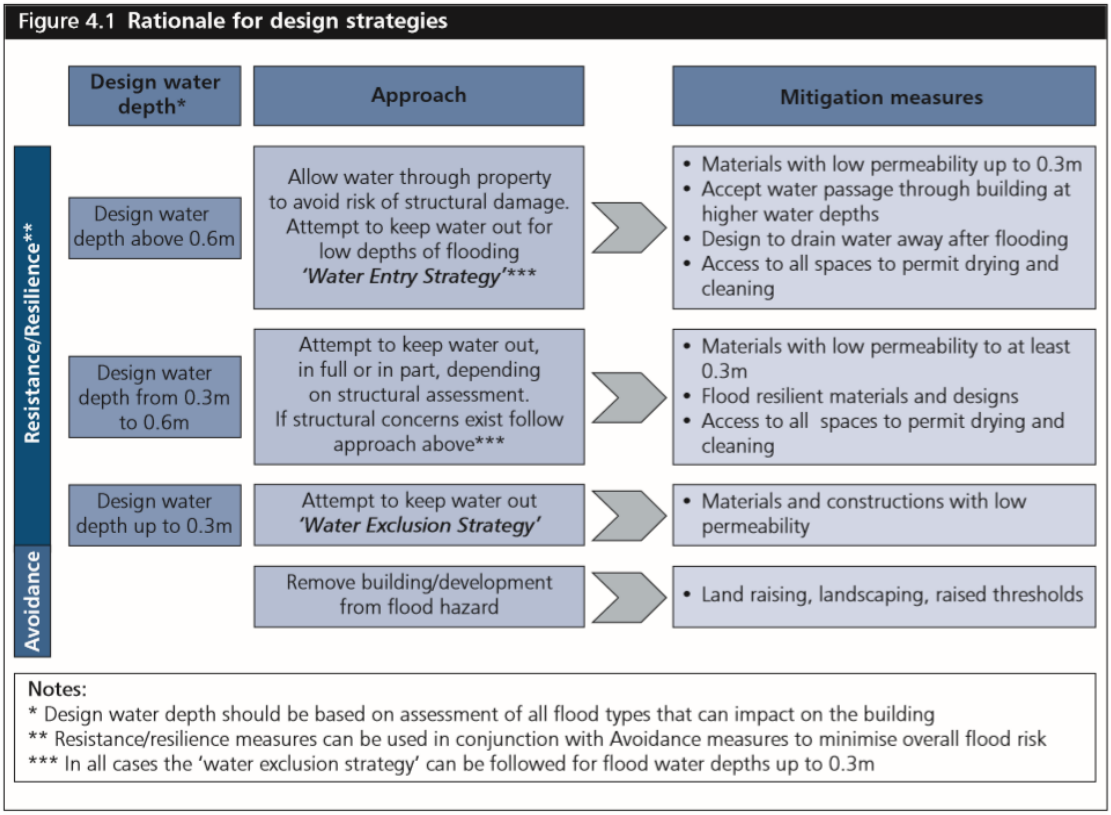


Figure 9-5 Flood resistant / resilient design strategies, Improving Flood Performance, CLG 2007

Flood resistance 'water exclusion strategy'

9.2.32 Resistance measures are aimed at preventing water ingress into a building (Water Exclusion Strategy). They are designed to minimise the impact of floodwaters directly affecting buildings and to give occupants more time to relocate ground floor contents. These measures will probably only be effective for short duration, low depth flooding, i.e. less than 0.3m, although these measures should be adopted where depths are between 0.3m and 0.6m and there are no structural concerns.

9.2.33 In areas at risk of flooding of low depths (<0.3m), developers and applicants should implement flood resistance measures such as:

- Using materials and construction with low permeability.
- Land raising.
- Landscaping e.g. creation of low earth bunds (subject to this not increasing flood risk to neighbouring properties).
- Raising thresholds and finished floor levels e.g. porches with higher thresholds than main entrance.
- Flood gates with waterproof seals.
- Sump and pump for floodwater to remove waste faster than it enters.

9.2.34 There are a range of property flood protection devices available on the market which are designed specifically to resist the passage of floodwater. These include removable flood barriers and gates designed to fit openings, vent covers, and stoppers designed to fit WCs. These measures can be appropriate for preventing water entry associated with fluvial flooding as well as surface water and sewer flooding. The efficacy of such devices relies on their being deployed before a flood event occurs. It should also be borne in mind that devices such as air vent covers, if left in place by occupants as a precautionary measure, may compromise safe ventilation of the building in accordance with Building Regulations.

Flood resilience 'water entry strategy'

9.2.35 For flood depths greater than 0.6m, it is likely that structural damage could occur in traditional masonry construction due to excessive water pressures. In these circumstances, the strategy should be to allow water into the building, but to implement careful design in order to minimise damage and allow rapid re-occupancy. This is referred to as the Water Entry Strategy. These measures are appropriate for uses where temporary disruption is acceptable and suitable flood warning is received.

9.2.36 Materials should be used which allow the passage of water whilst retaining their structural integrity and they should also have good drying and cleaning properties. Alternatively, sacrificial materials can be included for internal and external finishes; for example, the use of gypsum plasterboard which can be removed and replaced following a flood event. Flood resilient fittings should be used to at least 0.1m above the design flood level. Resilience measures are either an integral part of the building fabric or are features inside a building that will limit the damage caused by floodwaters.

9.2.37 In areas at risk of frequent or prolonged flooding, the following flood resilience measures may be appropriate:

- Use materials with either, good drying and cleaning properties, or, sacrificial materials that can easily be replaced post-flood;
- Design for water to drain away after flooding;
- Design access to all spaces to permit drying and cleaning;
- Raise the level of electrical wiring, appliances and utility meters;
- Coat walls with internal cement-based renders; apply tanking on the inside of all internal walls;
- Ground supported floors with concrete slabs coated with impermeable membrane;
- Tank basements, cellars or ground floors with water resistant membranes; or
- Use plastic, water-resistant internal doors.

9.2.38 Further specific advice regarding suitable materials and construction techniques for floors, walls, doors and windows and fittings can be found in 'Improving the Flood Performance of New Buildings, Flood Resilient Construction'.

9.2.39 Structures located in areas with a high flood risk should be flood resilient and be firmly attached to the ground. They should be designed in such a way as to prevent entrainment of debris which in turn could increase flood risk and/or breakaway posing a danger to life during high flows. This would include, for example, bus or bike shelters, park benches and refuse bins (and associated storage areas).

Special Measures and information to support emergency services

Flood warning and evacuation

9.2.40 One of the considerations to ensure that any new development is safe, including where there is a residual risk of flooding, is whether adequate flood warnings would be available to people using the development. The PPG states that a flood warning and evacuation plan for occupants is a requirement for sites at risk of flooding used for holiday or short-let caravans and camping and are important at any site that has transient occupants (e.g. hostels and hotels). In the context of Ipswich Borough, applications for hostels and hotels or sites for Gypsies and Travellers in the Flood Zone are most likely to be relevant. Owners of holiday lets should consider a flood warning and evacuation plan and providing suitable contact numbers for visitors.

9.2.41 The NPPF requires that residual risk can be safely managed. Therefore, flood warning and evacuation plans should also be provided for sites at risk of flooding, where there is the potential need to evacuate in advance of an extreme flood, or to take action to keep safe in the event of the occurrence of flooding with no pre-warning, such as that which could occur should a flood defence breach. The flood warning and evacuation plan must make clear the steps that the occupants of a building need to take to keep themselves safe in such circumstances. It should make use of information from the Flood Risk Assessment to inform the occupants of:

- the circumstances in which they should take refuge,
- the likely duration of the flooding, and
- the circumstances in which, with warning of an extreme flood, they should be prepared to evacuate to a rest centre if advised to do so by the emergency services (and the plan should show where the nearest rest centre is located).

9.2.42 Flood warning and evacuation plans will need to take account of the likely impacts of climate change, e.g. increased water depths and the impact on how people can be evacuated. In consultation with the authority's emergency planning staff, the local planning authority will need to ensure that evacuation plans are suitable through appropriate planning conditions or planning agreements. Developers can register the plans as a Land Charge so that they come up in legal property searches. The flood warning and evacuation plan could form part of the documents linked to the property deeds. However, the developer wishes to make residents aware, this is required to be passed on to future occupiers.

9.2.43 In advising the local planning authority, the emergency services are unlikely to regard developments that increase the scale of any rescue that might be required as being safe. Even with defences in place, if the probability of inundation is high, safe access and egress should be maintained for the lifetime of the development. The practicality of safe evacuation from an area will depend on:

- the type of flood risk present, and the extent to which advance warning can be given in a flood event;
- the number of people that would require evacuation from the area potentially at risk;
- the adequacy of both evacuation routes and identified places that people could be evacuated to (and taking into account the length of time that the evacuation may need to last); and
- sufficiently detailed and up to date evacuation plans being in place for the locality that address these and related issues.

9.2.44 It is the responsibility of developers to provide evacuation plans for their proposed developments, if required. Such plans are held by Ipswich Borough Council on its Planning Online database and within the Ipswich Borough Council section of Resilience Direct. Applications for developments within flood risk areas that do not provide these up front as supporting evidence of non-structural measures designed to help satisfy the second part of the Exception Test, are likely to be refused. Where refuge is the key measure for keeping the building's occupants safe in extreme circumstances it is important that they know that this is the primary action that they need to take and that the development is designed to be safe for them with refuge at that level.

Areas at risk of fluvial flooding

9.2.45 Due to the nature of fluvial flooding, and the location of Ipswich at the lower end of the catchments, it is likely that there will be advanced warning prior to fluvial flooding from the River Gipping. This will provide time for occupants of premises at risk of fluvial flooding to take steps to protect themselves in the event of an **extreme** flood in the future (0.1% AEP), for example by evacuating, moving vulnerable items, installing flood barriers to properties such as flood gates to reduce potential water penetration for doors and air bricks. Evacuation linked to flood warnings is the preferred strategy for managing fluvial flood risk as far as rest centre capacity allows (the majority would tend to evacuate to family and

friends in the area). However, development in an area that could be subject to hazardous flooding in an extreme flood event or as a result of a breach of defences (see e.g. SFRA Appendix A, Map 8E) should incorporate measures to keep occupants safe (see preceding sections).

9.2.46 The most appropriate approach for managing the future fluvial flood risk from the River Gipping Needs to be developed in conjunction with the EA and JEPU / Suffolk Resilience Forum re evacuation/site specific flood plan by applicant.

9.2.47 It should be noted that the risk in the future from the River Gipping may change, for example, should there be upgrades to the standard of protection provided by the defences. However, funding for such improvements cannot be guaranteed. Therefore, it is essential that developers put alternative arrangements in place to manage the future risk in the event that the defences are not upgraded.

9.2.48 The Environment Agency does not provide flood warnings for the Belstead Brook. Therefore, refuge capability may have to have a higher weighting for extreme floods in this catchment.

Areas at risk of tidal flooding

9.2.49 It is likely that there will be advanced warning prior to a tidal overtopping of the defences in the Wherstead Road area of Ipswich. This will provide time for occupants of premises at risk of flooding to take steps to protect themselves in the event of an **extreme** flood in the future (0.1% AEP), for example by evacuating, moving vulnerable items, and installing flood barriers to properties. Evacuation linked to flood warnings is the preferred strategy for managing fluvial flood risk as far as rest centre capacity allows (the majority would tend to evacuate to family and friends in the area). However, development in an area that could be subject to hazardous flooding in an extreme flood event or as a result of a breach of defences (see e.g. SFRA Appendix A, Map 8E) should incorporate measures to keep occupants safe (see preceding sections).

