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# Site Specific FRA 'Toolkit'

## **A1 OVERVIEW OF FLOOD RISK**

A.1.1 Mapping within Appendix D of the SCDC and CCC Level 1 SFRA provides a graphical representation of the variation in flood risk across the study area. These maps highlight the fluvial extent of Flood Zones 1 (Low Flood Risk), 2 (Medium Flood Risk), 3a (High Flood Risk) and 3b (Functional Floodplain). The Functional Floodplain is defined as land where water has to flow or be stored in times of flood. PPS25 provides guidance on how sustainable development should be implemented within these various flood risk areas. Where available, Flood Hazard mapping has also been provided.

A.1.2 SCDC and CCC should review the risk of flooding posed to a particular site by reference to the maps in Appendix D of the SFRA. Clear planning and development control recommendations have been provided in Section A.5 of this note, should be applied only once the Sequential Test has been applied in accordance with PPS25 (refer to Sections 1.4 of the SFRA). One of the key recommendations of the Pitt Review; *“Learning lessons from the 2007 floods”*, was that Local Authorities should lead on the management of local flood risk, with the support of the relevant organisations. The Flood and Water Management Act (2010), also highlights how a lead local authority in England, must; *develop, maintain, apply and monitor a strategy for local flood risk management in its area.*

A.1.3 It is highlighted that, in addition to a risk of flooding from rivers, there is also a potential risk of flooding from localised sources, including sewers, blocked gullies and culverts, and surface water runoff. This is more difficult to predict, and within more intensely urbanised areas within the districts, may occur at any location and / or point in time. It is essential that all future development is designed to minimise the potential impacts of localised flooding (e.g. through the provision of SuDS, overland flood flow routing, and careful location of on-site flood detention areas). All sources of flooding should be taken into consideration.

A.1.4 Within Sections A.3 and A.4 of this note, a 'toolkit' has been provided to inform SCDC and CCC and prospective developers of the likely flood risk issues to be addressed on a site-specific basis.

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## **A2 SCOPE OF THE DETAILED FLOOD RISK ASSESSMENT**

A.2.1 The Level 1 SFRA is a strategic document that provides an overview of flood risk throughout the area. It is imperative that a site based Flood Risk Assessment (FRA) is carried out by the developer for all proposed developments. This should be submitted as an integral part of the planning application (when it is submitted to the Local Planning Authority).

A.2.2 The site specific FRA toolkit has been based upon planning policies and information available at the time of report issue (September 2010). Flood risk classifications may be subject to change in line with future planning policy. It should also be noted that flood zoning may be subject to change following consideration of detailed topographical information, and following investigation of site specific flood risk issues. This relates to further detail as part of a site specific FRA. An FRA is required to be undertaken by developers to accompany any future planning applications for developments, and for any proposed development in a medium (FZ2) or high probability (FZ3) flood risk area.

A.2.3 Flood risk will need to be considered by developers as part of any specific development proposals in the future. Developers must:

- carry out site specific FRA's;
- engage the EA from the outset; and
- seek guidance from the EA on requirements for an FRA.

A.2.4 The FRA should be commensurate with the risk of flooding to the proposed development. For example, where the risk of flooding to the site is negligible (e.g. 'low probability' Flood Zone 1), there is little benefit to be gained in assessing the potential risk to life and / or property as a result of fluvial (river) flooding. Rather, emphasis should be placed on ensuring that runoff from the site does not exacerbate flooding elsewhere i.e. adjacent developments. The particular requirements for FRAs, for specific development uses, and within each delineated flood zone are outlined within Sections A.3 and A.4 of this note.

A.2.5 In all areas, a localised risk of flooding may also occur, typically associated with local catchment runoff following intense rainfall (Pluvial Flooding) passing directly over the local catchment area. Surface water sheet flow as a result of pluvial flooding, must be taken into consideration as an integral part of a site specific FRA. Reference should be made to the Environment Agency's (EA) surface water flood maps provided in Appendix B of the Level 1 SFRA. These maps should be used as a starting point, when considering surface water flooding across a site. Reference should be made to section 4.11 of the SFRA for further background on the production and application of these maps.

