Test Valley Borough Council

Strategic Flood Risk Assessment for Local Development Framework

Final

September 2007

Halcrow Group Limited

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Test Valley Borough Council

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Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Signed
1	1	Draft	July 07	AS/BV
2	1	Final	Sept 07	AS/BV

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Figures

Glossary of Terms

Annual Monitoring Report (AMR) - Assesses the implementation of the Local Development Scheme and the extent to which policies in Local Development Documents are being successfully implemented.

Area action plans – Development Plan Documents that provide a planning framework for areas of change and areas of conservation.

Core Strategy - The Development Plan Document which sets the long-term spatial planning vision and objectives for the area. It contains a set of strategic policies that are required to deliver the vision including the broad approach to development.

Development plan - As set out in Section 38(6) of the Planning and Compulsory Purchase Act (2004), an authority's development plan consists of the relevant Regional Spatial Strategy (or the Spatial Development Strategy in London) and the Development Plan Documents contained within its Local Development Framework.

Development Plan Documents (DPDs) - Spatial planning documents within the Council's Local Development Framework which set out policies for development and the use of land. Together with the Regional Spatial Strategy they form the development plan for the area. They are subject to independent examination. They are required to include a core strategy and a site allocations document, and may include area action plans if required; other DPDs may also be included, e.g. development control policies.

DEFRA - Department of Environment, Food and Rural Affairs Development.

Emergency Planning – Planning for and response to emergencies such as flooding, including consideration of the resilience of emergency infrastructure that will need to operate during flooding.

Environment Agency - The leading public body for protecting and improving the environment in England and Wales. Flood management and defence are a statutory responsibility of the Environment Agency; it is consulted by local planning authorities on applications for development in flood risk areas, and also provides advice and support to those proposing developments and undertaking Flood Risk Assessments. The Environment Agency reports to DEFRA.

Environment Agency Flood Zones - Nationally consistent delineation of 'high' and 'medium' flood risk, published on a quarterly basis by the Environment Agency.

Flood Estimation Handbook - The latest hydrological approach for the estimate of flood flows in UK.

Flood Risk Vulnerability - PPS 25 provides a vulnerability classification to assess which uses of land may be appropriate in each flood risk zone.

Formal Flood Defence - A structure built and maintained specifically for flood defence purposes.

Habitable Room - A room used as living accommodation within a dwelling but excludes bathrooms, toilets, halls, landings or rooms that are only capable of being used for storage. All other rooms, such as kitchens, living rooms, bedrooms, utility rooms and studies are counted.

Informal Flood Defence - A structure that provides a flood defence function, but has not been built or maintained for this specific purpose (e.g. boundary wall).

JFlow - A computer river model based on routeing a flood calculated by Flood Estimation Handbook methodology along a river corridor the levels of which are derived from a Side Aperture Radar (SAR) remote sensed Digital Terrain Model.

LiDAR – 'Light Detection and Ranging' is an airborne terrain mapping technique which uses a laser to measure the distance between the aircraft and the ground. It therefore provides accurate topographical/contour mapping.

Local development documents – the collective term for Development Plan Documents and Supplementary Planning Documents.

Local Development Framework (LDF) - The name for the portfolio of Local Development Documents. It consists of the Local Development Scheme, a Statement of Community Involvement, Development Plan Documents, Supplementary Planning Documents, and the Annual Monitoring Report.

Local Development Scheme (LDS) - Sets out the programme for preparing Local Development Documents. All authorities must submit a Scheme to the Secretary of State for approval within six months of commencement of the 2004 Act (thus all authorities should now have submitted an LDS). LDSs are subject to review.

'Making Space for Water' (DEFRA 2004) - The Government's new evolving strategy to manage the risks from flooding and coastal erosion by employing an integrated portfolio of approaches, so as: a) to reduce the threat to people and their property; b) to deliver the greatest environmental, social and economic benefit, consistent with the Government's sustainable development principles, c) to secure efficient and reliable funding mechanisms that deliver the levels of investment required.

Planning Policy Statements - The Government has updated its planning advice contained within Planning Policy Guidance Notes (PPGs) with the publication of new style Planning Policy Statements (PPSs), which set out its policy for a range of topics.

Previously Developed (Brownfield) Land - Land which is or was occupied by a building (excluding those used for agriculture and forestry). It also includes land within the curtilage of the building, for example a house and its garden would be considered to be previously developed land. Land used for mineral working and not subject to restoration proposals can also be regarded as brownfield land.

Regional Spatial Strategy - Sets out the region's policies in relation to the development and use of land and forms part of the development plan for local planning authorities.

Residual Risk - The risk which remains after all risk avoidance, reduction and mitigation measures have been implemented.

Statement of Community Involvement (SCI) - Sets out the standards which authorities will achieve with regard to involving local communities in the preparation of local development documents and development control decisions. It is subject to independent examination.

Strategic Environmental Assessment (SEA) - A generic term used to describe environmental assessment as applied to policies, plans and programmes. The European 'SEA Directive' (2001/42/EC) requires a formal 'environmental assessment of certain plans and programmes, including those in the field of planning and land use'.

Supplementary Planning Documents (SPDs) - Provide supplementary information in respect of the policies in Development Plan Documents. They do not form part of the Development Plan and are not subject to independent statutory examination, but are normally subject to public consultation.

Sustainability Appraisal (SA) - Tool for appraising policies to ensure they reflect sustainable development objectives (i.e. social, environmental and economic factors) and required in the 2004 Act to be undertaken for all local development documents. It incorporates Strategic Environmental Assessment.

Sustainable Development – "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (The World Commission on Environment and Development, 1987).

The Exception Test - 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 in areas with less risk of flooding that would be appropriate to the type of development or land use proposed, the Exception Test may apply. PPS 25 sets out strict requirements for the application of the Test.

The Sequential Test - Informed by a Strategic Flood Risk Assessment, a planning authority applies the Sequential Test to demonstrate that there are no reasonably available sites in areas with less risk of flooding that would be appropriate to the type of development or land use proposed.

1 Executive Summary

In April 2007, Test Valley Borough Council commissioned Halcrow to produce a Strategic Flood Risk Assessment in accordance with Planning Policy Statement 25 (PPS 25) and the recently published document: Development and Flood Risk, a Practice Guide Companion to PPS 25 (February 2007). This Strategic Flood Risk Assessment will inform the plan-making process of the Local Development Framework. It will in particular inform the Core Strategy, the Development Control Policies and the Development Provision and Allocations documents.

This report provides an overview of the methodology, assumptions, uncertainties, tasks undertaken and the links to the wider sustainability appraisal process. It provides policy recommendations and guidance for the application of the Sequential Test, the preparation of flood risk assessments and the use of sustainable drainage systems, within the Borough Council's administrative boundary.

Since the Test and Itchen Catchment Flood Management Plan (CFMP) is not yet completed, it is recommended that policies and actions be based on similar Thames CFMP policies where these have been developed. The proposed main message and implementations for this SFRA and consequently the Local Development Framework are:

Main Message	**SFRA Implementation**
PPS25 provides the policy framework to make sure that flood risk is considered in new developments. There does not need to be a radical change in the way the risk is managed in these areas. The aims are to continue to maintain watercourses, increase flood awareness and provide appropriate flood warnings. Flood risk to essential infrastructure should be reduced to acceptable levels.	Ensures that the flood risk is managed appropriately in these areas by applying PPS25. The aims of PPS25 are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. There may be exceptional circumstances where new development is necessary. In such areas, policy aims to make it safe without increasing the risk elsewhere and, where possible, to reduce the overall flood risk. Structural works may be required to reduce flood hazard to within acceptable limits at Level 2 SFRA locations.

Further more detailed work may be required to determine more precise locations appropriate for development pending the undertaking of the Sequential Test. It is likely that flood hazard mapping (which identifies the level of risk to life and property) may be required, as a Level 2 SFRA, at all locations where the Exception Test will need to be undertaken.

Historically, flooding incidents have been scattered throughout the borough, along the paths of the watercourses. The highest frequencies of flooding predominantly occur in the north of the borough along the Charlton River and Pilhill Brook and their tributaries, and in the south of the borough around Romsey.

2 Background Information

2.1 *Terms of Reference*

In April 2007, Test Valley Borough Council commissioned Halcrow to produce a Strategic Flood Risk Assessment in accordance with Planning Policy Statement 25 (PPS 25). Advice on flood risk within the administrative boundary of the planning authority is required to support the preparation of their Local Development Framework, in accordance with government guidance and advice from the Environment Agency.

This report complies with the proposal dated 12 March 2007. The Environment Agency has fully reviewed this document and all issues have been addressed (see formal response from the Environment Agency in ***Appendix C***.)

2.2 *The Study Area*

Test Valley Borough (see ***Figure 1:*** *Study Area*) covers a major part of western Hampshire, with an area of approximately 628 km^2. The River Test, Hampshire's longest river, runs throughout most of its length. It rises at the village of Ashe, just north-east of Test Valley in the borough of Basingstoke and Deane, and flows through the Borough into Southampton Water. Test Valley is predominantly rural with the main towns being Andover in the north and Romsey in the south. It has a population of about 112,000.

2.3 *Constraints on development*

Over 9500ha of the Borough is covered by a local, national or international ecological or landscape designation. There are 26 Sites of Special Scientific Interest (SSSI), either wholly or partly within the Borough (about 3.4% of the Borough's area); 7 European designated wildlife sites (two Special Protection Areas and five Special Areas of Conservation); 3 designated Nature Reserves, and 36 designated Conservation Areas. The North Wessex Downs, an Area of Outstanding Natural Beauty (AONB) covers much of the Borough north of Andover. The Test River valley is itself an SSSI and subject to an Environmentally Sensitive Areas (ESA) scheme to maintain and enhance the landscape and protect archaeological and historical features. The Lower Test Nature Reserve and SSSI is part of a RAMSAR site and an EC Special Protection Area.

3 Planning Context

3.1 *Introduction*

This Strategic Flood Risk Assessment (SFRA) conforms with National and Regional Planning Policy. A SFRA is a living document which is used as a tool by a planning authority to assess flood risk for spatial planning, producing development briefs, setting constraints, informing sustainability appraisals, identifying locations of emergency planning measures and requirements for flood risk assessments.

The success of the Strategic Flood Risk Assessment is dependent upon the Planning Authority's ability to implement the recommendations put forward for future sustainable flood risk management in conjunction with the Environment Agency. It is their responsibility to establish policies to ensure future sustainability with respect to flood risk.

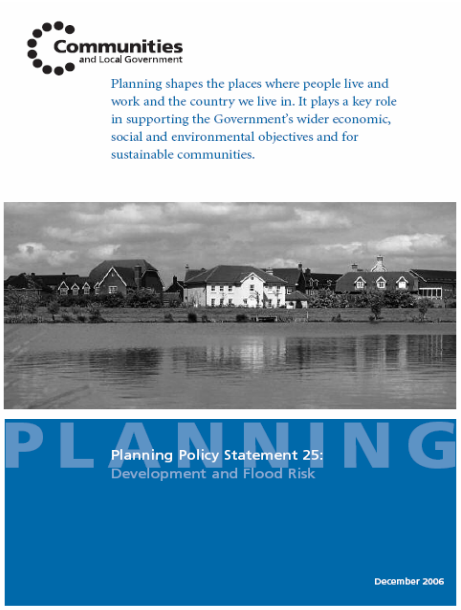
Emerging planning policies normally cover about 20 years in advance. Planning for flood management is a longer-term practice and SFRAs consider implications for spatial planning about 100 years ahead.

