Regional Flood Risk Appraisal for South East England

Summary

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Halcrow

SOUTH EAST ENGLAND Regional Assembly

COUNCILS AND COMMUNITIES IN PARTNERSHIP

Contents

Preamble

This summary provides an overview of the content of the Regional Flood Risk Appraisal. It will help planners, developers and policy makers at regional and local level to understand flood risk across the region. The full report, prepared by consultants Halcrow on behalf of the Regional Assembly, includes more detailed information, and was developed in close co-operation with the Environment Agency. The report is available on the Assembly's website www.southeast-ra.gov.uk/sustainability_flooding.html.

1. Introduction

The South East England Regional Assembly undertook a Regional Flood Risk Appraisal (RFRA) in autumn 2006 complementing the flood risk policy in the draft South East Plan (March, 2006). This was prior to the publication of the Planning Policy Statement on Flood Risk (PPS25) and its companion guide. At the time there was only limited information available on flood risk. The Assembly therefore commissioned Halcrow Group Ltd to review and update the RFRA.

High level flood risk data were used from Strategic Flood Risk Assessments (SFRAs), Catchment Flood Management Plans (CFMPs) and Shoreline Management Plans (SMPs) supplemented by consultations with the Environment Agency. CFMPs and SMPs are strategic documents that present a long-term policy framework to manage flood risk in a sustainable way. All CFMPs are available now and all SMP reviews will be completed early 2010.

More detailed local flood risk issues are addressed through SFRAs. They are typically carried out by individual local authorities or in some cases by several councils working together. Figure 1 shows the progress of SFRAs in the South East.

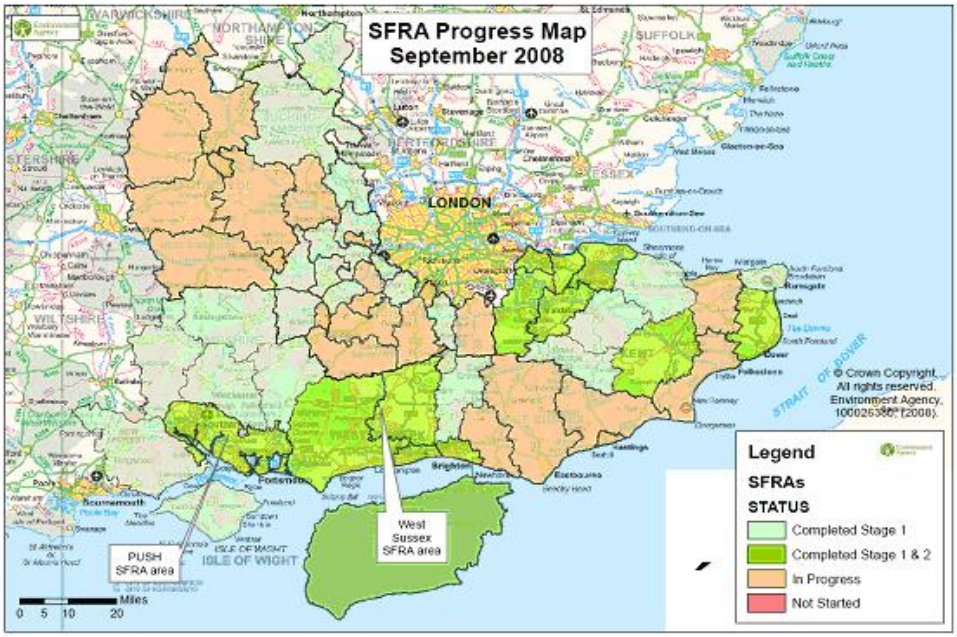

Figure 1: SFRA Progress as of September 2008

The Environment Agency defines flood zones as areas that refer to the probability of sea and river flooding ignoring existing defences. There are three zones:

- Zone 3 is an area with a high risk of flooding. It could be affected by a sea flood with a 0.5% (1 in 200) or greater chance or river flood that has a 1% (1 in 100) or greater chance of happening each year.
- Zone 2 is an area that could be affected by flooding with up to a 0.1% (1 in 1000) chance of occurring each year.
- Zone 1 is an area that has a smaller annual chance of flooding than zone 2.