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### **A3 FRA TOOLKIT: BY PROPOSED DEVELOPMENT USE**

A.3.1 Set out below is an initial guide to the key issues identified as part of the SFRA, but this is not an exhaustive list. The exact scope and requirements of any site specific FRA will be set by the Environment Agency and South Cambridgeshire District Council or Cambridge City Council. It is recommended that early consultations take place with the EA in order to ensure a satisfactory FRA is prepared and submitted with any future planning application for new development. Reference should be made to the EA's standing advice on the Flood Risk Assessment process which can be found on the web link below;

<http://www.environment-agency.gov.uk/research/planning/93498.aspx>

The vulnerability of a development in relation to the level of flood risk should be taken into consideration. Reference should be made to the tables provided in Annex D of PPS25. Reliable site level information, preferably in the form of a topographical survey, set to Global Positioning System (GPS) datum, will be required in the first instance to determine the actual flood zone for the site.

#### *Essential Infrastructure*

A.3.2 The FRA will need to address the safe access and egress to any bridge structures or other essential infrastructure to be sited in flood risk areas. The design of any bridge deck arrangements will need to allow sufficient clearance (to be advised by the EA) above the 1 in 100 year flood level (incorporating an allowance for climate change) and ensure that no constriction in flow is generated by the proposed deck and parapet arrangements.

A.3.3 The FRA will need to ensure that the infrastructure is designed and constructed to:

- Remain operational in times of flood;
- Compensate the net loss of floodplain storage;
- Not impede water flows;
- Not increase flood risk elsewhere.

#### *Other Proposed Development*

**A.3.4 The FRA should consider the appropriateness of proposed development uses in flood risk areas in line with Table D.3 of PPS25. This is shown in section 10.2 of the SFRA.**

A.3.5 Further investigation of any recently modelled flood levels and topography will give a better understanding of the flooding mechanism of the site.

A.3.6 Sustainable drainage techniques should be implemented wherever practicable as part of the development proposals (see section 8.1) of the SFRA.

A.3.7 Surface water runoff should look to be controlled as close to the source as possible with run-off rates set to mitigate any impact to the receiving environment. They should also seek to provide a tangible reduction in flood risk to adjacent and downstream areas prone to historic flooding. Areas prone to surface water flooding are also likely to be identified as part of the Cambridge detailed Surface Water Management Plan (SWMP) and Cambridgeshire Flood Risk Management Plan.

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A.3.8 The developer should **seek to reduce runoff rates and volumes to the receiving surface water drainage system** and watercourse 'post development' in order to reduce the flood risk to downstream areas prone to historic flooding (or identified as having a high potential for flood risk as identified in the SWMP). For areas served by separate sewer systems, a 20% reduction in surface water flows should be sought 'post development' for the lifetime of the development. Nil detriment should be viewed as the absolute minimum requirement. Discharge rates and volumes from the proposed development into the receiving watercourse and drainage systems should be agreed with the EA, Local Planning Authority, relevant sewerage undertaker or relevant IDB.

A.3.9 The impact of foul and surface water flows resulting from proposed development upon the receiving combined public sewer should be assessed, following liaison with Anglian Water Services Ltd and the EA. For areas served by combined sewer systems, a 20% reduction in net foul and surface water flows should be sought 'post development' for the lifetime of the development. Nil detriment should be viewed as the absolute minimum requirement.

A.3.10 The FRA should take into account the requirements for safe access (dry access where possible), and compensatory flood storage to mitigate any loss of potential flood storage volumes as a result of development proposals.

A.3.11 Where volumes of flood storage are displaced by the development proposals, compensatory flood storage must be provided within the site (or upstream) on a 'level for level', 'volume for volume' basis up to and including the 1 in 100 year flood level incorporating climate change.

A.3.12 Climate change impacts should also be considered for all types of flooding (including sewer flooding) and minimum finished floor levels for the development should be set above the 1 in 100 year flood level (incorporating climate change), with an allowance for freeboard. Typically this freeboard should be 300mm above the 1 in 100 plus climate change flood level or 600mm above the 1 in 100 year flood level.