3.2 *The EU Water Framework Directive*

In relation to water, an integrated approach to the management of water is a key aim of the EU Water Framework Directive (Water Framework (England and Wales) Regulations 2003), which aims to integrate sustainable water planning and management. The Water Framework Directive applies to all surface and ground water bodies with significant effects for spatial and development management planning. A new system of river basin management plans (RBMP) will be statutory plans that set out the actions required to meet the water framework directive with the overall aim of achieving good water status. RBMPs are strategic plans, and will be subject to strategic environmental assessment and appropriate assessment under the Habitats Directive. All these processes are based on multi-criteria analysis to enable correlation between the objectives. RBMPs will need to take into account existing studies and reports such as this Level 1 SFRA and the CFMPs being prepared.

3.3 National Planning Policy

The Government has updated its planning advice contained within Planning Policy Guidance Notes (PPGs) with the publication of new style Planning Policy Statements (PPSs). As they are policy documents PPSs carry more weight than their predecessors.



PPS 3: Housing (December 2005) specifically mentions the need to have regard to strategic flood risk assessments when local authorities are producing development plan documents relating to housing.

In December 2006 the Government published PPS 25: Development and Flood Risk (a restatement of PPG 25). It reflected the general direction set out in 'Making Space for Water' (Defra, 2004), the evolving new strategy to shape flood and coastal erosion risk over the next 10-20 years (see Glossary of Terms).

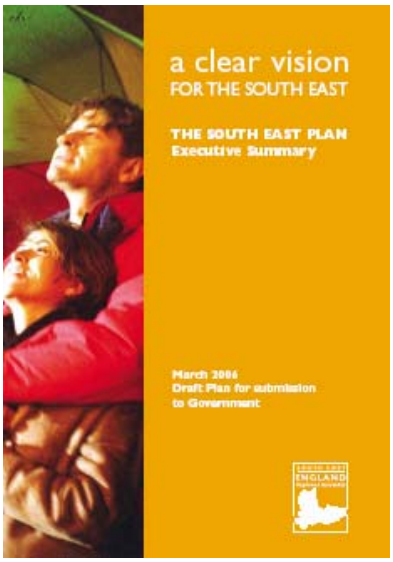
PPS 25 advises that regional planning bodies in preparing regional spatial strategies should include a broad consideration of flood risk from all sources and set out a strategy for managing it in accordance with policies and plans prepared under the Water Framework Directive. Local planning authorities should prepare local development documents in their LDFs that set out policies for the allocation of sites and the control of development to avoid flood risk to people and property where possible and manage it elsewhere. The guidance also advises that flood risk should be considered alongside other spatial planning issues such as transport, housing, economic growth, natural resources etc and that the findings of the SFRA should inform the sustainability appraisal of the LDF.

3.4 Regional Planning Policy

3.4.1 Regional Planning Guidance for the South East (RPG9)

Regional planning policies provide the overarching framework for the preparation of a Local Development Framework (LDF). Regional Planning Guidance for the South East (RPG9) covers the period up to 2016 and sets out the housing requirement for each county within the region.

3.4.2 The South East Plan



Under the Planning and Compulsory Purchase Act 2004, RPG9 is to be replaced by a new Regional Spatial Strategy, entitled the South East Plan. The South East Plan has been prepared by the South East England Regional Assembly (SEERA) and was submitted to the Government in March 2006. It sets out the vision for the region through to 2026. The examination into the South East Plan ran from November 2006 to March 2007, with the final plan anticipated in 2008.

The submitted South East Plan will set new requirements for housing and other developments in each district or borough. It is a requirement that the Core Strategy is in general conformity with regional planning policy.

Policy NRM3: Sustainable Flood Risk Management, indicates that the sequential approach to development in flood risk areas will be followed. In addition, the policy states that local authorities and developers, with advice from the Environment Agency, should undertake a Strategic Flood Risk Assessment. This should have regard for climate change.

3.5 Local Planning Policy

3.5.1 Local Development Framework

In accordance with the Planning and Compulsory Purchase Act 2004, Test Valley Borough Council is preparing the Local Development Framework (LDF). This consists of Development Plan Documents (including a Core Strategy and three Area Action Plans), Supplementary Planning Documents, a Statement of Community Involvement, the Local Development Scheme and Annual Monitoring Reports (see Glossary of Terms).

The documents in the LDF will gradually replace the current Test Valley Borough Local Plan 2006. The first stage of preparing the Core Strategy, the issues and options stage, set out Test Valley's strategic planning issues and possible options for tackling them for public consultation in November 2006. This will help to inform the next stages of the Core Strategy's development, which will act as a framework for all the other documents. Information on the Council's planning policies can be accessed on the website at: http://www.testvalley.gov.uk/default.aspx?page=162.

4 PPS 25 Flood Zones, Environment Agency Flood Zones and SFRA Flood Maps

4.1 Introduction

A good understanding of the PPS 25 Flood Zones, the Environment Agency Flood Zones and SFRA Flood Maps is of fundamental importance for SFRAs. Flood Maps are the key elements in a SFRA as they provide a visual understanding of flood risk at strategic level.

4.2 The PPS 25 Flood Zones

The PPS 25 Flood Zones subdivide the land, according to its spatial variation of flood probability, into 4 classifications; the low, medium and high probability flood zones and the functional floodplain - Zones 1, 2, 3a and 3b respectively (see ***Figure 2:*** *Schematic of the PPS 25 Flood Zones*). A Flood Zone can also be defined as the combination of a number of flood outlines (the maximum extents of floods) from events that fall within a range of probabilities. In the case of Zone 1, for example, it will be the combination of flood outlines that fall within events with 0.1% flood probability or less (very extreme events).

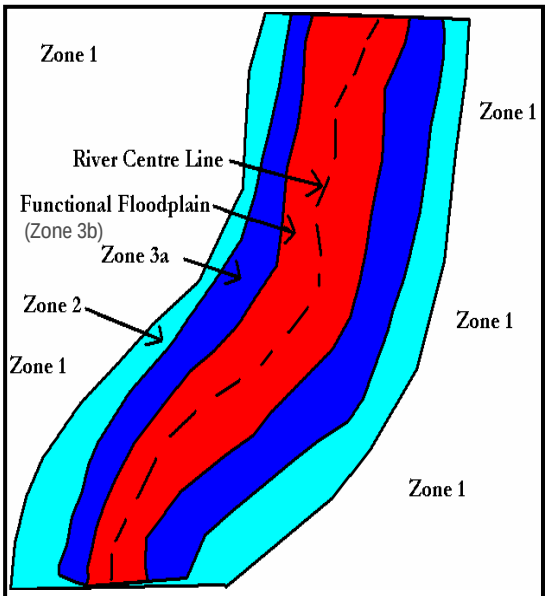


Figure 2: *Schematic of the PPS 25 Flood Zones*

PPS 25 defines the flood zones as follows:

Zone 1 - Low Probability

This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).

Zone 2 - Medium Probability
This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.

Zone 3a - High Probability
This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Zone 3b - The Functional Floodplain
This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the Local Planning Authority (LPA) and the Environment Agency, including water conveyance routes).

The range of probabilities covered by each flood zone is defined in PPS 25, in terms of annual average probability of flooding from rivers and the sea. The term 'average' means that, for example, a flood that has a 100% (or 1 in 1) probability of occurrence, will over a number of years have occurred once a year on average, although in any given year it may have occurred more than once or not flooded at all.

There are many methods that estimate the probability of occurrence of a flood, based on historical events, measurements of flows, modelling studies, etc. In the case of the functional floodplain, it may be possible for this to be drawn on a map by combining the flood extents of many frequent historical flood events (up to the 5% probability event). For more extreme flood events (lower probability events), however, it will be increasingly necessary to rely on modelling to determine the extents, as there are not many sufficiently accurate records available.

4.3 Environment Agency Flood Zones

Historically the Environment Agency and its predecessors have kept formal maps of tidal and fluvial flooding to the standards required by legislation. Originally this mapping simply recorded flood events, but in 2001, PPG 25 (the predecessor of PPS 25 – see ***Section 3.2***) imposed a duty on the Environment Agency to produce flood zone maps which showed the predicted extent of tidal and fluvial flooding for the high, medium and low flood zones. The Environment Agency flood zones are published on their website at http://www.environment-

agency.gov.uk/subjects/flood/?lang=_e, and are updated on a quarterly basis as improved modelling and recent events provide data for refining flood extents.

The only difference in the definition of the Environment Agency flood zones and the PPS 25 flood zones is that the former's high probability flood zone refers to Zone 3, with no distinction between Zones 3a and 3b (Zone 3a + Zone 3b = Zone 3). Distinguishing the functional floodplain, Zone 3b, is a recent PPS 25 requirement. Both definitions do not rely on the presence of defences (formal or informal, see Glossary of Terms) as these could fail during a flood as a result of poor maintenance. Both definitions refer primarily to flooding from rivers and the sea, although the Environment Agency flood zones sometimes include other sources of flooding which occur in the vicinity of a main river if these are extensive or significant (see ***Appendix A*** for further details about the Environment Agency flood zones). PPS 25 flood zones are not intended to include flooding from groundwater or other sources, although in practice they may be included, particularly if zones have been defined based on historical records where there may be a combination of sources or uncertainty about the cause of flooding.

4.4 SFRA Flood Maps

SFRA Flood Maps in general reproduce the Environment Agency high, medium and low probability flood zones where no other more up-to-date information is available. They also include assessments of the functional floodplain and the effect of climate change on the flood zones, where appropriate.

SFRA Flood Maps do not only show updated flood zones, they also show localised flooding areas (see ***Tiles A to H***) which relate to historical flooding at individual locations. Their main form of flooding can be other sources of flooding (see ***Section 6.3.5***) or mainly fluvial/groundwater or tidal combined with insufficient surface drainage, etc. The flood risk at localised flooding areas that fall in Zones 1 and 2 may in some cases be significant, with deep and frequent flooding. These areas could be considered as if they were high risk areas (equivalent to the fluvial/tidal Zone 3a) when applying the Sequential Test (see ***Chapter 9***).

5 PPS 25 and its Practice Guide Companion

5.1 *PPS 25 - Key Aims*

The key aims of PPS 25 are reproduced below:

'The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.