Flood risk[1] at a broad regional scale was assessed, followed by a more detailed analysis[2] of:

- District council areas where flood risk is comparatively low (as indicated by proportion of the land area within flood zones 2 and 3) to inform planning policy, i.e. consider growth first in areas of low risk (sequential approach).
- Areas where high levels of planned housing growth coincide with high flood risk (flood zones 2 and 3). Flood risk indicators have been developed for these locations in order to highlight the flood risk issues to be considered by development planning.

2. Overview of flood risk in South East England

Inherent flood risk is defined as the extent of flooding, which would occur if there were no flood defences or other man-made obstructions. To compare inherent flood risk across the region, the proportion of each district that lies within flood zone 3 has been calculated and the results are shown in Figure 2.

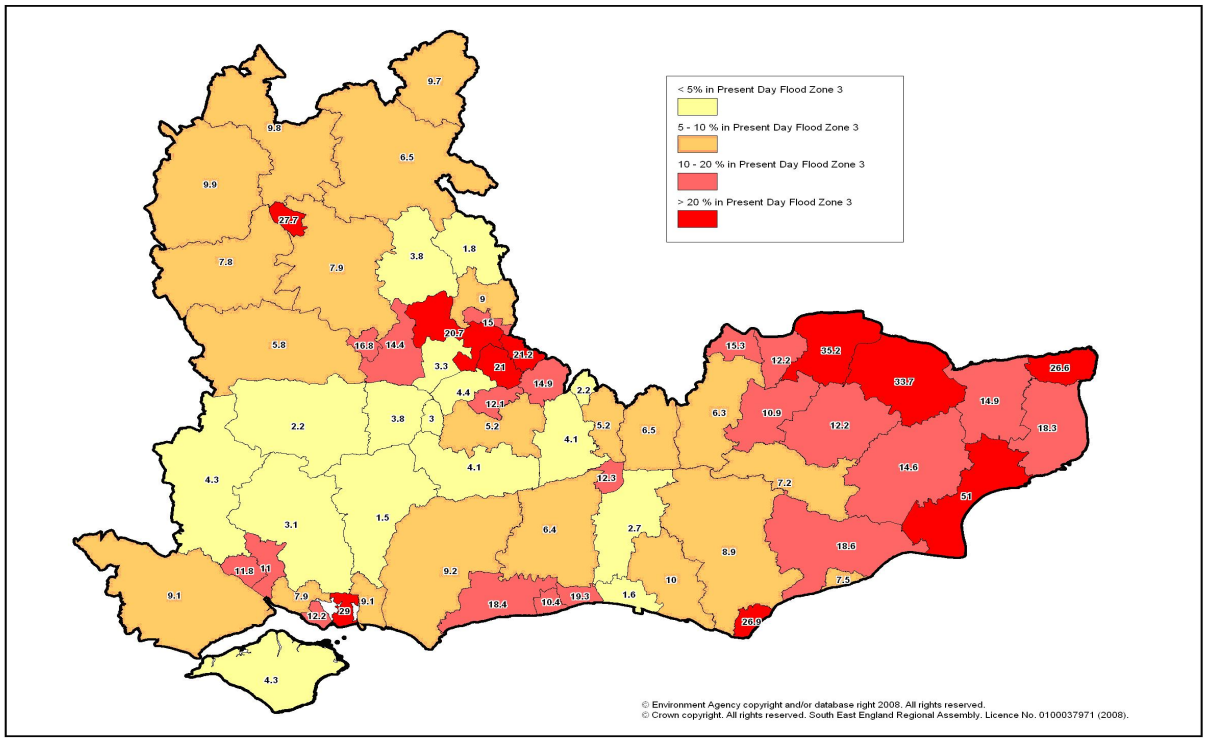

Figure 2: Present day inherent flood risk for each of the districts

To understand the potential impact of climate change, it is assumed that over the next 100 years flood zone 3 will increase to encompass the area currently covered by flood zone 2. This is a relatively simple assumption used in initial SFRAs at local level and is also considered appropriate at regional level. This 'climate change flood

[1] Initially only from rivers and the sea as defined in flood zones 2 and 3
[2] Addressing all sources of flooding

risk' has been calculated for each district based on the proportion of the district's area within flood zones 2 and 3 combined. This is shown in Figure 3. It should be noted that the impact of climate change on relatively flat coastal areas could be greater.