A.3.13 Appropriate to the scale and nature of the development, the FRA should take into account residual risks due to extreme events and potential culvert blockages.

### **Sequential Test**

A.3.14 A risk-based Sequential Test (see section 1.4 of the SFRA) should be applied at all stages of the planning process on a case by case basis. Reference should be made to the Flood Risk Constraints Mapping provided in Appendix D; undefended flood outlines should be used. In areas at risk from fluvial or tidal flooding, preference should be given to locating new development in Flood Zone 1. If there is no reasonably available site in Flood Zone 1, the flood vulnerability of the proposed development can be taken into account in locating development in Flood Zone 2 and the current Flood Zone 3. If, following the application of the Sequential Test it is not possible or consistent with wider sustainability objectives, for the development to be located in zones of lower probability of flooding, the Exception Test can be applied.

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### **Exception Test**

A.3.15 PPS25 describes the Exception Test as providing a 'method of managing flood risk while still allowing necessary development to occur'. For the Exception Test to be passed it must be demonstrated that;

a) the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared;

b) the development should be on developable previously developed land or, if it is not on previously developed land, that there are no reasonable alternative sites on developable previously developed land; and

c) a FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall.

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## **A4 FRA TOOLKIT: BY FLOODZONE**

### *Proposed Development within Zone 3a 'High Probability' and Zone 3b 'Functional Floodplain' (Developed Areas)*

A.4.1 All FRAs supporting proposed development within both Zone 3b 'Functional Floodplain' (existing developed areas only) and Zone 3a 'High Probability' should include an assessment of the following:

- It is important to note that only limited forms of development are permitted in Flood Zone 3b (Functional Floodplain). Only Water-Compatible uses and Essential Infrastructure listed in table D3 of PPS25 (see section 10.2.4 of the SFRA), are permitted in this zone. Essential Infrastructure in this zone should pass the Exception Test. No other forms of development are permitted.
- The vulnerability of the development to flooding from other sources (e.g. surface water drainage, groundwater) as well as from river flooding. This will involve discussion with the Environment Agency, Anglian Water Services Ltd, SCDC/CCC, Cambridgeshire County Council and relevant IDB to confirm whether a localised risk of flooding exists at the proposed site.
- The vulnerability of the development to flooding over the lifetime (typically 60 years for commercial and 100 years for residential) of the development (including the potential impacts of climate change), i.e. maximum water levels, flow paths and flood extents within the property and surrounding area. The Environment Agency may have carried out detailed flood risk mapping within localised areas that could be used to underpin this assessment (see Flood Risk Constraints Mapping in Appendix D of SFRA). Where available, this will be provided at a cost to the developer. Where detailed modelling is not available, hydraulic modelling by a suitably qualified professional will be required to determine the risk of flooding to the site. Reference should be made to the EA's Computer River Modelling guidance (2009) as part of a Flood Risk Assessment.
- The effect of the new development upon depth and velocity of floodwater. This will require a detailed assessment, to be carried out by a suitably qualified professional. Reference should be made to areas that fall within the Flood Hazard Mapping extents as shown in Appendix D of the SFRA.
- Volumes of flood storage displaced as a result of the development proposals. Compensation should be provided on a level for level, volume for volume basis up to and including the 1 in 100 year event including climate change.
- The potential for the development to increase flood risk elsewhere through the addition of hard surfaces, and the effect of the new development on surface water runoff. Details of proposed mitigation measures and SuDS must be provided, with accompanying hydraulic calculations to demonstrate the robustness of the approach taken. A tangible reduction in surface water flows should be sought 'post development' for the lifetime of the development.
- For areas deemed to be protected by flood defences (see defence plans in Appendix C of the SFRA) or alleviation schemes, the risk of breach (failure) of defences or exceedance of their design criteria. This will require a detailed assessment, to be carried out by a suitably qualified professional.