Regional planning bodies and local planning authorities (LPAs) should prepare and implement planning strategies that help to deliver sustainable development by:

Appraising risk

- identifying land at risk and the degree of risk of flooding from river, sea and other sources in their areas;
- preparing Regional Flood Risk Appraisals (RFRAs) or Strategic Flood Risk Assessments (SFRAs) as appropriate, as freestanding assessments that contribute to the Sustainability Appraisal of their plans;

Managing risk

- framing policies for the location of development which avoid flood risk to people and property where possible, and manage any residual risk, taking account of the impacts of climate change;
- only permitting development in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and benefits of the development outweigh the risks from flooding;

Reducing risk

- safeguarding land from development that is required for current and future flood management e.g. conveyance and storage of flood water, and flood defences;
- reducing flood risk to and from new development through location, layout and design, incorporating sustainable drainage systems (SUDS);
- using opportunities offered by new development to reduce the causes and impacts of flooding e.g. surface water management plans; making the most of the benefits of green infrastructure for flood storage, conveyance and SUDS; recreating functional floodplain; and setting back defences;

A partnership approach

- working effectively with the Environment Agency, other operating authorities and other stakeholders to ensure that best use is made of their expertise and information so that plans are effective and decisions on planning applications can be delivered expeditiously (this is currently being implemented by a series of pilot projects for DEFRA) and
- ensuring spatial planning supports flood risk management policies and plans, River Basin Management Plans and emergency planning.'

5.2 Outcomes of the SFRA Process

The broad planning objectives of PPS 25 described in ***Section 5.1***, effectively set the scope for the specific outcomes of the SFRA process. The SFRA, in turn, then informs forward planning and development control decisions that ensure the objectives set out above can be achieved.

It is important to reiterate that PPS 25 is not applied in isolation but as part of the planning process. The formulation of flood risk policy and the allocation of land for future development must also meet the requirements of other planning policy. Clearly, a careful balance must be sought in these instances, and the SFRA aims to assist in this process through the provision of a clear and robust evidence base upon which informed decisions can be made.

5.3 The Sequential Test of PPS 25

In seeking to allocate a specific type of development or land use, planning authorities should apply the Sequential Test to demonstrate that there are no reasonably available, appropriate sites in areas with less risk of flooding.

Preference should be given to locating new development in Flood Zone 1 (see ***Section 4.2***) because this zone has the lowest risk of flooding. If there is no reasonably available site in Flood Zone 1, the flood vulnerability (or level of resilience to damages from flooding) of the proposed development can be taken into account in locating development in Flood Zone 2 and then, if no appropriate sites are available, Flood Zone 3.

Within each Flood Zone new development should be directed to sites with lower flood risk (towards the adjacent zone of lower probability of flooding) from all sources as indicated by the SFRA.

5.4 The Exception Test of PPS 25

If, following application of the Sequential Test, it is not possible for the development to be located in zones of lower probability of flooding consistent with wider sustainability objectives, the Exception Test can be applied. This Test provides a method of managing flood risk while still allowing necessary development to occur.

The Exception Test is only appropriate for use when there are large areas in Flood Zones 2 and 3, where the Sequential Test alone cannot deliver acceptable sites, but where some continuing development is necessary for wider sustainable development reasons, taking into account the need to avoid social or economic blight and the need for essential civil infrastructure to remain operational during floods. It may also be appropriate to use it where restrictive national designations such as landscape, heritage and nature conservation designations, e.g. Areas of Outstanding Natural Beauty (AONBs), Sites of Special Scientific Interest (SSSIs) and World Heritage Sites (WHS), prevent the availability of unconstrained sites in lower risk areas.

For the Exception Test to be passed:

a) it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared. If the Development Plan Document has reached the 'submission' stage (see Figure 4 of PPS 12: Local Development Frameworks), the benefits of the development should contribute to the Core Strategy's Sustainability Appraisal;

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

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

It is possible that, even when applying the sequential and exception tests, a local planning authority cannot reasonably allocate in its Local Development Documents all the requirements for new development imposed by the Regional Spatial Strategy. However, such a conclusion should be based on firm evidence and be supported by the Environment Agency.

5.5 The Practice Guide Companion to PPS 25

A new practice guide companion to PPS 25 has been recently published in February 2007. It is a 'living draft' web-based consultation paper (see http://www.communities.gov.uk/index.asp?id=1504639). It is comprehensive and incorporates many recommendations from previous Guidance documents.

The guide reaffirms the adoption of a risk-based approach to flooding by following stepped hierarchical measures at all stages in the planning process. Avoidance/prevention is always the first measure, followed by substitution, control and finally mitigation. This is summarised in Table 1.2 of the Practice Guide Companion to PPS 25, which is reproduced in the Table below).

Table 1.2 Overview of the flood risk management hierarchy

Flood Risk Management Measure	Description	Example tools and measures	Key responsible parties
Avoidance/ Prevention	Allocate developments to areas of least flood risk and apportion development types vulnerable to the impact of flooding to areas of least risk	Regional Flood Risk Appraisals (RFRAs), Strategic Flood Risk Assessments (SFRAs), Flood Risk Assessments (FRAs) and application of the sequential approach	Planning bodies
Substitution	Substitute less vulnerable development types for those incompatible with the degree of flood risk		Planning bodies and developers
Control	Implement measures to reduce flood frequency to existing developments Appropriate design of new developments	River Basin Management Plans (RBMPs), Catchment Flood Management Plans (CFMPs), Shoreline Management Plans (SMPs), Flood Risk Management Strategies, appraisal, design and implementation of flood defences	Environment Agency and other flood and coastal defence operating authorities, developers and sewerage undertakers
Mitigation	Implement measures to mitigate residual risks	Flood risk assessments. Incorporating flood resistance and resilience measures. Emergency Planning Documents. Implementation of flood warning and evacuation procedures	Planning bodies, developers, the Environment Agency, other flood and coastal defence operating authorities and sewerage undertakers

The Sequential Test of PPS 25 is the most important flood risk management tool for spatial planning, as it implements the high level measures of avoidance/prevention and substitution (see ***Section 5.3***).

5.6 *SFRA Levels 1 and 2*

A Level 1 SFRA is defined in the Practice Guide Companion to PPS 25, as the level that provides the necessary information for undertaking the Sequential Test.

Where the need to apply the Exception Test is identified, due to there being an insufficient number of suitably available sites for development within zones of lower flood risk, the scope of the SFRA is widened to a more detailed Level 2 study. A Level 2 is also likely to be of value in informing the LPA in dealing with windfall planning applications, that is, those on land not allocated in the development plan. This information, however, will not necessarily negate the need for a site specific flood risk assessment, the responsibility for which would fall upon the potential developer.

The scope of this report is a Level 1 SFRA to inform the plan-making process of the Core Strategy and other development plan documents as required (see ***Section 3.4***). This information will be used by the planning authority to undertake sequential testing in identifying general locations for development and to formulate strategic policies, and may assist in informing the Borough Council's emergency plan. The study covers the area within the administrative boundary of Test Valley Borough Council.

6 Study Methodology

6.1 *Specific Project Outputs*

The specific outputs are based on the required outputs for a Level 1 SFRA, as follows:

i. Map existing Flood Zones 1, 2 and 3 across the plan area (see ***Section 6.4.1, Tables 2 and 3*** and ***Tiles A to H***).

ii. Map Flood Zones 1, 2 and 3 for the future climate change scenarios of 2070 and 2115 as set out in PPS 25 Annex B, taking account of recommended national precautionary sensitivity ranges for peak rainfall intensities, peak river flows and wave heights (see ***Section 6.4.2***).

iii. Identify areas at risk of flooding from sources other than rivers and the sea (see ***Sections 6.3, 6.4.1***, ***Chapter 7, Tables 2 and 3***, and ***Tiles A to H***).

iv. Identify and take into account flood risk management measures including flood defences and emergency warning systems (see ***Chapter 8***).

v. Guidance on the Application of the Sequential Test (see ***Chapter 9***).

vi. Guidance for the preparation of Flood Risk Assessments (see ***Chapter 10***).

vii. Guidance on possible mitigation measures, including the likely applicability of different sustainable drainage systems (SUDS) techniques for managing surface water runoff at key Level 1 SFRA development sites (see ***Chapter 11***).

viii. Identify locations where development would significantly increase the risk of flooding elsewhere (see ***Section 11.4***).

6.2 *Approach to Data Gathering*

The main source of data for this study has been the Environment Agency, previous Halcrow projects, a number of relevant websites, the Local Planning Authorities, Hampshire County Council and Southern Water (see Audit Trail Database in ***Appendix B***).

Priority has been given to the collection of geo-referenced information in electronic format, to ensure the effective management of the data within a GIS environment. All incoming data has been recorded on a project data register by a specialist document controller/GIS data manager, specifically designated for this project.

The quality review of the information has been carried out by an experienced core team. The team has been able to review the collected data, assess its significance and quality, and advise on which part of the collected data needed to be used for the SFRA.

The main approach has been to build on the large number of strategic studies and relevant available data. Although the Test and Itchen Catchment Flood Management Plan (CFMP) is not yet complete, the Scoping stage is completed and this has provided a good foundation for catchment understanding and flood risk assessment.

Valuable flood risk information for localised flooding areas (as opposed to the 'non-localised' flood zones) was obtained from the drainage specialists working for Test Valley Borough Council and Hampshire County Council. The collected information complemented information provided by the Environment Agency, Southern Water and the local planning authority.

6.3 Forms of Flooding and Data Limitations

6.3.1 Introduction

For the purpose of this assessment, forms of flooding (also defined as sources of flooding) are divided into four categories:

a) river floods;

b) flooding from impounded water bodies such as canals and reservoirs;

c) groundwater flooding;

d) flooding from other sources.

The reason for adopting this classification is to provide an understanding of data limitations and assumptions as there are different standards for the collection of each of these types of data.

The various sources of flooding within the study area are described and shown in ***Tables 2 and 3*** and ***Tiles A to H***.

6.3.2 *Tidal and Fluvial Flooding*

Fluvial flooding (flood zones) is described in Sections ***4.2 and 4.3***, with further details, including assumptions and limitations, in ***Appendix A***. As the Test Valley Borough is inland, it does not experience tidal flooding.

6.3.3 *Records of Flooding from Impounded Water Bodies*

Records of flooding from reservoirs and canals are erratic as there is no requirement for the Environment Agency to provide information on historic flooding from canals and raised reservoirs on plans. In particular, PPS 25 does not require flood risk from canals and raised reservoirs to be shown on the Environment Agency Flood Zones.

Overtopping from canals is common due to flows from land drainage and their frequent lack of controlled overflow facilities. Occasionally, major bank breaches also occur, leading to rapid and deep flooding of adjacent land. Reservoirs with an impounded volume in excess of 25,000 cubic metres (measured above natural ground level) are governed by the Reservoirs Act and are listed on a register held by the Environment Agency. Due to high standards of inspection and maintenance required by legislation, flood risk from registered reservoirs is normally moderately low.

Flooding from canals is not an issue in Test Valley as there are no canals present in this Borough. However the Borough does contain impounded water bodies (see ***Section 7***).

6.3.4 *Records of Groundwater Flooding*

Both the Environment Agency and the planning authority keep records of individual groundwater flooding events.

In some cases groundwater flooding is incorporated within the flood zones, at locations where its effect is not localised. This occurs at many locations within Hampshire, including Test Valley Borough (see further details in ***Appendix A***).