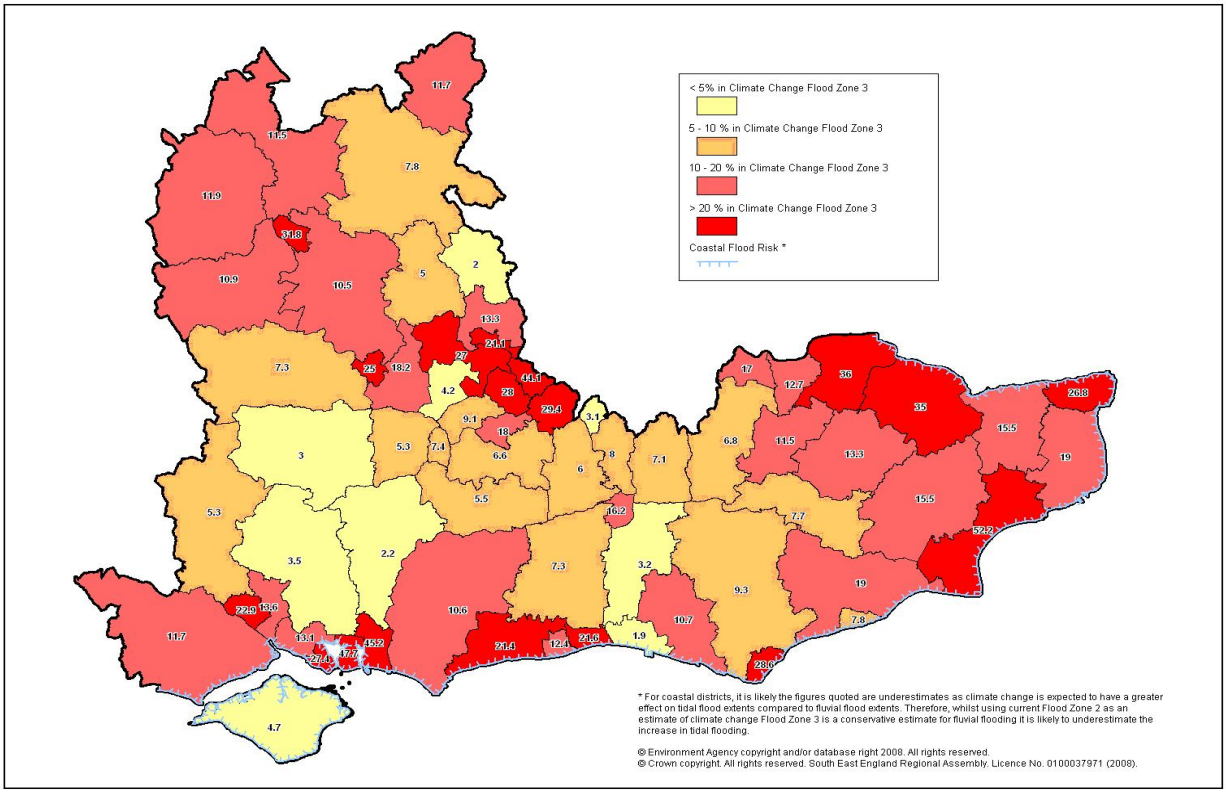

Figure 3: 'Climate change flood risk' for each of the districts

3. Areas with Low Flood Risk Constraints for Development

Several areas have been identified where the proportion of a district's area within the climate change affected flood zone 3 is lower than 5%. These include East Hampshire, Chiltern, Basingstoke and Deane, Epsom and Ewell, Mid Sussex, Winchester and Bracknell Forest (see Table 2). Note that Figure 3 also indicates a low proportion for the Isle of Wight and Brighton & Hove. However, as the climate impacts could be greater in coastal areas they have both not been considered as low flood risk areas.

Alongside flood risk there are a wide range of other constraints to look at when planning for future development. The Area of Outstanding Natural Beauty (AONB) designation has been used as an illustrative example of another constraint as it can be shown at a regional scale and in the South East often covers higher ground outside of flood zones. Table 2 shows a further reduction in land availability when AONBs are considered.