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- A demonstration that residual risks of flooding (after existing and proposed flood management and mitigation measures are taken into account) are acceptable. Measures may include flood defences, flood resistant and resilient design, escape / evacuation, effective flood warning and emergency planning (see section 4.14 of SFRA).
  - Details of existing site levels, proposed site levels and proposed ground floor levels. All levels should be stated relevant to Ordnance Datum (confirmed by Global Positioning System Datum).

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*Proposed Development within **Zone 2 'Medium Probability'** (Incorporating Areas Affected by the 1 in 100 Year Flood Including Climate Change)*

A.4.2 For all sites within Zone 2 'Medium Probability' an FRA should be prepared based upon readily available existing flooding information, sourced from the EA, and should include an assessment of the following:

- The vulnerability of the development to flooding from other sources (e.g. drainage, groundwater) as well as from river flooding. This will involve discussion with the Environment Agency, relevant IDB, Anglian Water Services Ltd, SCDC/CCC and Cambridgeshire County Council to confirm whether a localised risk of flooding exists at the proposed site.
- The vulnerability of the development to flooding over the lifetime of the development (including the potential impacts of climate change) (see section 6.1.7 of the SFRA).
- Volumes of flood storage displaced as a result of the development proposals. Compensation should be provided on a level for level, volume for volume basis up to and including the 1 in 100 year event including climate change.
- A demonstration that residual risks of flooding are effectively managed through, for example, the provision of raised floor levels, and the provision of a planned evacuation route and / or safe refuge.
- The potential for the development to increase flood risk elsewhere through the addition of hard surfaces, and the effect of the new development on surface water runoff. Details of proposed mitigation measures and SuDS must be provided, with accompanying hydraulic calculations to demonstrate the robustness of the approach taken. A tangible reduction in surface water flows should be sought 'post development' for the lifetime of the development.
- Details of existing site levels, proposed site levels and proposed ground floor levels. All levels should be stated relevant to Ordnance Datum (confirmed by Global Positioning System Datum).



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*Proposed Development within **Zone 1 'Low Probability'***

A.4.3 For all sites within Zone 1 'Low Probability' a basic FRA should be prepared, and should include an assessment of the following:

- Alternative sources of flooding (e.g. surface water/urban drainage and / or groundwater).
- The potential for the development to increase flood risk elsewhere through the addition of hard surfaces, and the effect of the new development on surface water runoff. Details of proposed mitigation measures and SuDS must be provided, with accompanying hydraulic calculations to demonstrate the robustness of the approach taken. A tangible reduction in surface water flows should be sought 'post development' for the lifetime of the development.

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## **POTENTIAL FLOOD MITIGATION MEASURES**

A.4.4 The SFRA provides specific recommendations with respect to the provision of sustainable flood risk mitigation opportunities that will address both the risk to life and the residual risk of flooding to development within particular 'zones' of the area. These recommendations should form the basis for the site-based FRA, and have been briefly set out below.

### *Raised Floor Levels and Basement Thresholds (Freeboard)*

A.4.5 The raising of finished floor levels above the 1 in 100 year fluvial flood level plus climate change, will ensure that the damage to property is minimised.

A.4.6 Wherever possible, finished floor levels should be situated a minimum of 300mm above the 1 in 100 year plus climate change flood level, determined as an outcome of the site based FRA. A minimum of 600mm above the 1 in 100 year flood level should be adopted if no specific climate change data is available. The height that the floor level is raised above flood level is referred to as the 'freeboard'.

A.4.7 The use of basements within flood affected areas should be discouraged. Where basement uses are permitted however, it is necessary to ensure that the basement access points are situated 300mm above the 1 in 100 year flood level plus climate change. The basement must be of a waterproof construction to avoid seepage during flooding conditions. Habitable uses of basements within flood affected areas should not be permitted.

### *Sustainable Drainage Systems (SuDS)*

A.4.8 SuDS is a term used to describe the various approaches that can be used to manage surface water drainage in a way that mimics the natural environment. Reference should be made to section 8.1 of the SFRA. The management of rainfall (surface water) is considered an essential element of reducing future flood risk to both the site and its surroundings.