Areas at **residual** risk of tidal flooding

9.2.50 Much of central Ipswich is protected against tidal flooding for the '**design event**' (0.5% AEP including climate change) and said to be at '**residual' risk** of tidal flooding. The residual risk is the risk that remains after the flood risk defence and management measures are taken into account.

9.2.51 This remaining residual risk is different in its probability of occurring, likely warning time and anticipated flooding impacts when compared to flooding resulting from overtopping of defences. The Ipswich Flood Defence Management Strategy system has been designed with a high level of resilience. All critical systems have multiple levels of redundancy built in to ensure that Ipswich is protected in the event of a tidal surge. Therefore, should there be a failure to close the barrier or operate any other defence assets that form the IFDMS, under normal operating procedures, contingency is now in place to mitigate the impacts. The flood warning areas for Ipswich have been changed to reflect the building of the Ipswich Barrier and associated flood defences. Should the very unlikely occurrence arise of failure to close the barrier, these flood warning areas would still be used to warn the public. A breach in the local flood defences, whilst of low probability, may occur with little warning, and may lead to rapid onset of flooding with greater flood depths and velocities than experienced during a fluvial flooding event. Such events are not considered the 'design event', rather an 'extreme flood' event. Developers preparing a site-level FRA should use the worst case from the breach modelling undertaken by IBC and link this to mitigations for building structure stability and occupant safety.

9.2.52 The primary measure to keep people safe during a potential breach event (extreme flood), will be either for people to evacuate prior to the event, or for people to remain where they are. Given the sudden nature of breach events, and the rapid onset of flooding, all buildings should be designed with safe refuge above the maximum extreme breach flood level (0.1% AEP including climate change). Residents or occupants of a site should be aware of the safe refuge protocol in the unlikely event of rapid inundation behind the flood defences. Safe

access/egress routes, where these are available for specific sites, should also be familiar to occupants. A flood warning, response and evacuation plan prepared by the developer and agreed by the LPA taking advice from the EA and emergency planners/responders prior to the award of planning permission is essential in this context.

9.2.53 For new development, the development management process, in assessing the adequacy of Flood Risk Assessments and associated flood warning and evacuation plans and safe refuge arrangements, will be led by technical consultation with the responsible organisations, depending on the type of flood risk.

9.2.54 For existing development, residents in areas at residual risk of flooding are referred to published flood guidance on the Council's website: https://www.ipswich.gov.uk/content/preparing-flooding . This includes information about which organisation is responsible for which type of flooding, and links to other relevant organisations' websites. There is also information about how to protect your property from flooding.

Content of Flood Risk Emergency Plans for New Development

9.2.55 A FRA must include appropriate Flood Risk Emergency Plan for the proposed development. Application drawings are required showing signage and evacuation routes. Appendix 6 provides an indication of the type of information that must be provided within a FMP. However, each FMP will need to be tailored to the individual development and the particular flood risks at that location.

9.4.56 It will be important for the purposes of planning emergency rest centre capacity that developers indicate the likely occupancy of planned developments, providing an estimate of numbers of residents and whether they have particular vulnerabilities which could affect their need to be evacuated in case of flood.

9.2.57 Reference should also be made to the newly published ADEPT/EA guidance, Flood Risk Emergency Plans for New Development[14]. Where an Emergency Plan is needed, Ipswich BC will need to form an overall view of its adequacy and be satisfied it can be safely and reasonably achieved *before* determining the planning application. It is not appropriate to defer consideration of emergency planning matters using pre-commencement planning conditions. This reinforces the need for applicants to engage with the local planning authority at the earliest stage of the development.

9.2.58 There is no statutory requirement for the Environment Agency or the emergency services to approve evacuation plans. Ipswich BC is accountable via planning condition or agreement to ensure that plans are suitable. This should be done in consultation with emergency planning staff. However, new development should not increase the burden on the Emergency Services or expose them to hazardous flooding when attempting to assist users of new developments.

Role of the Suffolk Resilience Forum in relation to developments in floodplains

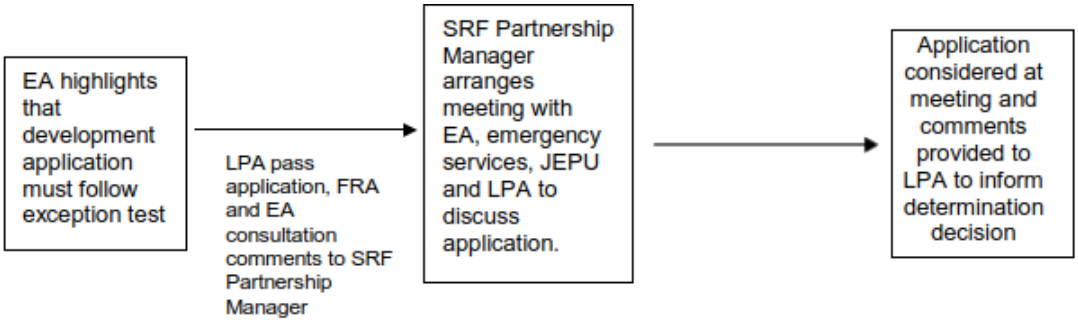
9.2.59 Planning for flood emergencies within Suffolk is a process that is overseen by the Suffolk Local Resilience Forum (SRF) in accordance with the Civil Contingencies Act[15]. Specifically, the risk of flooding is assessed, and appropriate contingency planning is undertaken. The outcome of these activities is published within the Suffolk Community Risk Register and in the SRF Flood Plan; both documents available at www.suffolkresilience.com.

[14] https://www.adeptnet.org.uk/floodriskemergencyplan
[15] The Civil Contingencies Act 2004 (Contingency Planning) Regulations 2005.

9.2.60 These documents demonstrate that Suffolk has assessed the risk of flooding within the county and has developed appropriate flood emergency response arrangements to deal with flood emergencies.

9.2.61 Legal advice taken by Suffolk Constabulary, Suffolk Fire and Rescue Services and Suffolk local authority emergency planning indicates that, to avoid potential future liability, it is not appropriate to provide a definitive statement with regards to the safety or adequacy of flood evacuation plans for developments in flood risk areas. However, recognising its collective responsibility for emergency planning, the SRF has signposted advice to developers on the content of a Flood Emergency Plan (available on the SRF website) along with other information from national and local agencies to help planning in flood risk areas.

9.2.62 A process that brings together the Environment Agency (EA), emergency services, Ipswich BC emergency planners (the Joint Emergency Planning Unit) and development management officers has been developed to allow a collective discussion of planning applications requiring application of the exception test. This process allows any Suffolk LPA to seek advice on planning applications via a single point of contact (the SRF Partnership Manager) and for emergency responders/planners to collectively consider and provide comment on applications considering the associated Flood Risk Assessment. This process is shown as follows[16]:



9.2.63 The outcome of this collective process is an auditable consultation with emergency services and emergency planners that allows any agency to highlight issues or concerns within the competence of the organisation over the proposed development. The process will not state the development is safe or that the Flood Evacuation plan is adequate. This collective approach does not replace existing mechanisms for statutory consultation with the emergency services to comment on any applications under the Town and Country Planning Act.

9.2.64 Ipswich Borough Council as local planning authority ultimately determines whether the proposed development is acceptable, taking into account the sequential and exception tests, in the context of suitable technical advice from the Resilience Forum and other technical consultees.

9.3 Car parks

9.3.1 Where car parks are specified as areas for the temporary storage of surface water and fluvial floodwaters, flood depths should not exceed 300mm given that vehicles may be moved by water of greater depths. Where greater depths are expected, car parks should be designed to prevent the vehicles from floating out of the car park. Signs should be in place to notify drivers of the car park's susceptibility to flooding and flood warning should be available to provide sufficient time for car owners to move their vehicles if necessary.

9.3.2 Where car parks are proposed in basements or under croft areas, developers should ensure that there are safe, dry access routes to land outside of the floodplain whilst ensuring that water cannot enter the car park during a design flood 1 in 100 year (1% AEP) plus climate change flood event.

[16] https://www.suffolkresilience.com/uploads/20190228_-_NPPF_SRF_Exception_Test_Process.pdf

9.4 Water compatible development

9.4.1 Appendix 3 of the NPPF classifies water compatible infrastructure as docks, marinas and wharves. It is recognised that providing safe access, raised floor levels and temporary refuges may not always be practicable. These types of infrastructure should be designed to withstand to maximum flood velocities and flood depths, to not impede water flows, remain operationally safe for users during flood events, and not increase the flood risk to the surrounding areas. All water compatible infrastructure should incorporate flood resilience measures.

9.5 Layout and form of development

Riverside development

9.5.1 Development should be set back from the edge of watercourses, and opportunities for riverside restoration should be considered. The Council would support ecological enhancements, which could contribute to the requirement for biodiversity net gain set out in the NPPF, and amenity and recreation/access improvements where appropriate in accordance with Local Plan policies DM31 and DM33 (and emerging Policies DM8 and DM10). Amenity & recreation improvements could also be incorporated.

9.5.2 An Environmental Permit will be required from the Environment Agency for any works within 8m from a main river fluvial watercourse and 16m from any tidal main river or flood defence structure (whether structure is tidal or fluvial). It is therefore likely that the permitting distance for most of the Gipping and Orwell riverside through Ipswich will be 16m. The 16m distance is not an exclusion zone, rather a distance within which the Environment Agency will scrutinise proposals with regard to:

- potential impacts on defence integrity;
- impacts on access to defences for inspection, repair and maintenance; and,
- impacts on the future ability to reconstruct or improve the defence.

9.5.3 Furthermore, excavation within 16m of a Main River is also an operation requiring a permit. Further guidance is available on the Environment Agency website[17].

9.5.4 As the LLFA, SCC require a 3.5m access strip adjacent to any Ordinary Watercourses. Appendix B of the LFRMS for SCC sets out the requirements for consenting. Further guidance is on the Suffolk CC website[18].

Development Layout and Sequential Approach

9.5.5 A sequential approach to site planning should be applied within new development sites.

9.5.6 Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development. Most large development proposals include a variety of land uses of varying vulnerability to flooding. The sequential approach should be applied within development sites to locate the most vulnerable elements of a development in the lowest risk areas (considering all sources of flooding) e.g. residential elements should be restricted to areas at lower probability of flooding whereas parking, open space or proposed landscaped areas can be placed on lower ground with a higher probability of flooding. Any existing features (ditches, ponds etc.) should be retained on site, and enhanced wherever possible.

9.5.7 Consideration of the presence of ‘older’ defences should be included, especially where they are located upstream of the new barrier and its associated raised defences. These defences may still perform a useful function for the management of fluvial flow volumes at times when the barrier is closed.

[17] Flood risk activities: environmental permits, https://www.gov.uk/guidance/flood-risk-activities-environmental-permits
[18] https://www.suffolk.gov.uk/roads-and-transport/flooding-and-drainage/guidance-on-development-and-flood-risk/

Floodplain compensation storage

9.5.8 Any increase in building footprint within the modelled flood extent for the 1% AEP design flood event associated with fluvial watercourses, including an allowance for climate change, must not result in a net loss of flood storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage.