An indicator has been assigned based on the percentage of a district area constrained by AONB. The impact is high where the percentage of AONB area is greater than 40%, moderate between 20% and 40 % and low if below 20%.

	East Hamp-shire	Chiltern	Basingstoke & Deane	Epsom & Ewell	Mid Sussex	Winchester City	Bracknell Forest
Total District Area	514	196	634	34	334	661	109
Percentage of Area in Climate Change Flood Zone 3	2%	2%	3%	3%	3%	4%	4%
Percentage of Area within AONB	41%	71%	32%	0%	59%	27%	0%
Impact of AONB	**HIGH**	**HIGH**	**MODERATE**	**LOW**	**HIGH**	**MODERATE**	**LOW**
Remaining Area (km^2)	292	53	411	33	128	462	105
Percentage Area Remaining	57%	27%	65%	97%	38%	70%	96%

Table 2: Impact of AONB Constraints for Low Flood Risk Areas

In Epsom and Ewell and Bracknell Forest land availability is not significantly constrained by flood risk and AONBs. However, the reduction in developable area in other districts including Chiltern and Mid Sussex could affect future growth.

For a number of the districts with relatively low flood risk such as East Hampshire, Basingstoke and Deane, Winchester, and Chiltern, the chalk geology creates a well defined narrow floodplain but also leads to a high risk of groundwater and related surface water flooding. This emphasises the importance of understanding the flood risk of an area from all sources of flooding, not just fluvial and coastal, when considering the opportunities for development and the scope for mitigation.

4. Areas of High Growth and High Flood Risk

4.1. Identifying high growth and high flood risk areas

The RFRA has also identified areas where high growth as set out in the South East Plan[3] and high flood risk coincide.

Detailed assessments of flood risk are not possible at a regional scale as the South East Plan is not site specific. However, it has been possible to identify areas in flood zones 2 and 3 that will see relatively high levels of growth (see Figure 4). The following criteria were applied to define high growth[4]:

[3] A 20-year statutory planning framework for the South East setting targets for housing, the economy, transport and the environment. The Government's Proposed Changes to the draft Plan suggests 33,125 homes a year until 2026.

[4] The housing number thresholds and categories were determined on a statistical basis, i.e. in order to achieve a good distribution across all categories.

- Districts with more than 700 homes a year (listed in Policy H1)
- Districts above 5 additional dwellings per annum and sq km of the whole district area – indicating high-density growth within local authority with a small area
- Locations such as Strategic Development Areas (SDAs) which are identified for high growth (above 4,000 until 2026) – for example South of Oxford
- Government Growth Points - for example Dover, Reigate and Banstead.