6.3.5 *Records of Flooding from Other Sources*

Until 2006 methodologies for recording flooding from sources other than tidal and fluvial were not standardised, so records held of such flooding are neither complete nor to a uniform standard. As part of DEFRA's Making Space for Water study, a report was published by the Environment Agency titled "Flooding from

other sources". The report recommended a classification for such flooding and methods for recording other sources of flooding. The classification approach has been adopted for this study.

Sources of information on flooding from other sources can be obtained from local government, highway authorities, the Environment Agency, sewerage undertakers, businesses, individuals and archives such as libraries.

The recording of flood instances by the authorities has often led to improvements intended to prevent recurrence, and hence historical flooding is not necessarily evidence of propensity for future flooding.

Currently few records of flooding from other sources contain sufficient detail to enable them to be classified in accordance with the Environment Agency classification of "flooding from other sources" and, indeed, many flood incidents had more than one cause.

The sources of flooding from the Environment Agency (Source report, JBA 2006) have been merged and are reproduced below.

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Type	Flooding Phenomenon	Sources	Pathways	Receptors	Hazard
1	Direct runoff	Intense rainfall	All surfaces including road network	People, vehicles, properties, commercial, environment	Deep fast water, with high rate of inundation Deep water / debris / cellar flooding Fast water – erosion
2	Sewerage and drainage system flooding from pipe capacity exceedance	Heavy rainfall over a long duration or intense rainfall	Surcharging from manholes and openings in the drainage system. Surcharging	People, vehicles, properties, commercial, environment.	Cellar and ground floor flooding with water quality issues
3	Sewerage and drainage system flooding from 'other causes' (blockage and collapse)	Long duration or intense rainfall	Manholes and overflows in drainage and sewerage network	People, vehicles, properties, commercial, environment	Deep ponded water. Cellar and ground floor flooding with water quality issues
4	Restricted outlets from drainage systems due to high flood levels in the receiving watercourse	Heavy rainfall over long duration	All surfaces and drainage network	People, vehicles, properties, commercial	Deep ponded water, and water diverted along unexpected routes.
5	Surcharge from small (ordinary) and 'lost' watercourses	Heavy or intense rainfall	All surfaces and drainage network	People, vehicles, properties, commercial	Deep ponded water
6	Floodplain flooding from ordinary watercourses not covered by the flood map (catchment area>3km^2)	Heavy rainfall	Ordinary watercourse embankments and floodplains	People, vehicles, properties, commercial	Deep ponded water and fast flowing floodplain flows.
7	Intense rainfall leading to overland flow including mud/debris flow and flow along old drainage lines, roads and railways.	Intense rainfall or long duration heavy rainfall	Land, field drainage, river and watercourse network	People, vehicles, properties, commercial, environment	Fast water erosion of soil for high grade agricultural land. Rapid rates of inundation affect road users. Runoff from land on urban fringe to flood properties
8	Heavy, long duration rainfall leading to ponding on for example roads or fields	Long duration heavy rainfall	Rural surfaces and field drainage	People, vehicles, properties, commercial, environment	Deep water, runoff from fields onto rural roads can cause serious hazard to drivers
9	Changes to drainage or land management. Reduction in agricultural pumping / land use management / drainage leading to increased risk of flooding	Loss of pumping / irrigation	Field drains, drift geology, watercourses and land surface	People, properties, environment	Reduction in capacity of land to drain water away – leading to ponding and or more surface runoff and erosion. Await findings of FD2120 (DEFRA document).

Table 1: *Other Sources of Flooding*

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6.4 Production of Flood Maps

6.4.1 Introduction

For a Level 1 SFRA and in accordance with the Practice Guide Companion to PPS 25, the current and climate change flood maps assume that the defences are not in place. This is a reasonable pre-cautionary option for the application of the Sequential Test, as it gives priority to development areas that do not require the presence and maintenance of defences.

6.4.2 Current Flood Maps (without climate change allowance)

The July 2007 Environment Agency Flood Zones have been used for the production of the SFRA Flood Maps (see ***Tiles A to H***). The draft maps included a combination of Environment Agency Flood Zones and Flood Maps originating from the CFMP scoping study. The Environment Agency has now reviewed these and has agreed to the recommendation that the Environment Agency Flood Zones should be used in preference. This is a precautionary approach as CFMP outlines are based on coarse assessments.

Further updates are likely to occur, for example following the Level 2 SFRA that is to be carried out within the Partnership for Urban South Hampshire area, which includes the southern end of Test Valley. Once the Environment Agency approves these studies, both the SFRA Flood Maps and the Environment Agency Flood Zones can be updated. SFRAs are living documents and, in order to ensure consistency, at least the digital flood maps should be updated in conjunction with Environment Agency Flood Zone updates.

The scale of the Flood Maps is 1:25 000 to give a strategic overview and reasonable clarity of general features.

As discussed in ***Section 4.2***, the functional floodplain covers flooding that occurs frequently, so it may in some cases be possible to estimate its extent based upon historical data. However, there is insufficient data to determine this for the whole Test Valley district, and as this method is complex and time-consuming it is not generally appropriate for a Level 1 SFRA.

In the absence of sufficient historical data or modelling work, a precautionary principle was adopted where it was assumed that Zone 3b covers all of Zone 3. In this case Zone 3a is represented in the flood maps merely as an outline since it is subsumed completely by the functional floodplain (Zone 3a + Zone 3b = Zone 3). In relation to development planning (see ***Chapter 9***) Zone 3b only permits water compatible and essential infrastructure land uses so in the event that the Sequential Test leads to a more vulnerable development being considered for a Zone 3 area, an Exception Test should be applied with a more detailed, Level 2 assessment to distinguish between Zones 3a and 3b.

Flooding incident records are maintained by Test Valley Borough Council (see ***Tiles A* to *H***) and these provide valuable information on previous incidents. Following occurrence of localised flooding, the authorities may have taken steps to mitigate flooding, and thus historical events are not necessarily indicative of future flooding.

As mentioned in ***Section 6.2***, valuable information for main localised flooding areas (see ***Tiles A* to H**) was obtained from the drainage specialists working for Test Valley Borough Council and Hampshire County Council. These are based on the main flood incident records where the risk is still present. Their main form of flooding can be other sources of flooding (see ***Section 6.3.5***) or mainly fluvial/groundwater or tidal combined with insufficient surface drainage, etc. The Flood Maps also provide information from Southern Water (indicated as separate points).

The Environment Agency also maintains flood incident records but these mainly relate to groundwater incidents and those that occur in the vicinity of main rivers. These have not been included in the map tiles to minimise duplication. The Environment Agency should, however, be consulted in relation to the flood incident records during the application of the Sequential Test, as explained in ***Section 9.2***.

6.4.3 *Effects of Climate Change*

In October 2006, DEFRA published a document identifying the climate change impacts to be considered in undertaking flood risk appraisals in the United Kingdom. In addition to sea level rise of approximately 1m in south east England over the next 100 years, the document also sets out how short duration rainfall could increase by 30% and flows by 20%, and suggests winters will become generally wetter. These effects will tend to increase both the size of flood zones associated with the sea and rivers, and the amount of flooding experienced from "other sources".

During the life span of new commercial and residential developments, it is expected that peak river flows will first increase for a short period by 10% (2007-2025) and for the remaining period by 20%. The PPS 25 table below indicates that an increase of 20% in peak river flow is estimated between years 2025 and 2115.

Parameter	**1990 to 2025**	**2025 to 2055**	**2055 to 2085**	**2085 to 2115**
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%		
Offshore wind speed	+5%		+10%	
Extreme wave height	+5%		+10%	

As recommended by the Environment Agency, it has been assumed that commercial and residential developments planned in the LDFs will reach the end of their life in 2070 and 2115 respectively.

6.5 Climate Change Flood Maps

Based on an estimated increase of 20% in peak river flow (which is expected to occur during the life of the new commercial and residential developments, see ***Section 6.4.3***) the following precautionary rules/assumptions have been adopted for this Level 1 SFRA:

C1) 'Climate Change' functional floodplain = Current Flood Zone 3 which can also be written as 'Climate Change' Zone 3b = Current Flood Zones 3a + 3b

C2) 'Climate Change' Flood Zone 3a = Current Flood Zone 2

Many previous flood mapping studies by Halcrow confirmed that increases in flows by 20% to Flood Zone 3, result in flood extents which are in general smaller than Flood Zone 2.

C3) 'Climate Change' Flood Zone 2 is slightly larger than Current Flood Zone 2 (as there is little certainty about the effect that climate change will have on very extreme fluvial events). It is reasonable to assume that these two Zones 2 (with and without climate change) are the same on the large scale SFRA flood maps.

The current flood maps (***Tiles A to H***: *Flood Maps*) can therefore be used to take account of climate change predictions along the fluvial reaches by applying rules C1, C2 and C3.

7 Flood Risk in the Study Area

7.1 *Introduction*

All forms of historical flooding have been considered, both in isolation and when occurring at the same time. For references to locations within the study area see the set of maps, ***Tiles A to H**: Flood Maps*.

7.2 *Geology and Hydrology*

7.2.1 *Geology and Topography*

Hampshire geology comprises a major syncline, or downward curving fold, in the Southern England Chalk Formation. The centre of the syncline is to the south of the Borough, with the result that the oldest surface rock type, which is the Cretaceous chalk, covers the entire north and centre of the Borough, and the youngest rocks, which are Eocene era clays and gravels, appear in the southern part.

The general fall of the land is north to south, with high ground at the edge of Salisbury Plain present along the western boundary.

7.2.2 *Hydrology*

All the principal rivers are shown and named on ***Tiles A to H***.

The main river system serving the Borough is the River Test, which is a mainly chalk fed watercourse.

All but two kilometres of the Hampshire Avon river channel and about 20 square kilometres of its catchment lie outside the Borough.

The Test, its tributaries (the Dun, Wallop Brook, Anton and Pilhill Brook, the Bourne Rivulet and the Dever), and their catchments, are mainly located within the Borough. Particular exceptions are 10 kilometres of the Upper Test (from its source near Overton to Longparish), 10 kilometres of the Dever (from Micheldever to Bullington) and 10 kilometres of the Bourne Rivulet (from Husrtbourne Tarrant to its confluence with the Upper Test).

Two smaller rivers drain the south east of the Borough near the borders with Southampton and Eastleigh, these being Tanner's Brook (which technically is a

tributary of the Test, as it discharges to its estuary, Southampton Water), and Monk's Brook, which is a tributary of the Itchen.

In the chalk areas, permanent watercourses are absent in all except the deepest valleys. Chalk is a major aquifer capable of absorbing large amounts of rainfall and releasing it slowly over a long period. This buffering effect together with the mainly rural nature of the chalk area means that the Hampshire Avon, and the upper and middle parts of the Test and associated tributaries, which are mainly spring fed by the chalk aquifers, have relatively narrow ranges of flows in a normal year and generally do not flood in response to short to medium duration heavy rainfall.