A.4.9 SuDS may improve the sustainable management of water for a site by:

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
- Reducing volumes and the frequency of water flowing directly to watercourses or sewers from developed sites;
- Improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
- Reducing potable water demand through rainwater harvesting;
- Improving amenity through the provision of public open space and wildlife habitat;
- Replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

A.4.10 In catchment terms, any reduction in the amount of water that originates from any given site is likely to be small. But if applied across the catchment in a consistent way, the cumulative effect of a number of sites could be significant.

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A.4.11 There are numerous different ways that SuDS can be incorporated into a development; information relating to the most commonly found components of a SuDS system can be found in the various documents listed below. The appropriate application of a SuDS scheme to a specific development is heavily dependent upon the topography and geology of the site (and its surrounds). Careful consideration of the site characteristics must be assured to ensure the future sustainability of the adopted drainage system. SuDS Infiltration Feasibility mapping based on underlying ground conditions has been provided in Appendix C of the Level 1 SFRA.

A.4.12 The location of Source Protection Zones (see maps in Appendix C in SFRA) in the study area, should be taken into consideration, when considering the application of SuDS.

A.4.13 For more guidance on SuDS, the following documents and websites are recommended as a starting point:

- Planning Policy Statement 25: Development and Flood Risk Practice Guide (2009)

<http://www.communities.gov.uk/publications/planningandbuilding/pps25guideupdate>

- CIRIA SuDS Manual (C697)

<http://www.ciria.com/suds/index.htm>

- Cambridge Sustainable Drainage Design and Adoption Guide (Cambridge City Council June 2009)

<http://www.cambridge.gov.uk/public/docs/SUDS-Design-and-Adoption-Guide.pdf>

- Water Cycle Strategy, Major Growth Areas in and around Cambridge, Phase 1 Outline Strategy (October 2008) and Phase 2 (late 2010)

[http://www.cambridgeshirehorizons.co.uk/our\\_challenge/environment\\_sustainability/water\\_cycle\\_strategy.aspx](http://www.cambridgeshirehorizons.co.uk/our_challenge/environment_sustainability/water_cycle_strategy.aspx)

- The South Cambridgeshire District Council, District Design Guide (Supplementary Planning Document, Adopted March 2010)

<http://www.scambs.gov.uk/environment/planning/districtplanning/localdevelopmentframework/spds/districtdesignguidespd.htm>

A.4.14 Furthermore, the Environment Agency issues best practice guidance for Sustainable Drainage Systems, available from the Environment Agency development and flood risk teams. This provides clear hierarchy for SuDS, reflecting the degree of sustainability offered by the SuDS application as captured in Table A.1 below:

	SuDS Technique	Flood Reduction	Water Quality Improvement	Landscape & Wildlife Benefit
Most Sustainable ↓ Least Sustainable	Living Roofs	✓	✓	✓
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices - Soakaways - Infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains - gravelled areas - Solid paving blocks - Porous paving	✓	✓	
	Tanked systems - Over-sized pipes/tanks - Storms cells	✓		

Table A.1

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## **LOCAL COMMUNITY ACTIONS TO REDUCE FLOOD DAMAGE**

A.4.16 Where properties are deemed to be at 'significant' risk of flooding (i.e. situated in Flood Zone 3) it is essential to provide the community with the knowledge (and tools) that will enable them to help themselves should a flood event occur. The Level 1 SFRA is a key source of flood risk information in the public domain.

A.4.17 Details of flood warning and flood resilience have been set out within the following 'community based measures' that local communities may introduce to minimise the damage sustained to their own homes in the event of flooding. Reference should also be made to section 7.4 of the SFRA and EA Flood Warning Areas provided in Appendix C of the SFRA.

### **Flood Warning**

A.4.18 Where available, communities in flood risk areas should be registered with the EA's Floodline facility. While this may not always cover the specific local watercourses that pose the greatest risk to the locale, advance warning of the onset of extreme weather conditions may be gathered and actions taken by residents at a local level. See section 7.4. of the SFRA.