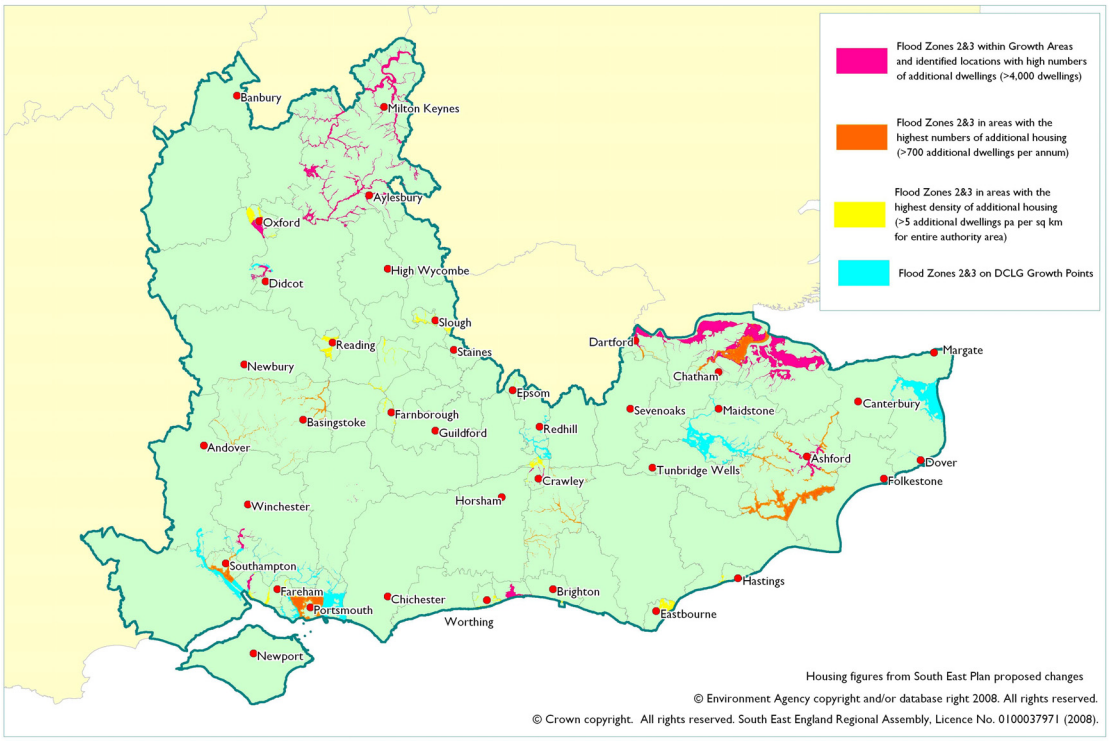

Figure 4: Areas of High Housing Growth and Flood Risk

Ten areas were identified for further analysis. They represent a cross-section of types of growth locations, but all with high flood risk.

- South Hampshire and Kent Thames Gateway - large sub-regional areas with high numbers of proposed additional housing and growth
- Milton Keynes and Crawley – large parts of districts affected by growth
- Ashford, Didcot, Oxford, Reading and Aylesbury - significant proposed development around the main urban areas
- Shoreham Harbour - a Government Growth Point.

Figure 4 also highlights other areas where high growth and flood risk coincide. However, this needs to be treated with caution, as for example the area south of Ashford only appears in Figure 4 because the whole district is identified as an area of high growth, while future development will focus around the town of Ashford.

4.2. Flood Risk Indicators

The flood risk indicators in Table 3 can be used to inform the development planning process, but they do not define what is or is not acceptable. They have been

determined using evidence from SFRAs, CFMPs, and SMPs and the Environment Agency.

It must be noted that the level of confidence associated with the indicators is not the same for each of them. It differs between districts due to the inconsistency of available information, in particular for tidal/coastal, surface water and groundwater flood risk and the standard of protection.

Table 3 is a summary of the scoring of the flood risk indicators for the identified locations. Areas with more than 10% of the selected area within flood zone 3 are defined as 'high' present day and climate change flood risk. There was no quantitative information available to inform the scoring (low, moderate, high) of the other indicators. Therefore expert judgement and a comparison of the broad scale of flood risk in different locations were used for the scoring.

Kent Thames Gateway and South Hampshire have the highest number of high scores. In particular surface and groundwater flooding risks are higher than in the other locations, and tidal flooding as additional threat. Fluvial flooding is a major risk for Reading, Oxford and Didcot.

Further details about scoring of flood risk indicators for each location are provided in Halcrow's full report.

	Kent Thames Gateway	South Hampshire Region	Shoreham Harbour	Ashford	Aylesbury	Reading	Didcot	Oxford	Milton Keynes	Crawley
Present day inherent flood risk	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	MODERATE	MODERATE
Climate change inherent flood risk	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	MODERATE
Fluvial flood risk	MODERATE	HIGH	LOW	MODERATE	MODERATE	HIGH	HIGH	HIGH	MODERATE	LOW
Tidal/Coastal flood risk	HIGH	HIGH	HIGH	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Flood risk from groundwater	MODERATE	MODERATE	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
Surface water flooding	HIGH	HIGH	LOW	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	LOW	HIGH
Residual risk of flooding[5]	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	LOW
Level of Structural Mitigation[6]	HIGH	MODERATE	HIGH	HIGH	MODERATE	LOW	LOW	LOW	MODERATE	LOW

Table 3: Summary of scoring of Flood Risk Indicators for areas of high growth and high flood risk

[5] The risk which remains after all risk avoidance, reduction and mitigation measures have been implemented, for example the flood risk from breach/overtopping of flood defences and infrastructure such as reservoirs.