After prolonged rainfall the water table in the chalk aquifer can rise to the ground surface causing springs to erupt in the valley floors and the creation of ephemeral watercourses, and indeed the upper reaches of many of the Test's tributaries have this characteristic. These effects can lead to "groundwater flooding" lasting for several months in very wet winters. Public supply and agricultural water abstraction from the chalk tends to increase the chalk's buffering effect, thereby suppressing the frequency at which ephemeral watercourses and springs occur. However, when the water table is sufficiently high for the aquifer to flow freely into the valleys, the runoff from the chalk can be similar to that from a generally impermeable catchment. Snow melt and rainfall on a frozen Upper Chalk catchment also can lead to rapid surface water runoff to the river system and widespread valley flooding.

Rainfall on the Eocene geology in the southern part of the Borough together with the much denser development in that area produces relatively rapid runoff, and gives the potential for flash flooding. Tadburn Lake catchment, to the east of Romsey, and the area to the west of Chandler's Ford, are afflicted by these conditions.

7.3 Historical Flooding

7.3.1 Introduction

This Section is to be read in conjunction with ***Tiles A to H**: Flood Maps* and ***Tables 2 and 3***.

7.3.2 Notable Flood Events

Flood records supplied by the Environment Agency from 1937 to 2000 together with it's Test and Itchen Flood Management Scoping Report 2006 suggest that a

number of relatively widespread flooding events have occurred within the study area. These events are outlined below:

Romsey, Middle and Lower Test – 1852, 1876, 1877, 1981, 1894, 1903, 1913, 1928, 1929, October 1960, November 1974, November 1976, February 1990, 24 December 1990, April 1993, winter of 1995, 24 December 1999, April 1993, winter of 2000-2001;

Andover, Anton, Pilhill Brook, Bourne Rivulet – 1852, winter of 1913-1914, winter of 1927-1928, 1935, 1937, August 1938, March 1947 (snow melt on frozen ground), 1951, November 1974, April 1993, winter of 1995, July 1999, winter of 2000-2001, winter of 2002-2003.

7.3.3 *Flooding shown on Environment Agency's Formal Flood Map*

Flood Zones shown on the Environment Agency's formal flood map are reproduced on ***Tiles A to H**: Flood Maps*. It should be noted that the tidal flood limit of the Test extends just north of the M27 motorway. Estuarial Flood Zone 3 represents the 1:200 year event, and on non tidal parts of rivers, Flood Zone 3 represents the 1:100 year event. Flood Zone 2 represents the 1:1000 year event.

Traditionally the Hampshire and Isle of Wight Area of the Environment Agency, which covers all the Borough except the South West area around Shipton Bellinger, which is part of the River Avon catchment, has shown both fluvial and groundwater flooding on its Flood Map without differentiating between these sources. For chalk areas this is a very practical approach, as in many places it is very difficult to differentiate between water from springs and a flooded river itself, or to decide exactly how much flow is required before spring water is designated as an ephemeral river. As a result, this section covers groundwater flooding as well as river flooding.

Within the study area, most Flood Zones are based on JFlow modelling (described in Appendix A), modified by records of flooding made from contemporary site observations and photographs, including aerial photographs. Considerable effort was made to record the widespread groundwater flooding that occurred in the winter of 2000-2001, and again in 2002-2003.

Halcrow produced a number of groundwater flooding reports for the following places within the study area covering the 2000-2001 flooding:

Appleshaw, Braishfield, Broughton, Hatherden, Chilbolton, Hurstbourne Tarrant, Kimpton, King's Sombourne, Little Sombourne, Monxton, Nether Wallop, Pitton, Romsey, Sherfield English, Stockbridge, Vernham Dean and Upton, West Tytherley, West Wellow, Weyhill Bottom.

Most flood outlines produced by Halcrow Group as part of its studies were transferred to the formal flood map.

The Environment Agency produced reports on flooding in 2002-2003 for the following places:

Amport, Appleshaw and Redmenham, Fullerton, Fyfield, Goodworth Clatford, Hatherden, Hurstbourne Tarrant, Kimpton, King's Sombourne, Little Sombourne, Nether Wallop, Penton Grafton, Pitton, Romsey, Vernham Dean and Upton, West Tytherley.

These reports should be referred to when considering allocating development to the places mentioned.

Detailed computer simulation of flooding using the ISIS modelling program has been undertaken for the Rivers Anton and Pillhill Brook, and the formal flood maps were changed to reflect the flood outlines yielded. This modelling did not extend up the Charlton River. These are the only rivers in the study area for which Flood Zone mapping is based on detailed modelling, although similar work is in progress for the Tanner's Brook, Monk's Brook and Tadburn Lake (east of Romsey), and future flood maps will reflect it.

Although detailed computer modelling for the Lower Test at Romsey (ISIS model) and the tidal Test at Totton (Tuflow model) has been undertaken, the results have not been transferred to the formal flood map.

It is recognised that as a result of modifying the formal flood map to show the ISIS flood model for the Anton and Pilhill Brook, there are areas close to the river where shallow flooding is experienced from spring activity that now lies outside the Flood Zones. Caution should be exercised, therefore, in interpreting the Flood Zone map for relevant reaches of these rivers.

Generally individual reports of flooding have not caused the flood map to be changed, so there are many small flood incidents, particularly from springs, located outside of Flood Zones 2 and 3.

Within the SFRA area there are a large number of flood records within Flood Zone 3 directly related to flooding from river water. The most significant historical flood events in terms of severity and damage are described in ***Table 3**: Localised Flooding Areas*. Locations of these areas are shown by a corresponding reference number on the map tiles. Typically a large number of flood reports, recorded in the Environment Agency flood database, occurred within each flood event area, and it is mainly these records that inform about the circumstances of the flooding.

7.3.4 *Fluvial Flood Events within Tile A*

Localised flooding areas reference TV027 (Redenham), TV028 & 29 (overlapping at Appleshaw), TV030 (Weyhill), TV031, 032 and 033 ("the Pentons", the former also shown on Tile C), TV034 (Hatherden), and TV037 (Vernham Dean) all occur within ephemeral tributaries of the Charlton River, which itself is a tributary of the Anton. The situation is similar at flood locations TV024 and 025 (Kimpton), which cross onto Tile C, and at TV036 (Upton) which crosses onto Tile B. The flooding was particularly severe in the winter of 2000-2001, when exceptionally high rainfall caused very high groundwater levels. The area was also particularly affected in the winter of 2002-2003.

Environment Agency records show that in all these places isolated flooding has been recorded outside Flood Zones 2 and 3, though in most cases within the Localised Flooding Areas. Exceptions are at Redenham and Penton Mewsey where flooding is recorded outside these high risk areas.

Proposed highway culvert improvements by Hampshire County Council could reduce flooding in parts of Penton Mewsey.

7.3.5 *Fluvial Flood Events within Tile B*

Localised flooding areas reference TV036 is dealt with under the heading for Tile B. TV035 at Hurstbourne Tarrant floods from groundwater springs close to the Bourne Rivulet.

At TV022 (East Anton), in 2000-2001, Finkley Road turned into a small river, the water from which ponded at the point where the ancient watercourse is culverted beneath the playing fields. TV022 is also shown on Tile D.

7.3.6 *Fluvial Flood Events within Tile C*

TV015 (Nether Wallop), TV018 (Stockbridge, also shown on Tile D), TV019 (Goodworth Clatford), TV023 (Fyfield) and TV041 (Thruxton) mainly related to groundwater flooding, but most have fluvial influence. TV036 (Shipton Bellinger) was flooded from the Hampshire Avon.

7.3.7 *Fluvial Flood Events within Tile D*

TV018 (Stockbridge) is dealt with in the description of Tile C, and TV022 is dealt with in the description of Tile B. TV020 and TV021 (both Andover), are associated with combined fluvial and groundwater flooding.

7.3.8 *Fluvial Flood Events within Tile E*

TV008, TV009, TV010, TV038 and TV040 (all located near Romsey) are attributable to fluvial causes. TV013 (West Tytherley) and TV014 (Broughton) are attributable to groundwater.

7.3.9 *Fluvial Flood Events within Tile F*

Flooding at TV007 (East of Romsey) is attributable to high runoff to the Tadburn Lake watercourse. TV016 and TV017 (King's and Upper Somborne respectively) are mainly attributable to groundwater.

TV005 and TV006 (west of Chandlers Ford) are attributable to high river levels in the Monk's Brook river system.

7.3.10 *Fluvial Flood Events within Tile G*

There are no fluvial or groundwater related localised flooding areas on this tile.

7.3.11 *Fluvial and Tidal Flood Events within Tile H*

TV003 and TV004 (North Baddesley) are noted as attributable to lack of capacity in land drainage, but in practice are closely related to flood levels in the upper reach of Tanner's Brook.

7.3.12 *Flooding from Impounded Water Bodies*

No records of flooding from impounded bodies have been discovered.

There are three Reservoir Act registered impoundments near Romsey, comprising two at Kentford Lakes and one at Timsbury. It is unlikely that these impoundments present significant flood risk.

7.3.13 *Flooding from Other Sources*

Although extensive records of flooding from other sources have been obtained as part of the research for this report, these records (summarised in ***Tables 2 and 3***) should not be considered a complete record of such flooding.

7.3.14 *Flooding from Other Sources – Tile A*

Southern Water records show flooding at Appleshaw and Ragged Appleshaw in January and April 2003 respectively, attributable at least in part to lack of capacity in the foul/combined sewerage system.

7.3.15 *Flooding from Other Sources – Tile B, C & D*

These three tiles are grouped together because Andover is divided between the three tiles.

Southern Water records identify seven flood locations in and around Andover (including Anna Valley, Kimpton, Goodworth Clatford, Monxton and Enham Alamein) relating to overloading of foul or combined sewerage in the period 1999 to 2003. None of the flooding affected the interior of buildings. There is no clear relationship to the local groundwater flooding events of 2000-2001 and 2002-2003, but high ground water levels do tend to exacerbate sewerage capacity problems.

Sewerage influenced flooding occurred at Salisbury Road, Shipton Bellinger, in January 2003 at a time when the river level was particularly high.

7.3.16 *Flooding from Other Sources – Tile E, F & H*

These tiles are dealt with together due to the tile overlaps occurring at Romsey and North Baddesley, where a large number of flood incidents arising from "other causes" are recorded.

Southern Water has advised of 19 locations at Romsey, three locations at North Baddesley, two locations west of Chandler's Ford, and one location west of Nursling where hydraulic problems with its sewerage has contributed to flooding since 1998. In all but one case flooding involved sewage, and at two locations in North Baddesley internal sewage flooding of buildings occurred.

TV011 (Lockerley, on Tile F) is attributable to blocked land drainage.

TV002 (West of Nursling on Tile H) is attributed to poor surface water drainage.

TV012 (Braishfield on Tile F) is the result of inadequate lack of road drainage to carry away surface water.

7.3.17 *Flooding from Other Sources – Tile G*

TV001 (West Wellow) was caused by land drainage defects.

7.4 Areas Where Development May Increase Flood Risk Elsewhere

The study of flood risk in this Chapter leads to the following conclusion: careful investigation of local flood risk (with a detailed investigation of flood incident records, management and maintenance issues) is required at most locations in the SFRA area before development is allocated.