### **Flood Resilience / Resistance**

A.4.19 Flood resistance involves constructing a building in such a way so as to prevent floodwater entering the structure and damaging it's fabric. Flood resilience involves constructing a building so as to permit floodwater to enter the structure but to reduce the impact of any damage caused (i.e. no permanent damage is caused, structural integrity is maintained and drying and cleaning are facilitated). Details of flood resilient construction can be found within the Department for Communities and Local Government publication; 'Improving the Flood Performance of New Buildings published in May 2007.

A.4.20 One of the Key recommendations of the Pitt Review; "*Learning lessons from the 2007 floods*", was that building regulations should be revised to ensure that all new or refurbished buildings in high flood-risk areas are flood resistant or resilient. Examples of flood resilient and resistant measures that can be adopted are listed below;

#### *Raising of floor levels (Resistance)*

The raising of floor levels above the anticipated maximum flood level ensures that the interior of the property is not directly affected by flooding, avoiding damage to furnishings, wiring and interior walls. It is highlighted that plumbing may still be impacted as a result of mains sewer failure.

#### *Raising of electrical wiring (Resilience)*

The raising of electrical wiring and sockets within flood affected buildings reduces the risks to health and safety, and reduces the time required after a flood to rectify the damages sustained.

#### *Use of sacrificial construction materials (Resilience)*

These are materials used in housing fittings that are likely to be damaged in case of flooding but can also be repaired i.e. gypsum plaster board. This would be used for a 'water entry' strategy where the emphasis is placed on allowing water into the building, facilitating draining and consequent drying.

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*Flood boards / gates (Resistance)*

The placement of a temporary watertight seal across doors, windows and air bricks to avoid inundation of the building interior. This may be suitable for relatively short periods of flooding, however, the porosity of brickwork may result in damage being sustained should water levels remain elevated for an extended period of time.

*Boundary walls and fencing (Resistance)*

Boundary walls and fencing can be designed with high water resistance materials and/or effective seals to minimise water penetration for low depth, short duration floods (but not for groundwater flooding).

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## **A5 DEVELOPMENT CONTROL RECOMMENDATIONS**

### **Future Developments within Flood Zone 3b 'Functional Floodplain' (developed areas)**

A.5.1 Table D.3 of Planning Policy Statement 25: Development and Flood Risk (PPS25) advises that only essential infrastructure (subject to the Exception Test) and water compatible development uses are appropriate in Flood Zone 3b. No other forms of development are permitted. See Flood Risk Constraints Mapping in Appendix D of SFRA for areas identified as Functional Floodplain. Further reference should be made to EA's standing advice on Flood Risk Assessments on the weblink below;

<http://www.environment-agency.gov.uk/research/planning/93498.aspx>

A.5.2 Any proposed future development within Zone 3b 'Functional Floodplain' will require a detailed Flood Risk Assessment (FRA).

A.5.3 SuDS should be implemented to ensure that runoff from the site is not increased and where possible reduced; any SuDS design must take due account of groundwater and geological conditions.

A.5.4 As previously mentioned in section A.3.10 of this note, dry access is to be provided wherever possible (above the 1 in 100 year flood level) to enable the safe evacuation of residents and / or employees in the event of flooding. In exceptional circumstances where this is not achievable, safe access must be provided at all locations, defined in accordance with DEFRA research as outlined in "Flood Risks to People" (FD2320). It is essential to ensure that the nominated evacuation route does not divert evacuees into a 'dry island' upon which essential supplies (i.e. food, shelter and medical treatment) will not be available for the duration of the flood event. Reference should be made to the Flood Risk Constraints Mapping provided in Appendix D.

A.5.5 Proposed development shall not result in an increase in maximum flood levels within adjoining properties. This may be achieved by ensuring (for example) that the existing building footprint is not increased and / or flood plain compensation should be provided on a level for level, volume for volume basis up to the 1 in 100 year event including climate change.

A.5.6 A suitable buffer zone (the EA have advised a minimum set back distance of 9m) must be provided to the base of a flood wall or embankment or to the 'top of bank' within sites immediately adjoining the river corridor. This buffer will differ for IDB watercourses. This may be reduced for ordinary watercourses where sufficient maintenance access is available. The Environment Agency (EA) has established a policy directive that encourages the retention of an open river corridor for environmental and recreational purposes. Future development should give due consideration to these directives, ensuring a setback from the riverfront is provided. South Cambridgeshire District Council Byelaws require no obstruction within 5m of watercourses in the control of the Council (e.g. award drains).