[6] This refers to the level of protection with regard to flood defences and flood storage reservoirs when compared to the minimum standard of protection.

5. Conclusions

This RFRA has showed the distribution of inherent flood risk across the region and can be used to inform the sequential approach to development at a sub-regional and local level. However, relevant local SFRAs will give a greater indication of the local capacity to accommodate growth and also to ensure that development takes place in areas with the lowest flood risk.

Where high levels of growth are proposed, the indicators provide a regional overview of flood risk and can be used to inform more detailed local assessments.

Key findings and policy implications:

- **Climate change** will be the major cause of increased flood risk in the future. As a result the volumes of fluvial and surface water are likely to increase and in future many watercourses may not be able to contain the water within the river channels or drainage systems. It will be even more difficult to contain the sea within existing coastal flood defences. It is advised to provide more open space for rivers or the sea by maintaining, refurbishing and upgrading or setting-back defences and replacing them in a sustainable manner.

- Many urban areas across the region face flood risk issues. This is particularly critical in South Hampshire and Kent Thames Gateway, where the **surface water flood risk** indicator is high. The increased storminess anticipated as part of climate change and the historic design standards for surface water infrastructure mean that action is needed to limit or prevent this source of flooding increasing in the future.

- There are several districts where based on the flood zones **flood risk is generally low**. However, for a number of these districts the ground conditions mean a high risk of groundwater and related surface water flooding. This emphasises the importance of assessing flood risk of an area from all sources of flooding, not just fluvial and coastal, when considering the opportunities for development and the scope for mitigation.

- The indicators provide a useful overview of **growth locations with high flood risk**. However, the scoring can only be indicative. Kent Thames Gateway and South Hampshire show the highest number of high scores. In particular surface and groundwater flooding risks are higher than in the other identified locations. Tidal flooding is an additional threat. For Reading, Oxford and Didcot fluvial flooding is the major risk.

6. Recommendations

6.1. Recommendations for Improvements to Regional Policy

On the basis of the findings of this RFRA the following additions to the South East Plan Proposed Changes policy on flood risk management (NRM4) are recommended.

Development applications in defended floodplains must ensure that the defences provide the required level of protection and will be maintained for the lifetime of the development (60 years for commercial and 100 years for residential developments).

In the preparation of Local Development Documents and considering planning applications, local authorities in conjunction with the Environment Agency should also:

- Reduce the level of flood risk to existing properties in the floodplain. - *To add to the supporting text of the policy: By making space for water and designing the built environment to be more resilient to flooding it is easier to achieve multi-objective benefits, such as the establishment of green corridors, improved amenity and access, habitat creation etc. The mechanism for achieving this is by adopting an integrated approach to flood risk management planning by developing strong partnerships between local authorities, developers and government organisations responsible for managing existing flood risk.*

- Require development to attenuate its runoff to greenfield runoff rates in catchments where the relevant CFMP identifies areas at high risk from surface water flooding. - *To add to the supporting text of the policy: Development should include Sustainable Urban Drainage Systems (SUDS) to infiltrate runoff on site wherever possible, or otherwise discharge it at no more than greenfield runoff rates into a nearby watercourse or, if no other option is possible, the local sewer system.*

- Take account of the level of risk from development that is dependent on critical infrastructure. Local authorities need to ensure that the potential risk caused by a breakdown of critical infrastructure is sufficiently mitigated prior to allowing development to take place.

6.2. Recommendations for Locational Criteria

Locational Criteria for Defences: Where it is necessary to locate new development in flood zones 2 and 3[7], such development should be located in accordance with the following locational criteria:

- The preferred policy option in the relevant Catchment Flood Management Plan or Shoreline Management Plan is to 'hold the line' and sustain the level of flood risk over the lifetime of the development
- The standard of protection of existing defences is compatible with the land use type proposed

[7] All cases assume that the sequential approach of avoidance and substitution has already been undertaken

- Application of the Sequential Approach has been used to identify the areas within the zone that are at least risk
- Ensure flood forecasting and warning systems, as well as evacuation plan procedures, are well-developed.