9.5.9 Where proposed development results in a change in building footprint, the developer must ensure that it does not impact upon the ability of the floodplain to store water or alter flood flow paths that would give rise to higher flood hazard in off-site developed areas and should seek opportunities to provide betterment with respect to floodplain storage.

9.5.10 Similarly, where ground levels are elevated to raise a development out of the fluvial floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain must be provided to ensure that the total volume of the floodplain storage is not reduced.

9.5.11 As depicted in Figure 9-6, floodplain compensation must be provided on a level for level, volume for volume basis on land which does not already flood and is within the site boundary. Where land is not within the site boundary, it must be in the immediate vicinity, in the applicant's ownership and linked to the site[19]. Floodplain compensation must be considered in the context of the 1% annual probability (1 in 100 annual chance) design flood level including an appropriate allowance for climate change. As described in the online Environment Agency guidance[20] the appropriate allowance to assess off-site impacts and calculate floodplain storage compensation depends on land uses in affected areas, as follows:

- In most cases, the higher central allowance should be used to calculate floodplain storage compensation;
- Use the upper end allowance to calculate floodplain storage compensation when the catchment is particularly sensitive to small changes in volume, which could cause significant increases in flood depth or hazard; or when the affected area contains essential infrastructure or vulnerable uses, such as primary schools, caravans, bungalows or basement dwellings; and
- Use the central allowance for floodplain storage compensation if you can demonstrate that the affected area contains only low vulnerability uses, such as water compatible development.

9.5.12 When designing a scheme, flood water must be able to flow in and out and must not pond. An FRA must demonstrate that there is no loss of flood storage capacity and include details of an appropriate maintenance regime to ensure mitigation continues to function for the life of the development. Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C624[21].

[19] In hydrological connectivity.
[20] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#types-of-allowances
[21] CIRIA January 2004, CIRIA Report 624: Development and Flood Risk - Guidance for the Construction Industry.

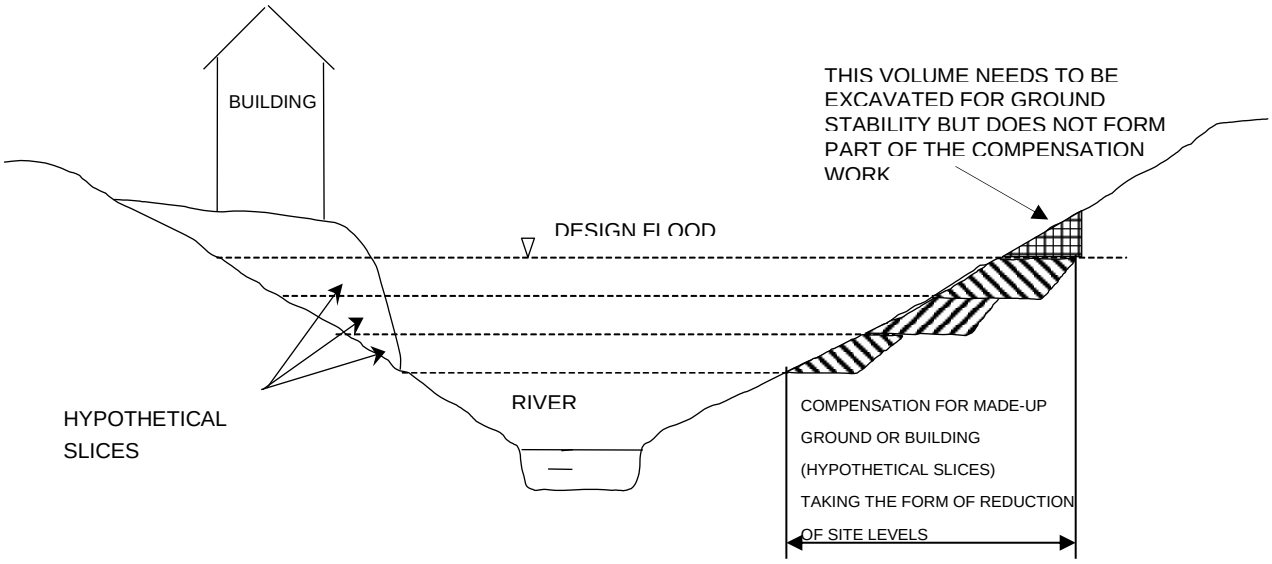


Figure 9-6 Example of Floodplain Compensation Storage (Environment Agency 2009)

9.5.13 The requirement for no loss of floodplain storage from the fluvial floodplain means that it is not possible to modify ground levels on sites which lie completely within the floodplain (when viewed in isolation), as there is no land available for lowering to bring it into the floodplain. It is possible to provide off-site compensation within the local area e.g. on a neighbouring or adjacent site, or indirect compensation, by lowering land already within the floodplain, however, this would be subject to detailed investigations and agreement with the Environment Agency to demonstrate (using an appropriate flood model where necessary) that the proposals would improve and not worsen the existing flooding situation or could be used in combination with other measures to limit the impact on floodplain storage.

Areas of Residual Tidal Risk

9.5.14 For areas at **residual risk of tidal flooding**, there is not usually a requirement from the Environment Agency to provide floodplain compensation storage within the defended floodplain, assuming that the defences will be maintained for the lifetime of the development. However, the impact of residual risk on other properties should be considered, and where the potential increase of flood levels, flood hazard or potential disruption of flow routes as a result of development is significant, compensatory flood storage should be provided.

Flood Voids

9.5.15 In some cases, full floodplain compensation may not always be possible, particularly for minor development schemes and sites wholly in Flood Zone 3. In these cases, **full justification** must be provided, and other measures incorporated to help mitigate the loss of floodplain storage, for example the use of flood voids.

9.5.16 The use of under-floor voids with adequate openings beneath the raised finished floor levels can be considered for development in Flood Zone 3. They are generally considered to provide indirect compensation or mitigation for loss of floodplain storage.

9.5.17 Ideally, void openings should be a minimum of 1 m long and open from existing ground levels to at least the 1% annual probability (1 in 100 annual chance) plus climate change design flood level. By setting finished floor levels at a minimum of 300 mm above the design flood level, there is usually enough space provision for voids below. There should be a minimum of 1 m of open void length per 5 m length of wall. Void openings should be provided along all external walls. If security is an issue, 10 mm diameter vertical bars set at 100 mm centres can be incorporated into the void openings. The use of under-floor voids will typically require a legal agreement or planning condition and maintenance plan for them to remain open for the lifetime of the development and agreement that the LPA will enforce. Sole reliance on the use of under-floor voids to address the loss of floodplain

storage capacity is generally not acceptable on undeveloped sites or for individual properties. The Environment Agency is likely to seek confirmation from the LPA that the voids be maintained in a free and open condition for the lifetime of the development.

9.6 Surface water management

Sustainable Drainage Systems ('SuDS') and higher density development in Ipswich

9.6.1 Paragraph 119 of the NPPF states that planning policies and decisions 'should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions.' The Core Strategy and Policies Development Plan Document of the adopted and emerging Ipswich Local Plan reflects national policy by setting out density standards for new housing developments through Policy DM23. The policy requires high density development (at least 90 dwellings per hectare) within Ipswich town centre, the Portman Quarter and Waterfront; medium density development (at least 40 dwellings per hectare) in the remainder of IP-One, District Centres and an 800m area around District Centres; and low density development (at least 35 dwellings per hectare) elsewhere in Ipswich.

9.6.2 Paragraph 169 of the NPPF requires major developments to incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. It is recommended that early consultation takes place with the planning case officers, landscape planning officers and parks team (where applicable). This ensures the SuDS features are as multifunctional as possible as stated in paragraph 169 of the NPPF. For example, landscape planting should be done to both replicate existing habitats, provide treatment of the surface water and offer biodiversity and amenity value. However, the planting should also be done to create new habitat, where appropriate, so that it is adaptable to climate change within Suffolk. SuDs design can be more innovative than swales and basins. SuDS such as green/blue roofs, vertical rain gardens, tree pits & planters are all very compatible with high density development. See Appendix 7.

9.6.3 The SuDS design process should begin as early as possible in the feasibility stages of a development project and, wherever possible, should be a consideration before land purchase. This notion of multi-functionality is crucial for providing successful surface water drainage systems, particularly on high density sites. It is reinforced through other relevant (adopted and emerging) Local Plan policies, including:

- Adopted and emerging Policy CS16, Green Infrastructure, Sport and Recreation - highlights the fact that open spaces on developments can be multi-functional, playing an important role in floodwater management as well as providing amenity and improving biodiversity.
- Adopted Policy DM29 (emerging Policy DM6), Provision of New Open Spaces, Sport and Recreation Facilities, sets out the requirement for proposed residential development on all larger sites to provide high quality open spaces, on-site where practicable. The supporting text indicates that public green space, 'shall include soft landscaping and tree planting to facilitate sustainable urban drainage and enhance the climate change resilience, appearance and biodiversity value of the development.'
- Adopted Policy DM31 (emerging Policy DM8), The Natural Environment, requires all development to incorporate measures to enhance biodiversity. Emerging Policy DM8 also requires net gains for biodiversity. Biodiversity measures can also serve as SuDS.
- Policy DM4, Development and Flood Risk, requires the appropriate application of Sustainable Drainage Systems. The supporting text indicates that, 'SuDS are an important method of reducing flood risk associated with development and are an essential element of any development in the Borough wherever practicable.'

9.6.4 Paragraph 174, of the NPPF states that development 'should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans'. SuDS can play a vital role in ensuring that surface water from development sites is cleaned before it is discharged into local water bodies, in order to meet the objectives of the Anglian River Basin Management Plans. As such, they are an important element in any design scheme.

9.6.5 Suffolk County Council (SCC), as the Lead Local Flood Authority (LLFA), are the statutory consultee that will provide advice to the Local Planning Authority (LPA) on the suitability of submitted applications. There are numerous different sustainable drainage solutions which could be utilised on development sites. The Suffolk Flood Risk Management Strategy, Appendix A[22], and in particular the emerging update more closely reflects modern innovative SuDs practice.

9.6.6 The document restates the advice from the NPPF that SuDS should be multifunctional, contributing to landscape and building design, public open space strategies, and biodiversity enhancement. This is especially important on medium/high density sites where space is more limited. The key to success is that architects and developers include SuDS in their earliest layout concepts or sketches. This should help to ensure that SuDS are effectively integrated into the design from the outset. SuDS such as green/blue roofs, vertical rain gardens, tree pits & planters are all very compatible with high density development.

9.6.7 The Planning Practice Guidance states, "developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems".

9.6.8 Sustainable Drainage Systems (SuDS) should be used to reduce and manage surface water run-off to and from proposed developments as near to source as possible in accordance with the requirements of the Technical Standards and supporting guidance published by DCLG and Department for the Environment, Food and Rural Affairs (DEFRA)[23] as well as SCC's SuDS Guidance[24] and the CIRIA SuDS Manual. In line with the IBC Local Plan, SuDS must be implemented for all development sites unless it is demonstrated that SuDS are not suitable.

9.6.9 Suitable surface water management measures should be incorporated into new development designs in order to reduce and manage surface water flood risk to and posed by the proposed development, including major highways schemes. This should ideally be achieved by incorporating SuDS.

What are 'SuDS'?