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### **Future Development within Flood zone 3a ‘High Probability’**

A.5.7 All proposed future development within Zone 3a ‘High Probability’ will require a detailed Flood Risk Assessment (FRA), in compliance with PPS25, current guidance and policy. All potential sources of flood risk are to be considered. See Flood Risk Constraints Mapping in Appendix D of SFRA for areas identified as Flood Zone 3a. Further reference should be made to EA’s standing advice on Flood Risk Assessments on the weblink below;

<http://www.environment-agency.gov.uk/research/planning/93498.aspx>

A.5.8 Minimum finished floor levels must be situated above the 1 in 100 year predicted maximum flood level plus climate change, incorporating a 300mm allowance for freeboard.

A.5.9 Where possible, dry access is to be provided (above the 1 in 100 year flood level) to enable the safe evacuation of residents and / or employees in the event of flooding. Where this is not achievable, safe access must be provided at all locations. Reference should be made to the Flood Risk Constraints Mapping provided in Appendix D of the SFRA.

A.5.10 Basements are not to be utilised for habitable purposes. All basements must provide a safe evacuation route in times of flood, providing an access point that is situated above the 1 in 100 year plus climate change flood level.

A.5.11 The SuDS principles relevant to Flood Zone 3b should be applied to Flood Zone 3a.

A.5.12 Proposed development shall not result in an increase in maximum flood levels within adjoining properties. This may be achieved by ensuring (for example) that the existing building footprint is not increased; compensation should be provided on a level for level, volume for volume basis up to the 1 in 100 year event including climate change.

A.5.13 As with Flood Zone 3b, a suitable buffer zone (the EA have advised a minimum setback distance of 9m) must be provided to the base of a flood wall or embankment or to the ‘top of bank’ within sites immediately adjoining the river corridor.



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### **Future Development within Zone 2 ‘Medium Probability’**

A.5.14 All proposed future development within Zone 2 ‘Medium Probability’ will require a Flood Risk Assessment (FRA) in compliance with PPS25, current guidance and policy, that is commensurate with the risk posed to the proposed development. All potential sources of flood risk are to be considered. See Flood Risk Constraints Mapping in Appendix D of SFRA for areas identified as Flood Zone 2. Further reference should be made to EA’s standing advice on Flood Risk Assessments on the weblink below;

<http://www.environment-agency.gov.uk/research/planning/93498.aspx>

A.5.15 Minimum finished floor levels must be situated 600mm above the 1 in 100 year predicted maximum flood level or 300mm above the climate change flood level.

A.5.16 Where possible, dry access is to be provided (above the 1 in 100 year flood level). In exceptional circumstances where this is not achievable, safe access must be provided at all locations, defined in accordance with the emerging DEFRA research as outlined in “Flood Risks to People” (FD2320). Reference should be made to the Flood Risk Constraints Mapping provided in Appendix D of the SFRA.

A.5.17 SuDS should be implemented to ensure that runoff from the site (post redevelopment) is not increased.

### **Future Development within Zone 1 ‘Low Probability’**

A.5.18 All proposed ‘major’ future development within Flood Zone 1 ‘low probability’ will require a basic Flood Risk Assessment (FRA), in compliance with PPS25, current guidance and policy. Major development is typically defined as exceeding 1 hectare. The FRA will need to focus primarily upon drainage impact assessment, implementation of appropriate forms of SUDS, and control of surface water runoff. See Flood Risk Constraints Mapping in Appendix D of SFRA for areas identified as Flood Zone 1. Further reference should be made to EA’s standing advice on Flood Risk Assessments on the weblink below;

<http://www.environment-agency.gov.uk/research/planning/93498.aspx>

A.5.19 It is important, however, that all potential sources of flood risk are considered. Control of surface water runoff will involve the introduction of SuDS techniques.