If the standard of protection from existing defences is locally not compatible with the land use proposed the following criteria should be considered:

- Raise defences where cost effective, sustainable and beneficial to the local community, for example by reducing flood risk to a large number of existing properties or where habitat creation is required by setting back the defences as part of a wider strategy
- Design the defences for ease of maintenance and replacement and allow for potential future raising if required
- Ensure that a legal agreement is in place for funding the upgrade and maintenance of the defences.

If it is not locally viable or sustainable to raise the defences (this case is mainly applicable for wide estuaries or the sea) the following criteria should be considered:

- Reclaim land from the sea as a form of defence only where cost effective, sustainable and beneficial to the local community (for example by also reducing flood risk to a large number of existing properties in an urban area)
- Ensure that the raised platform level of the reclaimed ground is sufficiently high to almost completely eliminate the risk from tidal/coastal flooding.

Locational Criteria for Surface Water Flood Risk: Where it is necessary to locate new development in flood zone 1 and 2 but at risk from surface water flooding, such development should be focused within areas where:

- It is possible to divert the surface water flood risk to open areas within the new development (car parks, wetlands, ponds) provided that the diverted flood risk hazard is acceptable,
- It is viable to reduce the risk to an acceptable level by adopting SUDS measures,
- Adequate drainage infrastructure is provided (with contribution from the developers) to reduce the existing risk to an acceptable level, while allowing for additional runoff from the new development. An effective Surface Water Management Plan[8] could ensure in particular that the cumulative effects of incremental development are not overlooked.

Locational Criteria for Groundwater Flood Risk: Groundwater flood risk is very difficult to mitigate and therefore the principle of avoidance is particularly important when undertaking the Sequential Test[9]. Where it is necessary to locate

[8] A Surface Water Management Plan will classify areas with different levels of flood risk caused by surface water runoff and will identify relevant flood risk management measures.
[9] Demonstrating that there is no reasonably available sites in areas with less risk of flooding that would be appropriate to the type of development proposed. See PPS 25 for more details.

new development in areas of groundwater flood risk such development should be focused within areas where:

- A permanent dry access route is provided (as groundwater flooding can last).
- The effect of development and permanent dry access do not adversely affect groundwater, which could result in increased flood risk elsewhere.
- The development and in particular its foundations are designed as flood resistant against long periods of groundwater flooding.
- The habitable ground floor levels are set above the highest groundwater level recorded.

6.3. SFRA Reports – Recommended Future Updates

SFRAs should include historic **surface water flooding** information including flood extents, likely frequency of flooding, the capacity of existing drainage infrastructure and the impact of climate change on surface water runoff. This information can be gathered from drainage engineers, land drainage specialists at planning authorities, flood resilient forums and by producing surface water flood maps.

It is recommended that SFRAs **along the coast** should be updated to produce undefended flood outlines for the years 2070 and 2115 by comparing the extreme sea level with the land level (as produced for example for the New Forest or Swale SFRAs). This will allow an assessment of the effect of climate change over the life time of developments (60 years for commercial development – up to year 2070, and 100 years for residential development – up to year 2115), when undertaking the Sequential and Exception Tests[10] of PPS25.

In terms of **critical infrastructure**, flood resilient forums are currently taking place around the country between key stakeholders (water companies, the Environment Agency, local planning authorities and the emergency services). They will provide information which will prove useful in the future in relation to identifying critical infrastructure and the associated flood risk, but as yet the data is not available to take into account in this RFRA.

The production of **joint SFRAs** has proved to be effective in terms of economy of scale and is appropriate at locations where, for example, river catchments cover more than one local authority area. It is recommended that this approach is considered more often in future SFRA reviews. The Environment Agency can advise on areas where such a joint approach can be recommended.

If joint SFRAs have not been undertaken, this should not be a constraint for undertaking a joint Sequential Test, developing common policies, developing multi-objective studies, etc as similar information should be available from the individual SFRAs. Good examples of local authority networking are CIRIA's LANDFORM project (http://www.ciria.org/landform/) and flood resilience forums. Multi-objective studies are strongly encouraged as they maximise benefits (including reducing flood risk) and can attract joint funding from a number of sources.

[10] If, following application of the Sequential Test, it is not possible (consistent with wider sustainability objectives) to demonstrate that there are no reasonably available sites, the Exception Test may apply. PPS25 sets out strict requirements for the application of the Test.