9.6.10 The Construction Industry Research and Information Association (CIRIA) SuDS Manual 2015 defines sustainable drainage or SuDS as *'a way of managing rainfall that minimises the negative impacts on the quantity and the quality of runoff whilst maximising the benefits of amenity and biodiversity for people and the environment'.*

9.6.11 Since April 2016 planning applications for all ''major development'' should be accompanied by a site-specific drainage strategy and/or flood risk assessment that demonstrates that the proposed drainage scheme is compliant with the National Planning Policy Framework, Planning Practice Guidance and DEFRA Technical Standards.

9.6.12 Planning Practice Guidance Paragraph 51 states that ''SuDS should be designed to control surface water runoff close to where it falls'', referred to as Source Control, they provide opportunities to:

[22] Appendix A is currently under review and will be published during early summer 2021.
[23] Sustainable drainage systems: non-statutory technical standards - https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards; PPG Flood Risk and Coastal Change – 23rd March 2015 http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/reducing-the-causes-and-impacts-of-flooding/why-are-sustainable-drainage-systems-important/
[24] https://www.suffolk.gov.uk/roads-and-transport/flooding-and-drainage/guidance-on-development-and-flood-risk/

- Reduce causes and impacts of flooding;
- Remove pollutants from urban runoff at source; and
- Combine water management and green space with benefits for amenity, recreation and wildlife.

9.6.13 SuDS are designed to maximise the opportunities and benefits from surface water management. There are 4 main categories of benefits that can be achieved by SuDS: water quality, water quantity, amenity and biodiversity. These are referred to as the 4 pillars of SuDS design. SuDS can take many forms, both above and below ground. Some types of SuDS include planting, others include proprietary/manufactured products. In general terms, SuDS that are designed to manage and use rainwater where it falls, on the surface and incorporate vegetation, tend to provide the greatest benefits. Most SuDS schemes use a combination of SuDS components to achieve the overall objectives for the site.

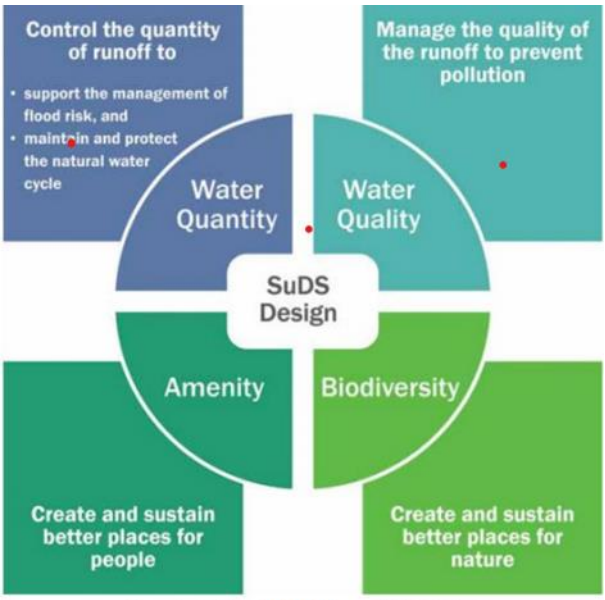


Figure 9-7 The 4 Pillars of SuDS Diagram CIRCA C753p.6

9.6.14 Generally, the aim should be to discharge surface water run-off as high up the following hierarchy of drainage options as reasonably practicable:

- Into the ground (infiltration);
- To a surface water body;
- To a surface water sewer, highway drain, or another drainage system; or lastly
- To a combined sewer.

9.6.15 Surface water runoff should be managed via a method as high up the following SuDS hierarchy as reasonably possible, with more sustainable options ruled out only where sufficient evidence can be provided to support the decision. The SuDS Manual[25] identified several processes that can be used to manage and control runoff from developed areas. Each option can provide opportunities for storm water control, flood risk management, water conservation and groundwater recharge.

- **Rainwater Harvesting**: the direct capture and use of runoff on site, e.g. for domestic use (flushing toilets) or irrigation of urban landscapes. The ability of these systems to perform a flood risk management function will be dependent on their scale, and

[25] CIRIA C697 SuDS Manual. Available from: http://www.ciria.org/Resources/Free_publications/the_suds_manual.aspx

whether there will be a suitable amount of storage always available in the event of a flood. This option is the priority option for SuDS.

- **Shallow Infiltration**: (circa 2m) the soaking of water into the ground. This is the most desirable solution as it mimics the natural hydrological process. The rate of infiltration will vary with soil type and condition, the antecedent conditions and with time. The process can be used to recharge groundwater sources and feed baseflows of local watercourses, but where groundwater sources are vulnerable or there is risk of contamination, infiltration techniques are not suitable. Infiltration testing to confirm the infiltration rate should be undertaken in accordance with BRE 365. If the site lies within groundwater Source Protection Zones 1 or 2[26] the risk of contaminating groundwater and control measures required to mitigate this should be considered, in accordance with IBC Supplementary Planning Document (SPD).
- **Detention/Attenuation**: the slowing down of surface flows before their transfer downstream, usually achieved by creating a storage volume and a constrained outlet.
- **Conveyance**: the transfer of surface runoff from one place to another, e.g. through open channels, pipes and trenches.

9.6.16 Ground conditions primarily dictate the use of infiltration and attenuation SuDS, as summarised in Table 9-3. Onsite storage should be provided for up to the 1in100 (1%) AEP storm + climate change to allow for pump failure. For more details, please see Appendix 1 of the SCC Flood Water Management Plan Chapter 4.

Table 9-3 Conditions for different type of SuDS

	Infiltration SuDS	Attenuation SuDS
Soil permeability >10mm/Hr	OK	Use infiltration in preference
Soil permeability <10mm/Hr	No	OK
High water table	Not below water table – there needs to be a minimum 1.2m separation between the base of the infiltration feature and the highest ground water level.	May be OK, permanent water possible
Filled land/contaminated land	No	
Groundwater Source Protection Outer Zone	Subject to pollution control measures, not directly to aquifer strata	OK
Groundwater Source Protection Inner Zone	OK for roof water	OK

9.6.17 As part of any SuDS scheme, consideration should be given to the whole life management and maintenance of the SuDS to ensure that it remains functional for the lifetime of the development. For brownfield sites with existing direct, uncontrolled discharges to the sewerage system, SuDS incorporated in new development, should reduce peak flows discharged to the sewerage system and thus provide a more strategic benefit to local flooding. Reference should be made to the Suffolk Flood Risk Management Strategy Appendix A for further detail on the design standards for SuDS on the Green Suffolk website.

9.6.18 It is important to note that SuDS require adequate space, (12-15% of the site area of all new outline application development should be dedicated to SuDS) and this will have implications for the consideration of site capacities during the preparation of the Strategic Housing and Employment Land Availability Assessment by Ipswich BC.

[26] Groundwater Source Protection Zones, http://apps.environment-agency.gov.uk/wiyby/37833.aspx

9.7 Guidance on SuDS

9.7.1 General guidance to consider when designing SuDS is as follows (and is reflected in more detail in Appendix A to the SCC Flood Risk Management Strategy, which developers should consult in detail, in particular sections 4 and 5):

- SuDS would not be required to limit flows discharged from developments alongside the Tidal River Orwell. However, the Environment Agency does require SuDS to limit flows discharged to the River Gipping. Developers should consult the Environment Agency to agree an acceptable discharge rate to the River Gipping;
- Infiltration SuDS should not be used where there is potential for ground instability, such as infilled ground, contaminated ground or close to steep slopes. An assessment of suitability for infiltration should be undertaken to demonstrate the impact of infiltration SuDS on ground conditions. Soakaways need to be above the groundwater table and are not normally permitted in or close to chalk strata in order to protect aquifers;
- Maintenance is vital to the long-term performance of the SuDS and it is important that drainage proposals consider the appropriate level of ongoing maintenance required for throughout the design life of the SuDS. The design of the SuDS should also consider safe access for maintenance.
- Confirmation of the ownership and adoption arrangement for the SuDS should be established at the conceptual design stage;
- Attenuation SuDS should be designed to attenuate to a controlled discharge rate. Discharge to existing land drains, highway drains or piped watercourses will only be permitted by SCC where they are constructed to an acceptable standard, have proven adequate capacity and clearly defined maintenance responsibilities. Water quality requirements will also need to be met;
- No minimum threshold is set for the control of flows. However, design should ensure that the flow control is protected from blockage. Attenuation systems are normally inappropriate for draining small areas where small throttles (<100mm) would be prone to blockage;
- Infiltration devices should not be designed within 5m of a building or road, or areas of unstable land in accord with Clause 3.25a of The Building Regulations 2010 Drainage and Waste Disposal27;
- Best practice guidance in the Suffolk Flood Risk Management Partnership (SFRMP)[28] SuDS Guidance and Anglian Water's Surface Water Drainage Policy[29] requires discharge rates from new developments should be restricted to greenfield runoff rates;
- Where a brownfield site is redeveloped, Anglian Water set out in their Surface Water Drainage Policy[30] that no historic right of connection will exist. Any new sewer connections will be treated as new and, therefore, discharge rates limited to the equivalent 1 in 1 year greenfield rate. Where this is not practical, the developer will be asked to calculate the brownfield rate, based on existing roof areas, and the discharge rate from the development will be limited to the equivalent 1 in 1 year rate, or a rate agreed by Anglian Water;

[27] The Building Regulations 2010 – Drainage and waste disposal. Approved Document H. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/442889/BR_PDF_AD_H_2015.pdf
[28] Sustainable Drainage Systems (SuDS) a Local Design Guide, https://www.suffolk.gov.uk/roads-and-transport/flooding-and-drainage/guidance-on-development-and-flood-risk/
[29] Anglian Water Surface Water Drainage Policy, February 2019 https://www.anglianwater.co.uk/developers/development-services/surface-water-policy/
[30] Anglian Water Surface Water Drainage Policy, February 2019 https://www.anglianwater.co.uk/developers/development-services/surface-water-policy/

- Layout and form of buildings and roads must be designed around SuDS bearing in mind SuDS should be sited in lower areas, but preferably close to source, making use of topography; and
- Infiltration systems must be sited at least 5m from buildings, 4 m from adopted highway kerb lines and 10m from railway boundary fences.

9.7.2 The preference is to use infiltration drainage wherever appropriate. Reference should be made to geology **SFRA Appendix A Figure 17** to determine where infiltration systems are most likely to be possible (subject to soakage tests).

9.7.3 These are areas expected to have sands and gravels that are outside the flood plain, above spring lines and outside known filled areas (which may possibly be contaminated). Inner groundwater protection zones are also shown. Soils outside the area might be found to be suitable for infiltration systems and in such cases infiltration systems should be used.

9.7.4 Experience shows that even in the Kesgrave sands and gravels, soakage rates may not be high enough for infiltration systems. Soakage rates measured in accordance with BRE365 can vary from less than 1mm/Hr to about 100 mm/Hr depending on the depth and location of the test pit. Soakage tests carried out in bore holes or small pits are often inappropriate, very inaccurate and not normally acceptable for planning purposes

9.7.5 Further advice on incorporating SuDS into small, higher density development sites is included in Appendix 7 and Appendix A of the SCC Flood Risk Management Plan.

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10 Is the exception test required?

10.1 What is the exception test?

10.1.1 The exception test, as set out in paragraph 164 of the NPPF, is a method to demonstrate that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

10.1.2 The requirement to apply the exception test is based on the Flood Zone in which the site is located and the vulnerability classification of the proposed development, as shown in the Appendix 3 Table 0-1.