It is not sufficient to assume that siting development away from Flood Zones 2 and 3 and localised flooding areas and the use of sustainable drainage systems (SUDS) techniques will automatically render flood risk to third parties adequately low irrespective of location (see ***Section 11.4***). A situation may arise in which there is no spare capacity at an outfall (for example a surface water drainage system a few kilometres from the proposed allocation). The approach could be to produce a specific policy in which development will not take place until the surface water drainage system is upgraded (unless an alternative outfall is identified and subject to approval by the planning authority and the Environment Agency).

A general policy for localised flooding issues could be as follows: 'No development will be allowed unless it is demonstrated that: a) dry access and egress is provided (see ***Section 10.4***), b) the receiving watercourse has sufficient capacity and c) flood risk will not be increased in nearby localised flooding areas and/or flood incident locations.

8 CFMP, Flood Management Measures and Flood Warning Systems

8.1 Introduction

SFRA reports are 'living documents' which should be updated when Environment Agency flood zones and other relevant documents (for example CFMPs, Strategies, Flood Warning Systems) are updated. It ensures a consistent and integrated approach to flood risk management.

8.2 CFMPs

As mentioned in ***Section 6.2***, only the scoping stage of the Test & Itchen CFMP has been completed. It has been considered reasonable in the meantime to complement its policy objectives with Thames CFMP policies that apply to similar catchments to the study area. It is possible to base the proposed policies on those related to Thames CFMP catchments with 'Narrow flood plains and mixed land use' (see Thames CFMP Summary document at http://www.environment-agency.gov.uk/yourenv/consultations/1695546/1696092/). The flood plain is defined as Zone 3 without taking account of the effect of defences, whereas the functional floodplain is Zone 3b only. The proposed main policy and implementation within the flood plain are:

Main Message	CFMP/SFRA Implementation
PPS25 provides the policy framework to make sure that flood risk is considered in new developments. There does not need to be a radical change in the way the risk is managed in these areas. The aims are to continue to maintain watercourses, increase flood awareness and provide appropriate flood warnings. Flood risk to essential infrastructure should be reduced to acceptable levels.	Ensures that the flood risk is managed appropriately in these areas by applying PPS25. The aims of PPS25 are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. There may be exceptional circumstances where new development is necessary. In such areas, policy aims to make it safe without increasing the risk elsewhere and, where possible, to reduce the overall flood risk. Structural works may be required to reduce flood hazard to within acceptable limits at Level 2 SFRA locations.

The major source of flooding for 'Narrow flood plains and mixed land use' is fluvial flooding, but it is often a combination of this and high groundwater levels. Many of the tributaries are heavily dependent on groundwater to maintain flows throughout the year. Because groundwater tends to react slowly to changes in rainfall, groundwater flooding can last for long periods of time.

It is important to note that CFMP policies consider a 100 year horizon and SFRAs should consider how to implement these in the short, medium and long term.

8.3 Flood Warning Systems and Future Flood Risk Management Schemes

The Environment Agency operates an effective flood warning service within the study area in respect to main river flooding and tidal flooding from the sea (for further details about this service see the Environment Agency website at http://www.environment-agency.gov.uk/subjects/flood/826674/829803/946278/?lang=_e).

The flood warning system consists of a set of codes with the following meanings:

- Flood Watch - Flooding of low lying land and roads is expected. Be aware, be prepared, watch out!
- Flood Warning - Flooding of homes and businesses is expected. Act now!
- Severe Flood Warning - Severe flooding is expected. There is extreme danger to life and property. Act now!
- All Clear - Flood Watches or Warnings are no longer in force for this area.

Further improvements to the flood warning service is being investigated by developing hydrological/hydraulic models that can predict flooding up to six hours prior to the event occurring. Halcrow has for example recently completed a flood forecasting model for Lymington and Brockenhurst. These models use rainfall estimates from the Met Office. The aim is to provide targeted flood warning at least 2 hours prior to events occurring.

Currently there are no areas that could be potentially allocated for Flood Risk Management Schemes by the Environment Agency or others. If such areas were identified, they would be considered as spatial constraints to development proposals).

9 Guidance on the Application of the Sequential Test

9.1 *Introduction*

As described in ***Chapter 5***, the application of the Sequential Test can be summarised as follows:

- to look for sites in areas at least risk from flooding (Zone 1), only making allocations in Zones 2 or 3 if there were no alternatives,
- within Zones 2 and 3, give preference to Zone 2, with Zone 3 only being used as a last resort and
- for sites in Zones 2 and 3, apply the Exception test as required, as set out in PPS25.

The following Sections/Steps provide additional guidance to that from PPS 25 and its Practice Guide, and have been produced in consultation with the Environment Agency (James Addicott). They provide details on how to take account of other sources of flooding (and not just the Flood Zones) during the application of the Sequential Test, and as part of a Sustainability Appraisal.

9.2 *First Step – Strategic Overview of Flood Risk for all Potential Areas*

The recommended initial step is to determine broad extents of potential land allocations in large scale maps showing the most up-to-date flood zones, in accordance with PPS 25 (areas to be drawn in the SFRA Flood Maps - ***Tiles A to H***: *Flood Maps*). Summary tables of flood risk issues are then prepared for each location, indicating if the potential areas overlap Zones 2, 3, localised flooding areas or if there are records of previous flood incidents shown in the maps. It is then recommended that the summary tables and proposed locations are sent to the Environment Agency to obtain further details about Environment Agency flood incident records within those areas. As mentioned in ***Section 7.5***, particular care should be taken by identifying allocations that could increase flood risk elsewhere (flood incident points, localised flooding areas, flood zones) and lack of dry access.

9.3 *Second Step – Analysis of Flood Risk Issues*

The next step is to analyse all potential sites within Zone 1, by identifying those that have any flood risk issues (for example those affected by other sources of flooding or those that do not have dry access routes during flood events). This step is carried out as part of the Sequential Test for Zone 1 (ideally the land uses most vulnerable to flood risk should be located in Zone 1).

For the sites with flood risk issues, an assessment of likely significance of flood risk is then carried out in terms of likely probability of flooding and potential consequences/flood damages (advice from a drainage specialist may be required, such as the SFRA consultant, the Environment Agency, a highways drainage engineer and/or the planning authority drainage specialist). The purpose is to identify sites with significant flood risk - high probability of flooding and significant flood damages with deep flooding and high velocities which could result in loss of property and potentially loss of life.

If a site with significant flood risk is identified within Zone 1 (or within a 100m radius), this would be considered as if it was in the High Probability Zone 3a for further application of the Sequential Test (see ***Section 9.4***), bearing in mind that if a more vulnerable land use is required for the site, it will have to pass the Exception Test (see PPS 25 Flood Risk Vulnerability and Flood Zone Compatibility table in the tiles).

9.4 *Third Step – Apply the Measures of Avoidance/Prevention*

It is recommended that the following actions take place prior to the application of the Sequential Test in Zones 2 and 3:

a) Apply the measure of avoidance/prevention (see ***Section 5.5***) by moving the boundaries of the potential sites away from Zones 2, 3a and 3b, for those cases where the loss of site area is acceptable. This is generally the case at locations where the loss in area is of the order of 10%.

b) Within Zones 2 and 3, provisionally adopt land uses that are fully compatible with the vulnerability classification of PPS 25, to try to avoid the need to apply the Exception Test where possible.

9.5 *Fourth Step – Apply the Sequential Test in Zone 2*

The fourth step is to identify high risk localised flooding areas as for Zone 1 (see ***Section 9.3***) as part of the Sequential Test in Zone 2. Where required, the Exception Test will be applied in accordance with PPS 25.

9.6 ***Fifth Step – Apply the Sequential Test in Zone 3***

The fifth step is to apply the Sequential Test in Zone 3, and where required the Exception Test in accordance with PPS 25. This applies to all potential sites that fall within Zone 3 as well as those that encroach or are located within a 100m radius from a high risk 'localised flooding area' in Zones 1 and 2.

10 Guidance for the preparation of Flood Risk Assessments

10.1 Introduction

A SFRA is a strategic document that provides an overview of flood risk throughout a study area. Flood Risk Assessments will be required for most proposed developments and the level of detail will depend on the existing level of flood risk in the site (see general FRA requirements for each flood zone in Table D.1, PPS 25 and further guidance in the Practice Guide Companion to PPS 25).

For those sites within localised flooding areas or with flood incident records where flood risk issues are not significant (for example shallow flooding and non-frequent blockages, etc), development should still be acceptable provided that adequate policies are in place for mitigating the risk. Options range from using on site water balancing and other SUDS solutions, and may include contributions from the developer for the upgrade of the surface water system, if feasible.

It is imperative that site-based Flood Risk Assessments (FRAs) should be discussed early in the planning process and submitted as an integral part of the planning application. It is now a government directive that planning applications seeking approval for development within flood affected areas can be regarded as invalid if not supported by a Flood Risk Assessment. The following section reflects best practice on what should be addressed within a FRA:

10.2 Proposed Developments within Flood Zone 3a and 2

All FRAs supporting proposed development within High Probability Zone 3a and 2 (as the existing Flood Zone 2 could become a high risk zone in the future due to the effects of climate change) should include an assessment of the following:

- The vulnerability of the development to flooding from other sources (for example surface water drainage, groundwater, etc) as well as from river/tidal flooding. This will involve discussion with the planning authority and the Environment Agency 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), for example 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. Where available, this will be provided at a cost to the developer. Where detailed modelling is not available, hydraulic modelling by suitably qualified specialists will be required to determine the risk of flooding to the site.

- The potential of the development to increase flood risk elsewhere through the addition of hard surfaces, the effect of the new development on surface water runoff, and the effect of the new development on depth and speed of flooding to adjacent and surrounding property. This will require a detailed assessment, to be carried out by suitably qualified specialists. The use of SUDS techniques can help mitigate the risks posed by the new development.
- 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.
- Details of existing site levels, proposed site levels and proposed ground floor levels. All levels should be stated relevant to Ordnance Datum.

It is highlighted that all forms of flooding need to be considered as localised flooding may also occur, typically associated with local catchment runoff following intense rainfall. A localised risk of flooding must be considered as an integral part of the detailed Flood Risk Assessment.

It is essential that developers thoroughly review the existing and future structural integrity of formal and informal defences, if present, upon which the development will rely (over the lifetime of the development), and ensure that emergency planning measures are in place to minimise risk to life in the unlikely event of overtopping or defence failure.

10.3 Proposed Development within Zone 1

For all sites within low probability Zone 1, unless the planning authority and the Environment Agency suggest otherwise, a high level FRA should be prepared based upon readily available existing flooding information (sourced from the Environment Agency, the local planning authority and information contained in this SFRA). PPS 25 recommends that an FRA is carried out in Zone 1 for development areas of 1 hectare or more. The PPS25 recommendation has been

extended in this SFRA to development areas less than 1 hectare, due to the extensive flood risk issues within the study area.