10.1.3 For the exception test to be passed it should be demonstrated that:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

10.1.4 Both elements of the exception test should be satisfied for development to be allocated or permitted. National guidance on the exception test is provided here and through the Planning Practice Guidance.

10.2 Providing wider sustainability benefits to the community that outweigh flood risk

10.2.1 In order to address part (1) of the exception test, developers should provide evidence to demonstrate how their proposals will contribute to the sustainability objectives as set out in Ipswich BC's Local Plan and Table 10-110-1 in Appendix 8. Sample sub-objectives are included in the table to help with making the assessment. The sustainability objectives are grouped into themes as follows to capture all the potential impacts of development:

Society	Environment	Economy
Population Housing Health and well being Education	Water Air Material assets (including soil and waste) Climatic change and flooding Coast and estuaries Biodiversity Cultural heritage Landscape	Economy Transport and connectivity Digital infrastructure

10.2.2 Baseline data are available through the Council's Sustainability Appraisal Scoping Report 2017 (Core Document reference B15). The Authority Monitoring Reports also report on some aspects of the baseline and are published annually on the Council's website https://www.ipswich.gov.uk/amr. Applicants completing the exception test will be expected to

provide evidence-based commentary against each of the objectives below indicating how the development will deliver sustainability benefits to the community.

10.3 Demonstrating the safety of development

10.3.1 In order to address part (2) of the exception test, developers must provide evidence to show that the proposed development would be safe and that any residual flood risk can be overcome to the satisfaction of the Ipswich BC as the local planning authority, taking account of any advice from the Environment Agency. The developer's site-specific flood risk assessment should demonstrate that the site will be safe in accordance with Ipswich BC's Safety Framework (Section 9), and that people will not be exposed to hazardous flooding from any source.

10.3.2 The following should be covered by the flood risk assessment:

- the design of any flood defence infrastructure;
- access and egress;
- operation and maintenance;
- design of development to manage and reduce flood risk wherever possible;
- resident awareness;
- flood warning and evacuation procedures (see also advice on when flood warning and evacuation plans are needed); and
- any funding arrangements necessary for implementing the measures.

10.4 Reducing flood risk overall

10.4.1 Part (2) of the exception test refers to reducing the risk of flooding. The PPG states that local authorities and developers should seek opportunities to reduce the overall level of flood risk in the area and beyond. This can be achieved, for instance, through the layout and form of development (Section 9.5, including green infrastructure and the appropriate application of sustainable drainage systems (Section 9.6), through safeguarding land for flood risk management, or where appropriate, through designing off-site works required to protect and support development in ways that benefit the area more generally.

11Abbreviations and glossary

ACRONYM	DEFINITION
AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
AW	Anglian Water
BGS	British Geological Survey
CFMP	Catchment Flood Management Plan
Defra	Department for Environment, Flood and Rural Affairs
DCLG (MHCLG)	Department for Communities and Local Government now named Ministry of Housing, Communities and Local Government (MHCLG)
IBC	Ipswich Borough Council
IDB	Internal Drainage Board
FRA	Flood Risk Assessment
FRMP	Flood Risk Management Plan
FWMA	Flood and Water Management Act 2010
GIS	Geographical Information System
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
PPG	Planning Practice Guidance
NPPF	National Planning Policy Framework
PFRA	Preliminary Flood Risk Assessment
RBMP	River Basin Management Plan
RoFSW	Risk of Flooding from Surface Water
SA	Sustainability Appraisal
SCC	Suffolk County Council
SFRS	Suffolk Fire and Rescue Service
SFRA	Strategic Flood Risk Assessment
SPD	Supplementary Planning Document
SPZ	Source Protection Zone
SRF	Suffolk Resilience Forum
SuDS	Sustainable Drainage Systems
SRFMP	Suffolk Flood Risk Management Partnership
SFRS	Suffolk Fire and Rescue Service
SWMP	Surface Water Management Plan

GLOSSARY	DEFINITION
1D Hydraulic Model	Hydraulic model which computes flow in a single dimension, suitable for representing systems with a defined flow direction such as river channels, pipes and culverts
2D Hydraulic Model	Hydraulic model which computes flow in multiple dimensions, suitable for representing systems without a defined flow direction including topographic surfaces such as floodplains
Aquifer	A source of groundwater comprising water bearing rock, sand or gravel capable of yielding significant quantities of water.
Attenuation	In the context of this report - the storing of water to reduce peak discharge of water.
Catchment Flood Management Plan	A high-level plan through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions. For fluvial events a 70% increase in river flow is applied and for rainfall events, a 30% increase. These climate change values are based upon information within the NPPF and Planning Practice Guidance as at 3rd February 2017.
Critical Drainage Area	Within the SWMP – A discrete geographic area (usually hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zone during severe weather thereby affecting people, property or local infrastructure. By the Environment Agency - discrete geographical area where multiple and interlinked sources of flood risk cause flooding during severe weather.
Culvert	A structure, often a channel or pipe that carries water below the level of the ground.
Design flood	The design flood is a flood event of a given annual probability, against which the suitability of a proposed development is assessed, and mitigation measures, if any, are designed. For fluvial flooding, the design flood is the 1% AEP event, taking account of the presence of defences and including an appropriate allowance for climate change. For tidal flooding, the design flood is the 0.5% AEP event, taking into account the presence of defences and including an appropriate allowance for climate change. It is the design flood for which mitigation measures such as finished floor levels and safe access/egress arrangements need to be considered.
Development lifetime	Lifetimes are normally 100 years for residential development or 75 years for commercial development, including hotels and halls of residence.
Ipswich Flood Plan	Plan for Ipswich which identifies risks within the Borough. It is prepared by the Suffolk Joint Emergency Planning Unit. This links to the Suffolk Resilience Forum Flood Plan, which is a multi-agency response to flooding events. There is also a generic evacuation plan for Ipswich.
Exception Test	The approach set out in the NPPF to help ensure that where new development is proposed in areas of flood risk, risk to people and property

	will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available. For the exception test to be satisfied it must be demonstrated that the development will be safe for its lifetime, will not increase flood risk overall and will deliver wider sustainability benefits that outweigh the risk of flooding. Refer to Section 10.
Extreme flood	The extreme flood event is the 0.1% AEP event, against which flood response procedures are considered.
Flood Defence	Infrastructure used to protect an area against floods, such as floodwalls and embankments; they are designed to a specific standard of protection (design flood) which is the largest flood that a given project is designed to safely accommodate.
Ipswich Flood Defence Management Strategy	This is a plan for the strategic provision of flood defences
Flood Resilience	Measures that minimise water damage (e.g. to buildings) and promote fast drying and easy cleaning.
Flood Resistant	Measures that prevent flood water entering a building or damaging its fabric. This has the same meaning as flood proof.
Flood Risk	The level of flood risk is the product of the frequency or likelihood of the flood events and their consequences (such as loss, damage, harm, distress and disruption).
Flood Warning and Evacuation Plan or Flood risk Emergency Plan for New Development	This is a plan prepared for a specific development. It provides a means by which those living/working/staying at the property will be made aware of the flood hazard, and procedures that will enable them to avoid being directly exposed to the hazard in any future flood events that may affect the site. Flood warning and evacuation plans may differ across various business or development types, such as housing developments, businesses and hotels.
Flood Zone	Flood Zones refer to the probability of river and sea flooding ignoring the presence of existing flood defences (i.e. the natural floodplain). It should be noted that Flood Zones on the Environment Agency Flood Map for Planning do not take account of the potential impact of climate change.
Fluvial	Relating to the actions, processes and behaviour of a watercourse (river or stream).
Freeboard	A freeboard is used to account for residual uncertainty within design, often an extra 300mm or 600mm added to finished floor level above the design flood level to account for any uncertainty in flood levels as a safety factor.
Functional Floodplain	Land where water has to flow or be stored in times of flood.
Groundwater	Water that is in the ground, this is usually referring to water in the saturated zone below the water table.
Lead Local Flood Authority (LLFA)	As defined by the Flood and Water Management Act, Suffolk County Council (SCC) as LLFA are responsible for developing, maintaining and applying a strategy for local flood risk management (flooding from surface water, groundwater and ordinary watercourses) in their areas and for maintaining a register of flood risk assets.
Local Planning Authority (LPA)	The public authority that is responsible for controlling planning and development through the planning system.
Major development	The The Town and Country Planning (Development Management Procedure) (England) Order 2015 defines major development as: ‘development involving any one or more of the following—

	(a)the winning and working of minerals or the use of land for mineral-working deposits; (b)waste development; (c)the provision of dwellinghouses where— (i)the number of dwellinghouses to be provided is 10 or more; or (ii)the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph (c)(i); (d)the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or (e)development carried out on a site having an area of 1 hectare or more;
Main River	Watercourse defined on a 'Main River Map' designated by Defra. The Environment Agency has permissive powers to carry out flood defence works, maintenance and operational activities for Main Rivers only.
Mitigation measure	An element of development design which may be used to manage flood risk or avoid an increase in flood risk elsewhere.
Ordnance Datum	In the British Isles, an ordnance datum is a vertical datum used by an ordnance survey as the basis for deriving altitudes on maps. A spot height may be expressed as AOD (Above Ordnance Datum), in this instance meaning above mean sea level at Newlyn in Cornwall.
Ordinary Watercourse	A watercourse that does not form part of a Main River. This includes "all rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows" according to the Land Drainage Act 1991. Table 8-1 of the Ipswich SFRA identifies whether sites identified through the Strategic Housing and Economic Land Availability Assessment are within 300m of an Ordinary Watercourse.
Residual Flood Risk	The remaining flood risk after risk reduction measures have been taken into account. An example of residual flood risk includes the failure of flood management infrastructure, or a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defences, or an intense rainfall event which the drainage system cannot cope with.
Return Period	Also known as a recurrence interval is an estimate of the likelihood of an event, such as a flood to occur.
Risk	Risk is a factor of the probability or likelihood of an event occurring multiplied by consequence: Risk = Probability x Consequence. It is also referred to in this report in a more general sense.
Sequential Test	Aims to steer vulnerable development to areas of lowest flood risk.
Sewer Flooding	Flooding caused by a blockage or overflowing from a sewer.
Source Protection Zone (SPZ)	Defined areas in which certain types of development are restricted to ensure that groundwater sources remain free from contaminants.
Surface Water Flooding	Flooding caused when intense rainfall exceeds the capacity of the drainage systems or when, during prolonged periods of wet weather, the soil is so saturated such that it cannot accept any more water.
Sustainable drainage systems (SuDS)	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Tidal flooding	Inundation from a tidal water body such as the sea or an estuary.
Topographic survey	A survey of ground levels.

Appendices

Appendix 1 Flood Risk Zones (PPG Table 1)

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map.)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Appendix 2 Flood Risk Vulnerability Classification (PPG Table 2)

Flood risk vulnerability classification	Uses in this category
Essential infrastructure	Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. Wind turbines.
Highly vulnerable	Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. Emergency dispersal points. Basement dwellings. Caravans, mobile homes and park homes intended for permanent residential use. Installations requiring hazardous substances consent.
More vulnerable	Hospitals. Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. Non-residential uses for health services, nurseries and educational establishments. Landfill and sites used for waste management facilities for hazardous waste. Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less vulnerable	Police, ambulance and fire stations which are not required to be operational during flooding. Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure. Land and buildings used for agriculture and forestry. Waste treatment (except landfill* and hazardous waste facilities). Minerals working and processing (except for sand and gravel working). Water treatment works which do not need to remain operational during times of flood.

	Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water compatible development	Flood control infrastructure. Water transmission infrastructure and pumping stations. Sewage transmission infrastructure and pumping stations. Sand and gravel working. Docks, marinas and wharves. Navigation facilities. Ministry of Defence defence installations. Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. Water-based recreation (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Appendix 3 Flood Risk Vulnerability and Flood Zone Compatibility (PPG Table 3)

Appendix 3 Table 0-1 Flood risk vulnerability and flood zone 'compatibility' (PPG, 2014)

		Flood Risk Vulnerability Classification				
		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	1	✓	✓	✓	✓	✓
	2	✓	✓	Exception Test Required	✓	✓
	3a	Exception Test Required	✓	×	Exception Test Required	✓
	3b	Exception Test Required	✓	×	×	×

✓ - Development is appropriate × - Development should not be permitted

Appendix 4 Risk Management Authorities and consultees for planning proposals

Table 0-2 Risk Management Authorities (RMAs) – Responsibilities and Consultation

RMA Consultee	Responsibilities	Consultation
Environment Agency	The Environment Agency has a strategic overview of all sources of flooding and coastal erosion (as defined in the Flood and Water Management Act 2010). It is responsible for flood and coastal erosion risk management activities on 'Main Rivers' and the coast, regulates reservoir safety, and works in partnership with the Met Office to provide flood forecasts and warnings. A Main River is a water course defined on a 'Main River Map' designated by Defra. The Environment Agency has permissive powers to carry out flood defence works, maintenance and operational activities for Main Rivers only. In Ipswich, Main Rivers include: the River Orwell, the River Gipping and Belstead Brook. See also SFRA Appendix A, Figure 1.	There is a statutory requirement for Local Planning Authorities to consult the Environment Agency for developments in areas at risk of flooding (as defined in the Town and Country Planning (Development Management Procedure) (England) Order 2015) before granting planning permission. The Environment Agency has Standing Advice available on its website which gives guidance to local planning authorities and developers where flood risk is an issue, including on when the Environment Agency should be consulted on planning applications. Applications to work on or near main rivers must be submitted to the Environment Agency to obtain a Flood Risk Activity Permit (FRAP). Other forms of Environmental permit are generally required for waste storage, use, treatment and disposal.
Suffolk County Council as	Suffolk County Council is the Lead Local Flood Authority with responsibility for managing the risk of flooding from surface	The Flood and Water Management team at Suffolk County Council, is a statutory consultee for surface water drainage proposals for major developments. This is

Lead Local Flood Authority	water, ground water and 'Ordinary Water Courses'. An Ordinary Water Course is one that does not form part of a Main River. This includes "all rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows" according to the Land Drainage Act 1991. Examples in Ipswich include: Westerfield Watercourse, Mill River and the Alderman Canal,	part of their responsibility as the Lead Local Flood Authority (LLFA) under the Town and Country Planning Order 2015. Anyone who intends to carry out works in, over, under or near an ordinary watercourse in Suffolk must contact SCC to obtain Land Drainage Consent before starting the work.
Ipswich Borough Council	Ipswich Borough Council (IBC) is a Risk Management Authority, which works in partnership with others to ensure that flood risks are managed effectively. As a local planning authority (LPA), IBC is responsible for developing the Ipswich Local Plan, setting out how areas will develop in the future. It also makes decisions on which planning applications get approval.	IBC is responsible for considering the extent to which the sequential test and exception test considerations have been satisfied, taking advice from the Environment Agency as appropriate. IBC assesses the compliance of a development proposal with national and local planning policy and with the advice set out in this SPD.
Suffolk Resilience Forum	Whilst not defined as a Risk Management Authority, the Suffolk Resilience Forum is a multi-agency group that provides strategic / tactical and operational guidance and support on the planning for the multi-agency response to a major incident. Tidal and fluvial flooding are identified on the Suffolk Community Risk Register.	Where a development is subject to the exception test, the Suffolk Resilience Forum will look collectively with the emergency services and LPA to give advice on the preparation of a FRA and evacuation plan.
Anglian Water	Anglian Water (AW) is a Risk Management Authority which plays a role in managing flood and coastal erosion risks. They manage the risk of flooding to water supply and sewerage facilities and flood risks from the failure of their infrastructure. They are responsible for foul, combined and surface water sewers that serve more than one property.	AW is not a statutory consultee for planning applications. However, AW proactively provide informative comments on foul and surface water proposals for major planning applications to the Local Planning Authority for their consideration. AW should be consulted where connection to surface water sewers is required or where the flow to the public sewerage system may be affected.
Network Rail	Whilst not a Risk Management Authority, Network rail is responsible for managing railway tracks. Development on land close to railways can increase flooding if rain which previously soaked into the ground flows off hard, impermeable surfaces and onto the tracks.	Network Rail may need to be consulted where drainage such as soakaways may affect the stability of the side slopes of cuttings or railway drainage, or where culverts or other drainage features need to cross railways.
East Suffolk Internal Drainage Board	This is an independent public body responsible for managing water in low lying areas and supervising land drainage and flood defence works on ordinary watercourses.	East Suffolk IDB manage the consenting process and issue Land Drainage Consent for IDB watercourses. (Suffolk County Council will not issue Land Drainage Consent for IDB watercourses). IDB watercourses are identified on this map[31] and include all non-Main River tributaries along the course of the River Gipping, Belstead Brook, Mill River and River Fynn.
Highway Authority	Responsible for providing and managing highway drainage and roadside ditches. They must ensure that road projects do not	For any application where the highway is involved, the Highway Authority is a

(Suffolk County Council)	increase flood risk. Highways England is responsible for motorways and major trunk roads. Local authorities or national park authorities are responsible for other roads.	statutory consultee in the planning process. The owners of land adjoining a highway have a common-law duty to maintain ditches to prevent them causing a nuisance to road users.

Appendix 5 Site-specific flood risk assessment: Checklist

Please refer to section 8 of the SPD.

Table 0-3 Site-specific flood risk assessment checklist

1. Development site and location Describe the site you are proposing to develop. Include, or make reference to, a location map which clearly indicates the development site. a. Where is the development site located? (e.g. postal address or national grid reference) b. What is the current use of the site? (e.g. undeveloped land, housing, shops, offices) c. Which Flood Zone (for river or sea flooding) is the site within? (i.e. Flood Zone 1, Flood Zone 2, Flood Zone 3). Refer to the Flood Map for Planning (Rivers and Sea) and the Ipswich BC SFRA and Map 6, Appendix A (reference I34 and I34.1).
2. Development proposals Provide a general summary of the development proposals. Include, or make reference to, an existing block plan and a proposed block plan, where appropriate. a. What are the development proposal(s) for this site? Will this involve a change of use of the site and, if so, what will that change be? b. In terms of vulnerability to flooding, what is the vulnerability classification of the proposed development? See PPG Table 2. c. What is the expected or estimated lifetime of the proposed development likely to be? (e.g. less than 20 years, 20-50 years, 50-100 years?). *Lifetimes are normally 100 years for residential or up to 50-75 years for commercial developments (depending on construction), including hotels and halls of residence.* *d. FRAs normally need to include ground levels (to ordnance datum) preferably as contours on plans showing SuDS layouts, key flood paths, areas at risk of SW flooding and floor levels.*
3. Sequential Test For developments in flood zones 2 or 3 only. Describe how you have applied the sequential test (if needed, as set out in Section 5). a. What other locations with a lower risk of flooding have you considered for the proposed development? b. If you have not considered any other locations, what are the reasons for this? c. Explain why you consider the development cannot reasonably be located within an area with the lowest probability of flooding (flood zone 1); and, if your chosen site is within flood zone 3, explain why you consider the development cannot reasonably be located in flood zone 2. d. As well as flood risk from rivers or the sea, have you taken account of the risk from any other sources of flooding in selecting the location for the development?
4. Climate Change How is flood risk at the site likely to be affected by climate change over the lifetime of the development? (Refer to the Ipswich BC SFRA. Section 5 of the SFRA describes flood risk and cross refers to mapping included in Appendix A). Further advice on how to take account of the impacts of climate change in flood risk assessments is available from the Environment Agency.
5. Site specific flood risk

Describe the risk of flooding to and from the proposed development over its expected lifetime, including appropriate allowances for the impacts of climate change. Include any evidence, such as maps and level surveys of the site, flood datasets (e.g. flood levels, depths and/or velocities) and any other relevant data, which can be acquired through consultation with the Environment Agency, the lead local flood authority for the area, or any other relevant flood risk management authority. Alternatively, you may consider undertaking or commissioning your own assessment of flood risk, using methods such as computer flood modelling.

a. What is/ are the main source(s) of flood risk to the site? (e.g. tidal/sea, fluvial or rivers, surface water, groundwater, other?). You should consider the flood mapping available from the Environment Agency, the Ipswich BC SFRA (Section 5 and Appendix A), historic flooding records and any other relevant and available information.

b. What is the probability of the site flooding, taking account of the maps of flood risk available from the Environment Agency, the Ipswich BC SFRA (Appendix A) and any further flood risk information?

c. Are you aware of any other sources of flooding that may affect the site?

d. What is the expected depth and level for the design flood[1]? If possible, flood levels should be presented in metres above Ordnance Datum (i.e., the height above average sea level).

e. Are properties expected to flood internally in the design flood and to what depth? Internal flood depths should be provided in metres.

f. How will the development be made safe from flooding and the impacts of climate change, for its lifetime? (Refer to Section 9).

g. How will you ensure that the development and any measures to protect the site from flooding will not cause any increase in flood risk off-site and elsewhere? Have you taken into account the impacts of climate change, over the expected lifetime of the development? (e.g. providing compensatory flood storage which has been agreed with the Environment Agency). Refer to Section 9.5 and 9.6.

h. Are there any opportunities offered by the development to reduce the causes and impacts of flooding? Refer to Section 10.4.

6. Surface water management

Describe the existing and proposed surface water management arrangements at the site using sustainable drainage systems (SuDS) wherever appropriate, to ensure there is no increase in flood risk to others off-site.

a. What are the existing surface water drainage arrangements for the site?

b. If known, what (approximately) are the existing rates and volumes of surface water run-off generated by the site?

c. What are the proposals for managing and discharging surface water from the site, including any measures for restricting discharge rates? For major developments (e.g. of 10 or more homes or major commercial developments), and for all developments in areas at risk of flooding, sustainable drainage systems should be used, unless demonstrated to be inappropriate. *The preference is to use infiltration drainage wherever appropriate. For developments where sufficient space exists for some infiltration drainage, FRAs need to include details of soakage tests (undertaken following BRE365 in pits rather than boreholes) and design calculations.*

d. How will you prevent run-off from the completed development causing an impact elsewhere?

e. Where applicable, what are the plans for the ongoing operation and/or maintenance of the surface water drainage systems?

f. The FRA will need to demonstrate how any key surface water flood paths, watercourses or other areas at risk of flooding are to be safeguarded for the future by protecting them from development and obstruction. Drainage designs may need to take account of water flowing into the site from elsewhere.

g. SuDS measures must normally be shown on all relevant plans submitted as part of detailed planning applications, in order to demonstrate how SuDS integrate with planned public open spaces, landscaping, roads, trees and buildings. Plans should identify multifunctional SuDs e.g. those which enhance biodiversity or improve water quality.