The following issues should be considered: a) the vulnerability to flooding from other sources (as well as from river and sea flooding), b) the potential to increase flood risk elsewhere through the addition of hard surfaces and c) the effect of the new development on surface water runoff. It is recommended that sustainable urban drainage techniques are employed to ensure no worsening to existing flooding problems elsewhere within the area.

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 (see ***Section 10.4*** and ***Chapter 11***).

10.4 *Raised Floor Levels, Basements and Dry Access (Freeboard)*

The raising of floor levels above the 1% probability peak flood level will ensure that the damage to property is minimised. Given the anticipated increase in flood levels due to climate change, the adopted floor level should be raised above the 1% probability flood level assuming a 20% increase in flow over the next 20 to 100 years (see PPS 25 climate change Tables in ***Section 6.4.2***).

It is highlighted that many of those areas currently situated within Medium Probability Zone 2 could become part of the High Probability Zone 3. This is important as it means that properties that are today at relatively low risk are likely to be, in 20 to 100 years, within High Probability Zone 3a (see precautionary assumption in ***Section 6.4.2***). It is imperative therefore that planning and development control decisions take due consideration of the potential risk of flooding in future years.

Wherever possible, floor levels should be situated a minimum of 300 mm above the 1% annual probability peak flood level plus climate change flood level, determined as an outcome of the site-based FRA, or 600 mm above the 1% annual probability peak flood level if no climate change data is available. The height that the floor level is raised above flood level is referred to as the 'freeboard', and is determined as a measure of the residual risks.

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

11 Guidance for the Application of Sustainable Drainage Systems

11.1 Introduction

PPS 1: Delivering Sustainable Development and PPS 25 require that LPAs should promote Sustainable Urban Drainage Systems (SUDS). LPAs should ensure policies encourage sustainable drainage practices in their Local Development Documents. 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. The management of rainfall (surface water) is considered an essential element for reducing future flood risk to both the site and its surroundings. Indeed, reducing the rate of discharge from urban sites to greenfield (undeveloped) runoff rates is one of the most effective ways of reducing and managing flood risk. For further information on methods used for the estimation of greenfield runoff and the management of rainfall runoff in developments, see September 2005, DEFRA/Environment Agency Interim document - R&D Technical Report W5-074/A/TR/1 Revision C.

11.2 Types of SUDS Systems

SUDS may improve the sustainable management of water for a site by:

- controlling or reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
- reducing volumes of water flowing directly to watercourses or sewers from developed sites;
- improving water quality, compared with 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.

Any reduction in the amount of water that originates from a given site is likely to be small. However, if applied across a catchment, the cumulative effect from a number of sites could be significant.

There are numerous different ways that SUDS can be incorporated into a development. The appropriate application of a SUDS scheme to a specific development is heavily dependent upon the topography and geology of the site and the surrounding areas. Careful consideration of the site characteristics is necessary to ensure the future sustainability of the adopted drainage system. The most commonly found components of a SUDS system are described below:

Pervious surfaces:- Surfaces that allow inflow of rainwater into the underlying construction or soil, such as porous provisions, avoidance of blacktop in car parks etc.

Green roofs:- Vegetated roofs that reduce the volume and rate of runoff and remove pollution.

Filter drains:- Linear drains consisting of trenches filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water. They may also permit infiltration.

Filter strips:- Vegetated areas of gently sloping ground designed to drain water evenly off impermeable areas and to filter out silt and other particulates.

Swales:- Shallow vegetated channels that conduct and retain water, and may also permit infiltration; the vegetation filters particulate matter.

Basins:- Ponds and Wetlands Areas that may be utilised for surface runoff storage.

Infiltration Devices:- Sub-surface structures to promote the infiltration of surface water into the ground. They can be trenches, basins or soakaways.

Bio-retention areas:- Vegetated areas designed to collect and treat water before discharge via a piped system or infiltration to the ground

Pipes and accessories:- A series of conduits and their accessories, normally laid underground, that convey surface water to a suitable location for treatment and/or disposal (although sustainable, these techniques should be considered only where other SUDS techniques are not practicable).

For more guidance on SUDS, the following documents and websites are recommended as a starting point:

- PPS 25
- Practice Guide Companion to PPS 25

- Interim Code of Practice for Sustainable Drainage Systems, National SUDS Working Group, 2004
- Best practice guidance for Sustainable Drainage Systems from the Thames Region, providing a clear hierarchy for SUDS requirements at the planning application stage (available from the Environment Agency development control teams).
- Preliminary management of rainfall runoff - September 2005, DEFRA/Environment Agency Interim document - R&D Technical Report W5-074/A/TR/1 Revision C.
- www.ciria.org.uk/suds/

11.3 Application of SUDS for the Proposed Allocation Sites

It is recommended that priority is given to the use of infiltration drainage techniques as opposed to discharging surface water to watercourses. Where infiltration techniques are not viable (due to a high water table, local impermeable soils, source protection zones etc), discharging attenuated site runoff to watercourses is preferable to the use of sewers. An indication of soil hydrological properties in Test Valley Borough is illustrated in ***Figure 3:*** *Distribution of Soil Permeability*, which is based on the estimate of the Standard Percentage Runoff from the Flood Estimation Handbook. Apart from the soil area highlighted in green (which has a SPR of 49.6%) the other soil areas are in principle sufficiently permeable to allow the infiltration of surface runoff.

11.4 Effective application of SUDS techniques

Large increases in impermeable areas contribute to significant increases in surface runoff volumes and peak flows and could increase flood risk elsewhere unless adequate SUDS techniques are implemented. This may even apply for developments within Zone 1 which, whilst they are not at risk of flooding themselves, may still increase the risk of flooding elsewhere.

A critical situation could be that of building a new large development just upstream of an existing development which already suffers from frequent flooding. The correct SUDS technique could, in this case, be to build large areas of pervious surfaces (pervious paving, etc) combined with infiltration and rainfall harvesting techniques. The use of large attenuation areas may not be the appropriate SUDS technique, as these attenuate peak flows but do not reduce flood volumes.

SUDS techniques will be required for most, if not all, proposed land allocations. The attenuation to 'greenfield' (undeveloped condition) discharge should be the norm and the method adopted will depend on the individual circumstances. Developers should consult with the Environment Agency at an early stage about their SUDS proposals, to ensure that they are adopting the most affective methods for their site.

Appendix A *Details of the Environment Agency Flood Zone*

A.1 *Introduction*

A more detailed understanding of the Environment Agency Flood Zones and their limitations is important, as these are often used (unless more accurate flood outlines are available) for the production of SFRA flood maps.

A.1.1 *Environment Agency Tidal Maps*

Mapped tidal Flood Zones 3 and 2 generally comprise land that is lower than the estimated height of the extreme surge tide in the relevant event. Where detailed studies have been undertaken, tidal Flood Zones 3 and 2 have been modified to take into account wave height, the gradient of the land and the relatively short duration of the high tide. In appropriate circumstances, the build up of tidal water trapped behind tidal defences over several high tides is mapped.

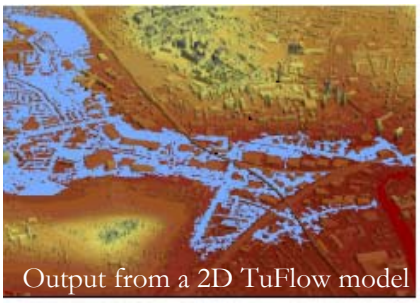
A.1.2 *Environment Agency Fluvial Maps*

Data for fluvial Flood Zones 3 and 2 is derived from a number of sources. Some observations of flooding by the Environment Agency's predecessors are included, for instance the extent of the severe 1947 floods. Most fluvial flood outlines are derived from the "JFlow" generalised computer modelling, which is a 'coarse' modelling approach (Ref. 31 and 32).

Caution must be exercised in interpreting JFlow derived flood outlines due to the large number of assumptions incorporated into the JFlow model. For instance, at some locations the river centreline incorporated into the model was found to be erroneous with the result that the associated flood plains deviate from the natural valleys.

A.1.3 *Updates of the Environment Agency Flood Maps from Modelling*

In many places the results of flood mapping studies have superseded the JFlow model. Generally these studies included high quality hydrological research, surveyed river cross sections, and more precise digital modelling such as ISIS, TuFlow and HecRas.



Output from a 2D TuFlow model

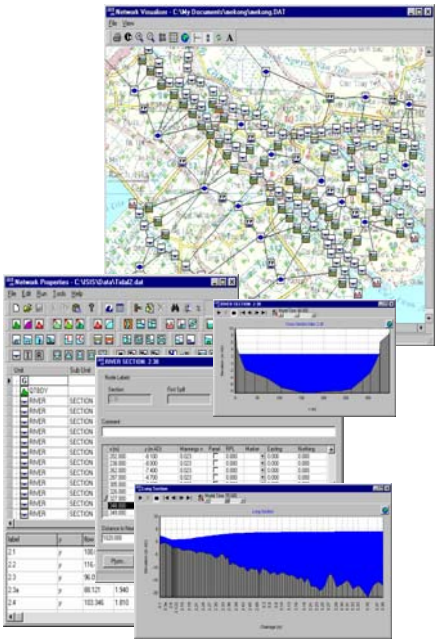
Although fluvial flooding is dependent on the standard of maintenance of watercourses and structures, the degree of maintenance allowed for tends to vary from model to model, with the result that flood maps based on modelling do not offer a consistent approach in this respect. As a consequence, serious blockages occurring during a flood might produce much more flooding than shown on previous modelling for a similar hydrological event.

A.1.4 *Updates of the Environment Agency Flood Maps from Recent Events*

Records of recent flood events have been used to modify the flood map. In these cases the Environment Agency has determined the return frequency of the observed event and modified the appropriate flood zone accordingly.

When evidence of flooding is based on aerial photographs, there is often uncertainty about a) whether the flooding has emanated from the river or is the result of other land drainage, b) the precise flood return period and c) whether the flooding was the result of blockage or some other maintenance factor. Occasionally therefore, flood zone modifications based on observed flooding are unreliable.

ISIS Software Graphic Interface



A.1.5 *Other Forms of Flooding in the Environment Agency Flood Maps*

Although PPG 25 and PPS 25 advise that the flood zone maps, which are primarily intended as a planning tool rather than a definitive record, should only show tidal and fluvial flooding, in practice many show other sources of flooding. In Hampshire for instance, much flooding derived from groundwater sources is included, both in dry valleys and isolated ponds. These groundwater flooding outlines are derived from both JFlow and observations.

A.1.6 *Non Main River flooding in the Environment Agency Flood Maps*

Inland Flood Zone maps show some non main river watercourse flooding as well as main river watercourse flooding. "Main rivers" are principal watercourses defined by Section 93 of the Water Resources Act, 1991 and shown on a formal map held by the Environment Agency – the Environment Agency flood zones. Larger ordinary watercourses are shown on the background Ordnance Survey mapping.

There is no precise definition of how much non main river watercourse related flooding is included. If no flood plain is shown for a catchment that is less than 3 square kilometres in area, it should be presumed that the area has not been modelled and/or it has not been recorded (as opposed to assuming that flooding has not occurred or would not occur).