7. Occupants and users of the development

Provide a summary of the numbers of future occupants and users of the new development; the likely future pattern of occupancy and use; and proposed measures for protecting more vulnerable people from flooding.

a. Will the development proposals increase the overall number of occupants and/or people using the building or land, compared with the current use? If this is the case, by approximately how many will the number(s) increase?

b. Will the proposals change the nature or times of occupation or use, such that it may affect the degree of flood risk to these people? If this is the case, describe the extent of the change.

c. Where appropriate, are you able to demonstrate how the occupants and users that may be more vulnerable to the impact of flooding (e.g. residents who will sleep in the building; people with health or mobility issues etc) will

be located primarily in the parts of the building and site that are at lowest risk of flooding? If not, are there any overriding reasons why this approach is not being followed?
8. Exception Test Provide the evidence to support certain development proposals in flood zones 2 or 3 if, following application of the sequential test, it is appropriate to apply the exception test. a. Would the proposed development provide wider sustainability benefits to the community? If so, could these benefits be considered to outweigh the flood risk to and from the proposed development? b. How can it be demonstrated that the proposed development will remain safe over its lifetime without increasing flood risk elsewhere? c. Will it be possible to for the development to reduce flood risk overall (e.g. through the provision of improved drainage)? Refer to Section 10 of the SPD for further information on the exception test.
9. Residual risk Describe any residual risks that remain after the flood risk management and mitigation measures are implemented, and explain how these risks can be managed to keep the users of the development safe over its lifetime. a. What flood related risks will remain after the flood risk management and mitigation measures have been implemented? b. How, and by whom, will these risks be managed over the lifetime of the development? (e.g. putting in place flood warning and evacuation plans).
10. Flood risk assessment credentials Provide details of the author and date of the flood risk assessment. a. Who has undertaken the flood risk assessment? b. When was the flood risk assessment completed?

Appendix 6 Emergency Flood Management Plan Content

Please refer to section 9 of the SPD and see also the checklist available through the ADEPT guidance - https://www.adeptnet.org.uk/system/files/documents/ADEPT%20%26%20EA%20Flood%20risk%20emergency%20plans%20for%20new%20development%20September%202019....pdf .

Suggested structure for Emergency Flood Management Plans
1. Introduction • Name and address of premises • Describe the location of the site fully and accurately. • Attach a site plan to help identify the location and size of the site. • State the size of the development including the number and type of properties within the development and their proposed use (residential, commercial, tourism). • Define the access and egress arrangements for the site, the height of proposed buildings and the rescue or re-supply points for those instructed not to evacuate. • State the likelihood of flooding. How big is the risk? • State who will be responsible for reviewing and implementing the FMP. • How will occupants be made aware of the FMP (distribution list, solicitors, part of deeds) 2. Warning arrangements • How will occupants be informed if a flood is likely to occur? • Do you intend to register the site with the Environment Agency's flood warning service 'Floodline'? • How will flood warnings be received and by whom? (text, phone) • What procedure will you follow in responding to any flood warnings received from the Environment Agency? Managed evacuation or containment and refuge. • Where is the nearest rest centre (SFRA Appendix A Figure 6).

- Particular attention should be given to the communication of warnings to vulnerable people including those with impaired hearing or sight and those with restricted mobility. The police are responsible for evacuations; they may be able to assist but cannot normally force people to evacuate. Consideration should be given to informing appropriate response organisations, such as the council's Ipswich HEARS service and Social Services, about any elderly or vulnerable people who may require assistance.

3.0 Instructions to occupants in the event of a flood warning

- How will occupants be instructed on the procedures to follow in the event of a flood or flood warnings?
- What will these instructions cover?
- What is the procedure for passing on information to new occupants?

4.0 Instructions to commercial tenants in the event of a flood warning

- How will commercial tenants be instructed on the procedures to follow in the event of a flood or flood warnings?
- What will these instructions cover?
- When commercial tenants leave, how will new commercial tenants be informed of the flood evacuation procedures?

5.0 Advice and information for developers

- List useful telephone numbers and websites
- Provide residents/tenants with information on the Environment Agency's Floodline Warnings Direct service.
- Advice on the dangers of floodwater
- Flood kit advice

Appendix 7 SuDS Guidance for small, higher density sites

SuDS and Density

SuDS should be seen as an opportunity to create multi-functional spaces on site, providing numerous benefits to the communities that will be inhabiting them, managing flood risk on site and, ultimately, adding value to the development scheme. To ensure successful integration, SuDS design should be considered at the master planning stage of every project; careful planning, innovative design and site-specific responses will be the key to success.

The SuDS Manual, Ciria:

'SUDS can be used in even the smallest spaces – the apparent lack of space should never be a reason for not using SUDS. Designing SUDS so that the space performs multiple functions is particularly important in dense urban area where space is at a premium.'

The adopted and emerging Ipswich Local Plan requires all new residential developments of 10 dwellings or more (or on sites of 0.5ha or more) to provide at least 10% of the site area as open green space and encourages the integration of sustainable drainage systems into these spaces. SuDS tend to be associated with large open spaces; ponds, reed beds and swale systems require large amounts of land for successful installation. However, there are also numerous components with a much smaller land requirement which can be used for constrained urban sites, such as permeable paving, green/blue roof systems and bioretention areas. Incorporating multi-functional components can also ensure that space is utilised effectively, for example, the installation permeable paving to parking areas provides car parking spaces whilst also allowing infiltration, water treatment and attenuation of surface water run-off at the source.

Table 1: Overview of potential SuDS components for sites with limited space

SuDS Component	Land Requirement	Attenuation Capability	Water Treatment	Improvement to Amenity	Improvement to Biodiversity
Green/Blue Roof	None Built on top of buildings so no land take	Varies Dependent on build-up/use of attenuation cells	Varies Ability to filter water through substrate dependent on composition	Varies Accessible intensive green roof can provide amenity space	Varies Dependent on green roof uses/planting
Permeable Paving	None Built into useable surfaces e.g. parking spaces and pavements so no land take	Varies Dependent on build-up/use of attenuation cells	Varies Dependent on sub-base specification and build-up	Low Colour and layout of paving can provide visual amenity	None

Bioretention Area e.g. Rain Garden	Low Size can be suited to the available space	Varies Dependent on size and build-up	High Filtration through filter medium e.g. engineered soils and vegetation	High Planting can enhance streetscape amenity	High Planting can enhance biodiversity
Tree Pit System e.g. Silva Cell (Deeproot) or ArborFlow (Green Blue Urban)	None System installed underground so no land take	Varies Dependent on size and type size of system	High Filtration through filter medium e.g. engineered soils and vegetation	High Planting can enhance streetscape amenity	High Planting can enhance biodiversity
Soakaway	None System installed underground so no land take	Varies Dependent ofnsize of system	Varies Can be used with pre-treatment device	None	None
Geocelluar Systems	None System installed underground so no land take	High Large storage capability	None	None	None

The table above highlights some of the SuDS components which could be integrated into higher density development sites where space on the ground is limited. It is clear that some components provide a wider range of benefits than others. Multi-functional components, such as those which provide surface water management as well as helping to improve amenity and biodiversity, should be prioritised wherever possible.

The components listed above aim to deal with the majority of surface water run-off at the source. This reduces the need for water conveyance and pond storage further along the SuDS management train which further reduces space requirements on site. Many of the SuDS components also provide some treatment of surface water before infiltration or conveyance which ensures that local water quality objectives are being met, again reducing the need for large open components.

SuDS solutions should be site specific, working with the individual site conditions to maximise success. On sites where larger amounts of space are available, open SuDS can be incorporated into multi-functional open space provision for amenity and biodiversity. However, for sites where space is limited, a mixture of open and closed SuDS can be employed, utilising creative solutions for the challenges posed.

Examples of SuDS Solutions on Urban Sites

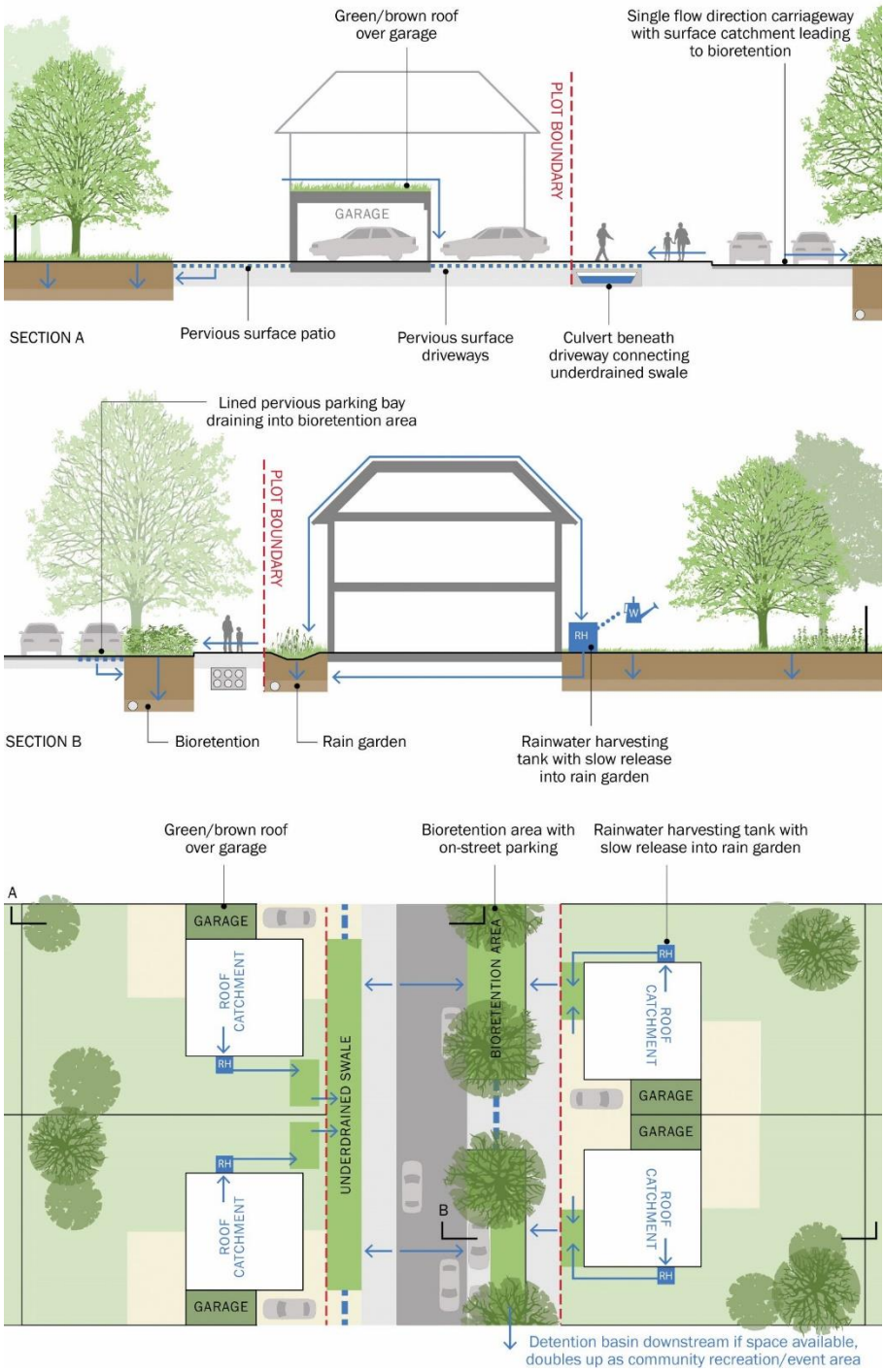

Figure A7.1 SuDS for small residential infill developments, CIRIA C753, p.179[32]

[32] Woods Ballard, B, Wilson, D, Udale-Clarke, H, Illman, S, Scott, T, Ashley, R, Kellagher, R (2015) The SuDS Manual, CIRIA, C753, London (ISBN: 978-0-86017-759-3). Go to: www.ciria.org

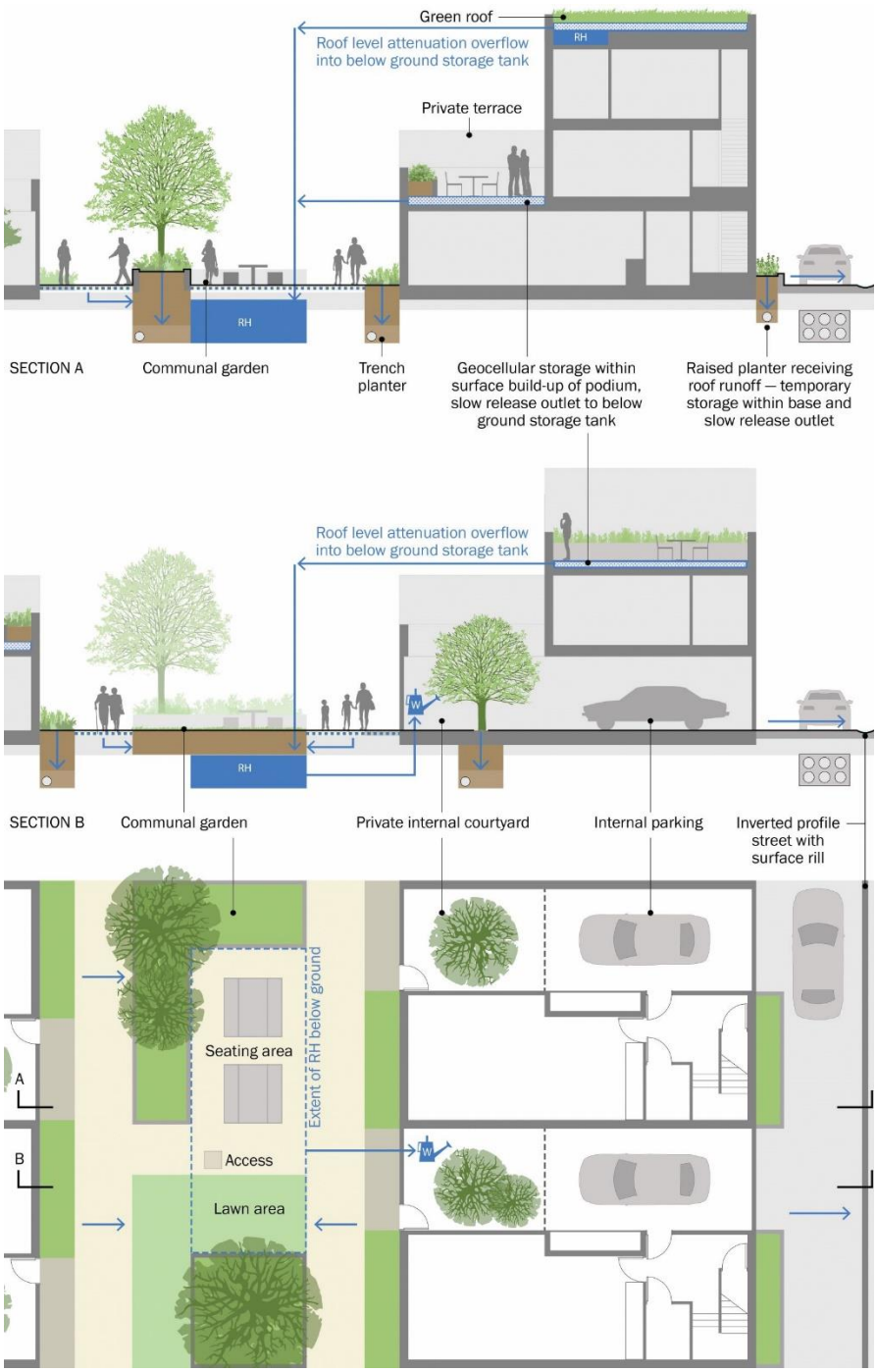

Figure A7.2 SuDS for medium residential infill developments, CIRIA C753, p.181

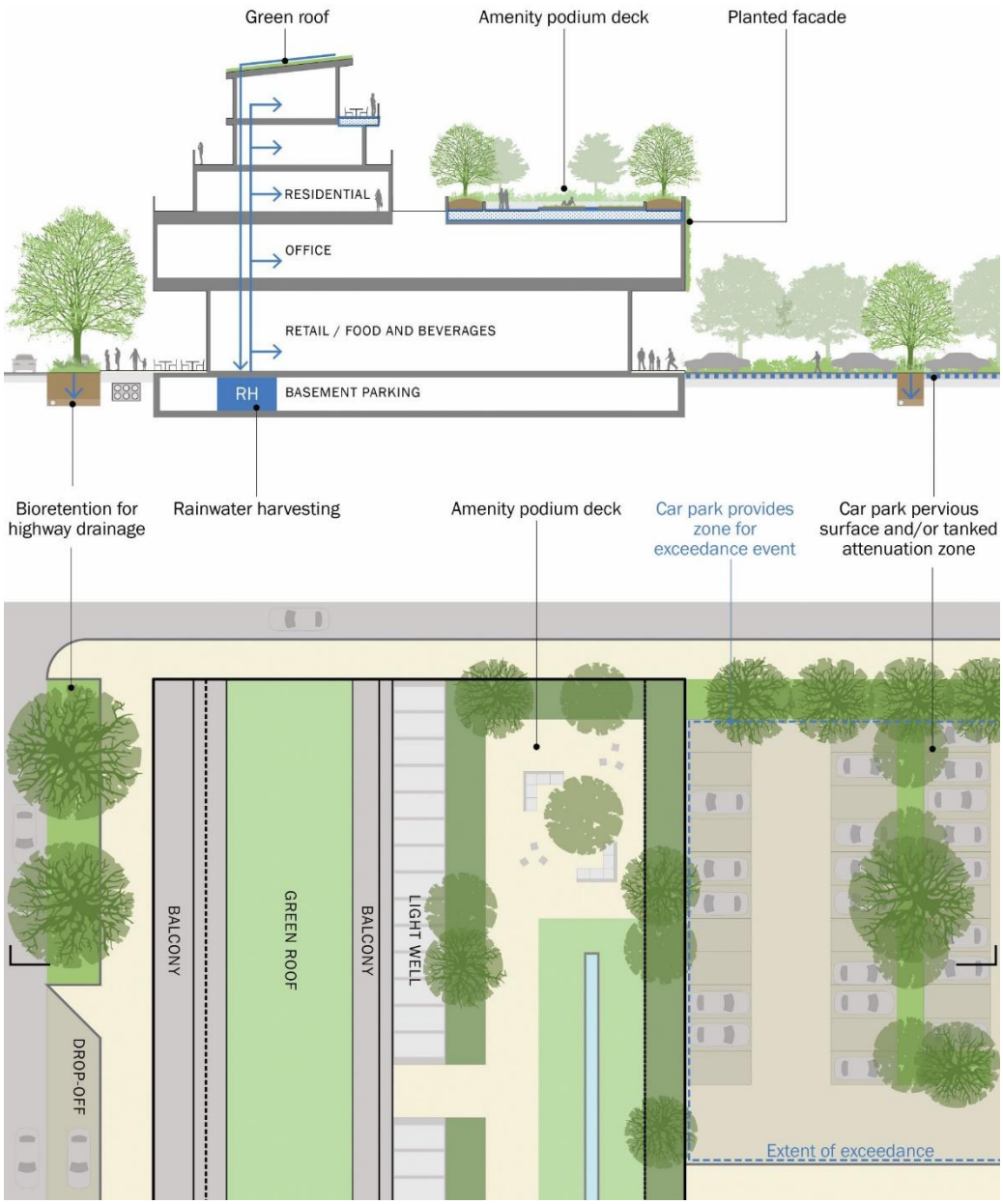

Figure A7.3 SuDS for mixed use developments, CIRIA C753, p.183

Appendix 8 Sustainability objectives for the exception test

Table 10-1 Ipswich Borough Council sustainability objectives [33]

SA Objective		Guide question
Population	1. To reduce poverty and social exclusion	Will it reduce poverty and social exclusion in those areas most affected?
Housing	2. To meet the housing requirements of the whole community	Will it contribute to the supply of housing?
Health and wellbeing	3. To improve the health of the population overall and reduce health inequalities 4. To improve the quality of where people live and work	Will it contribute to a healthy living environment?
Education	5. To improve levels of education and skills in the population overall	Will it improve qualifications and skills of young people and adults?
Water	6. To conserve and enhance water quality and resources	Will it promote sustainable use of water?
Air	7. To maintain and where possible improve air quality	Will it protect and improve air quality?
Material assets	8. To conserve and enhance soil and mineral resources 9. To promote the sustainable management of waste	Will it encourage the efficient use of land? Will it encourage the use of previously developed land and/or the reuse of existing buildings?
Climatic change and flooding	10. To reduce emissions of greenhouse gases from energy consumption 11. To reduce vulnerability to climatic events and flooding	Will it reduce emission of greenhouse gases/head of population by reducing energy consumption? Will it minimise the risk of flooding from rivers, watercourses, and on coasts? Will it reduce the risk of damage from extreme weather events?
The Coast and Estuaries	12. To safeguard the integrity of the coast and estuaries	Will it protect environmentally designated sites?
Biodiversity	13. To conserve and enhance biodiversity and geodiversity	Will it maintain and enhance designated nature conservation sites? Will it lead to the creation of new habitat and ensure ecological networks are not compromised?
Cultural heritage	14. To conserve and where appropriate enhance areas and assets of historical and archaeological importance	Will it protect and enhance buildings, monuments, sites, places, areas and landscapes of heritage interest or cultural value (including their setting)?
Landscape	15. To conserve and enhance the quality and local distinctiveness of landscapes and townscape	Will it protect and enhance landscape character and townscapes? Will it promote high quality design in context with its urban or rural landscape?
Economy	16. To achieve sustainable levels of prosperity and growth throughout the plan area 17. To maintain and enhance the vitality and viability of town and retail centres	Will it make land available for business development? Will it promote growth in key sectors? Will it increase the range of employment opportunities, shops and services available in town centres?
Transport, travel and access	18. To encourage efficient patterns of movement, promote sustainable travel of transport and ensure good access to services	Will it promote the use of sustainable travel modes and reduce dependence on the private car?
Digital infrastructure	19. To ensure that the digital infrastructure available meets the	Will it improve digital infrastructure provision?

[33] Ipswich Borough Council Strategic Environmental Assessment and Sustainability Appraisal, Table 2-1 The SA Framework https://www.ipswich.gov.uk/sites/www.ipswich.gov.uk/files/a4_-_ilp_arcadis_sa_report_inc_non-technical_summary_regs_19_stageappendices_a-eoct_2019.pdf June 2020.

	needs of current and future generations	