A.2 ***Areas Benefiting from Defences***

The current flood maps, although they are based on the "undefended situation", show selected raised formal flood defences, and selected "areas benefiting from defences" (ABDs). This is land where flooding is prevented by defences, although it is assumed that the defences are robust, leak free and maintained, which is not always the case. Improved channels are not normally regarded as defences for the purposes of flood zone mapping.

A.3 ***Climate Change Effect on Flood Zones***

In the absence of better information, the current fluvial Flood Zone 2 can be considered an estimate of the extent of fluvial Flood Zone 3 within 100 years. This principle does not hold for tidal floods, however, as the level difference between a 0.5% and a 0.1% annual probability tide is only about 200 mm, whereas the forecast increase in tide levels over the next 100 years is in excess of 1m.

As noted, current Environment Agency formal flood maps generally do not take into account the effect of climate change on winter rainfall and tide levels, or the effect of changes in the levels of tectonic plates on tide levels.

Appendix B: Audit Trail Database

Ref. No	Subject & Type of data	Source	Date	Author	Summary Description	Used for
HSFR/003	1 in 10,000 and 1 in 25,000 OS maps and layers for Hampshire Boundary and Districts	Hampshire County Council (CD)	Dec 2006	Hampshire County Council	GIS files showing geographical features related to Hampshire.	Production of Figures in reports and planning tool
HSFR/004	T&I, HA and NF CFMP data – Boundaries, DTMs, geo-referenced results and layers of flood extents	Environment Agency via Halcrow (internal transfer)	Jan 2007	Halcrow	DTMs based on SAR and LiDAR data, geo-referenced results and flood extents from detailed and broad based models using MDSF (includes model outputs outside CFMP – South West Region)	Production of some of the Flood Zones 3a, 3b, 2 and 3+CC (where applicable)
HSFR/007	Folders of GIS files, reports and databases, with copies of accompanying emails.	Environment Agency (CD)	20 Dec 06	Agency Winchester Office	GIS data - Flood events database, flood zones, historical flood maps, main rivers layer (1 in 10,000). Pdf and Word documents - Flood Reports 00-01 and 02-03. Spreadsheets - Environment Agency catalogues of reports, CDs and Microfiche in the Area Office, and database of Reservoirs under Act.	Production of some of the Flood Zones 3a, 3b, 2 and 3+CC (where applicable) and checking of flood events at proposed sites.). Flood risk from reservoirs to describe in report
HSFR/011	Southern Water Flood Risk Points with X, Y and Postcode (spreadsheets)	Southern Water (email)	7 Feb 07	SW, Barry Luck	Records of flooding in the last 10 years for events more frequent than 20 years	Show sewage flooding
HSFR/016	Hampshire Groundwater Flooding 00-01 layers.	Environment Agency via Halcrow (CD)	Feb 07	Halcrow, BP Library	GIS files for all flooded villages (used for preparing the reports). BP archive file OF 94776. Key is to replace n drive in the **xxx**apr file to c drive	Production of some of the Flood Zones 3a, 3b, 2 and 3+CC (where applicable)
HSFR/018	SFRA questions & Answers. Text file.	Environment Agency (memory stick)	Oct 06	James Addicott (Agency)	Environment Agency Guidelines with questions & answers. It also includes comments from James about Climate change, etc.	To ensure compliance with Guidelines
HSFR/034	Test Valley Borough Council Flood Hotspots	Test Valley Borough Council (email)	12 Jan 07	Andrew Bradley	GIS files and database of flood hotspots in Test Valley Borough	Producing the Historical Floods
HSFR/035	2000-01 flood event photos	Environment Agency (CD)	20 Dec 06	Agency Winchester Office	Jpg photos of flooding in Hampshire during 2000/2001.	Not used at this stage.
HSFR/037	2005 flood event photos	Environment Agency (CD)	20 Dec 06	Agency Winchester Office	Jpg photos of flooding in Hampshire during November 2005, plus some accompanying documents.	Not used at this stage.
HSFR/040	EA updated floodmaps and documents	Environment Agency (CD)	29 June 07	Winchester Office	Shapefiles of floodzones 2 and 3 (Mar 07), modelled/historical flooding in Tadburn Lake, Wallington River and River Avon, and accompanying pdf documents. NB; missing flood areas (River Avon, rivers in Rushmoor, Hart, East Hampshire, Basingstoke and Deane)	Updating SFRA flood maps – MapInfo files of floodzones 2 and 3 were created and replaced the files used in all tiles.
HSFR/041	EA updated floodmaps and documents	Environment Agency (CD)	11 July 07	Hayley Mizen	Shapefiles of floodzones 2 and 3 for south-east part of Thames region. NB; missing river in Basingstoke and Deane borough.	Updating SFRA flood maps – MapInfo files of floodzones 2 and 3 were created and replaced the files used in all tiles.
HSFR/042	EA updated floodmaps and documents	Environment Agency (CD)	11 July 07	Blandford Office (Richard Coombes)	Shapefiles of floodzones 2 and 3 for eastern side of South West region (i.e. especially River Avon)	Updating SFRA flood maps – MapInfo files of floodzones 2 and 3 were created and replaced the files used in all tiles.
HSFR/043	Test Valley potential housing developments	Test Valley Council	4 July 07	Fiona Mortimer	GIS files of locations for potential housing developments, plus a pdf map.	Create a second set of Test Valley SFRA maps showing developments vs flooding

Test Valley Borough Council (North)
Beech Hurst Weyhill Road
Andover
Hampshire
SP10 3AJ

Our ref: HA/2006/000293/BD-01/I21-L01
Your ref:

Date: 23 August 2007

Dear Sir/Madam

Strategic Flood Risk Assessment (SFRA) – Test Valley BC

We have recently been sent the final version of the Strategic Flood Risk Assessment (SFRA) for your area from Halcrow consultants appointed on your behalf. We have had the chance to review the document and we have the following comments to make from a flood risk perspective.

The document provides a comprehensive and compliant tool for the assessment of flood risk across the authority area. It provides the information to allow the authority to carry out the application of the sequential test in line with PPS25.

Should the authority propose to apply the exception test on certain sites, more detailed site specific data is likely to be required. There will of course still be the inherent requirement on developers to submit site specific flood risk assessments along with their planning applications, which should be informed by, and build upon information presented in this SFRA.

We are pleased to see the links that have developed through this document to studies such as Catchment Flood Management Plans as well as previous historic flooding reports.

We are pleased to see that the study contains an audit trail database. This forms an extremely useful element of the project and will be an invaluable asset in assessing assumptions of the study and information and data used in

future revisions and updates.

It is an important fact that the Strategic Flood Risk Assessment should form a "living document". It should be used by all teams that have relevant interest within the local planning authority including forward planners, development control officers, engineers, emergency planners and developers. Updates to the document should happen regularly, and sometimes after flood events a review may be appropriate to inform the study. We would recommend that a period for review should be suggested in the report and could initially be 12months. This may not necessarily form a complete update to the project but is more likely to consist of a steering group meeting to discuss changes to information and data within the study area and any recent flood events.

Recently a meeting has been held between Halcrow and representatives from Atkins consultants working on behalf of the Partnership for Urban South Hampshire (PUSH) group of authorities. This was to inform understanding of the studies across this area and was carried out as part of the New Forest SFRA. Part of the Test Valley Borough Council authority area overlaps with PUSH and integration of the two study areas will be key to delivering an easy to use and quality output. We would encourage you to make sure that this dialogue is initiated once more for your authority area within PUSH.

Section 11 includes advice on application of Sustainable Drainage techniques. We are pleased to see this inclusion and would reiterate that the objective of proposing such techniques would include rainfall source control (holding it up on site over immediate discharge to local surface water system) as well as no detriment to the water quality of receiving watercourses.

The map tiles bring together flood risks from a number of sources all in one document. Importantly the sewerage undertaker, Southern Water, have inputted into this process along with your internal engineering department.

One point of note on this information is that the frequency of flooding should be clarified. Should this be read as occurrence of flooding in years?

There is also the point that some of the problems highlighted on the database may have been fixed by a scheme or been caused by a blockage. There could be value in review of assessing whether ranking these events according to hazard or nature could be of value. At present the information should be used in its current form as a tool for further consultation of the relevant team and monitored in practice.

Section 7.2.2 and 7.3.3 references that the Hampshire Avon forms part of this authority area. This is not the case.

In addition section 12 of the report, referencing recommendations, does not include any information at present. This should be added.

One point regarding the map outputs is that all of the areas within Flood Zone 3 have been demonstrated as being within Flood Zone 3b, functional flood plain.

We are in agreement that where there is no better information available that the functional flood plain in fluvial flooding areas should be demonstrated as being equivalent to that of Flood Zone 3a. This is in line with guidance offered in section 3.17 of the PPS25 draft Practice Guide at the current time.

An area where this may cause problems with the application of the Sequential Test as demonstrated in Annex D of PPS25 are likely to be Romsey and Andover. In these areas parts of the towns are shown as being within Flood Zone 3. Further work may therefore be required in this locality in the form of a level 2 SFRA or work to derive a functional flood plain outline by developer lead Flood Risk Assessment.

One other point is that the climate change maps do not demonstrate graphically the fluvial climate change scenarios. It has been previously agreed and referenced in the report the current Flood Zone 2 would be used as an approximation for future Flood Zone 3. This is not demonstrated at present but suggested as a number of rules in section 6.5. This will be acceptable so long as these rules are adhered to.

Over the past week I am sure you will be aware that Atkins have released an output from the Phase 2 of their work for the PUSH (Partnership for Urban South Hampshire) SFRA. This includes the part of the Test Valley area within PUSH. It should be noted that the output from this piece of work includes some hazard mapping and information on flood management infrastructure and future costs for improvement. It is therefore suggested that the layers from the Atkins work are taken and combined with outcomes from this study.

This study has done a great deal in ensuring that the objectives of PPS25 can be delivered. The planning authorities have a compliant tool on which to base their spatial planning allocations with regard to flood risk. One important point in the process is that the study provides an information tool in carrying out assessment and decision making. It does not in itself make these decisions and you will still be require to undertake the decision making process. Section 9 of the study goes a long way to suggesting a process for doing this.

On this point we have recently been made aware of work undertaken by Chelmsford Borough Council to support broad allocations in their Core Strategy. This work was developed in consultation with our colleagues in the Environment Agency Anglian Region. I hope that it may help for you to have a look at the following link regarding demonstration of the PPS25 Sequential Test.

http://www.chelmsford.gov.uk/media/pdf/k/n/Core_Strategy_SEQUENTIAL__EXCEPTION_TESTS_Aug_07.pdf

Being the government's advisors on flood risk and a statutory consultee on such matters, we are happy to assist in its application wherever possible. In this light we will be visiting Test valley BC on 6 September to roll out PPS25 and discuss key aspects of the SFRA. We would be happy to meet with you again after this date for a more in depth discussion of the SFRA and next steps or provide a training session with key staff on the decision making processes involved in undertaking the sequential and exception tests.

If you require any further information or advice please do not hesitate to contact me at the offices below.

Yours faithfully

Miss Loretta Bean
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