



Newcastle City Council Level 2 Strategic Flood Risk Assessment

Volume II: SFRA User Guide

Final: Version 3.0

May 2011

Newcastle City Council
Planning and Housing Strategy
10th Floor Civic Centre
Civic Centre
NEWCASTLE UPON TYNE
NE1 8PH



JBA Office

JBA Consulting
 South Barn
 Broughton Hall
 Skipton
 BD23 3AE

JBA Project Manager

Howard Keeble MPhil BEng BSc CEng CEnv CWEM CSci MICE MCIWEM MCM

Revision History

Revision Ref / Date Issued	Amendments	Issued to
Draft v1.0 (October 2010)		Rachael Ashworth (Newcastle City Council), one digital copy uploaded to JBarn
Draft Final v2.0 (December 2010)	Addition of Newcastle CC response to Sequential Testing results	Rachael Ashworth (Newcastle City Council), one digital copy uploaded to JBarn
Final v3.0 (April 2011)	Text amendments following Environment Agency comments received 5th April 2011 and Newcastle CC comments of 7th March 2011	Rachael Ashworth (Newcastle City Council), 2 printed copies and 1 pdf copy. Cameron Sked, Environment Agency, 1 pdf copy

Contract

This report describes work commissioned by Newcastle City Council awarded by official order VPUV 0720910 dated 27th July May 2010. Newcastle City Council's representative for the contract was Rachael Ashworth. Howard Keeble and Rosalind Whitham of JBA Consulting carried out this work.

Prepared by Rosalind Whitham BSc

Analyst

Howard Keeble MPhil BEng BSc
 CEng CEnv CWEM CSci MICE
 MCIWEM MCM
 Principal Engineer

Reviewed by David Stark BSc CEng MICE
 Principal Engineer

Approved by Gary Deakin BSc CEng MICE

Project Manager

Purpose

This report has been prepared for Newcastle City Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared. JBA Consulting has no liability regarding the use of this report except to Newcastle City Council.

Copyright

© Jeremy Benn Associates Limited 2011

Carbon Footprint



A printed copy of the main text in this document will result in a carbon footprint of 421g if 100% post-consumer recycled paper is used and 535g if primary-source paper is used. These figures assume the report is printed in black and white on A4 paper and in duplex.

JBA is a carbon neutral company and the carbon emissions from our activities are offset.

Executive Summary

Introduction

Newcastle City Council is required to undertake a Strategic Flood Risk Assessment (SFRA) as an essential part of the evidence-gathering stage of the Local Development Framework (LDF) and in the preparation of the Local Development Documents (LDDs). The SFRA provides baseline information for use in the preparation of the Sustainability Appraisal (SA).

The requirement for the preparation of SFRAs is outlined in Planning Policy Statement 25 Development and Flood Risk (PPS25) and its Practice Guide. This requires Local Planning Authorities (LPAs) to take a lead role in local flood risk and development planning. SFRAs are required in order to demonstrate that sufficient consideration has been given to flood risk at all stages of the planning process and to avoid inappropriate development in higher risk areas.

Local authority planners need to demonstrate that a risk-based sequential approach to development planning and flood risk has been adopted throughout the evaluation process and applied during preparation of development plans. This is achieved through the application of the Sequential and Exception Test as outlined in PPS25.

The SFRA comprises relevant data, guidance and recommendations for flood risk issues at a local level. It is a planning tool that enables the Local Planning Authority (LPA) to carry out Sequential and Exceptions Testing and to select and develop sustainable site allocations at lower risk of flooding.

The SFRA provides an integrated approach to strategic and local Flood Risk Management (FRM). The SFRA also provides links to other policy documents such as Catchment Flood Management Plans (CFMPs), Regional Flood Risk Appraisals (RFRAAs), Preliminary Flood Risk Appraisals (PFRAs) and Surface Water Management Plans (SWMPs).

The Newcastle Level 2 Strategic Flood Risk Assessment (SFRA) is presented as two reports.

- Volume 1: Is the Level 2 SFRA, including detailed assessment of actual and residual flood risk within high risk communities.
- Volume 2: Is the accompanying SFRA User Guide.

SFRA User Guide

The User Guide provides specific guidance for the SFRA. This report should be used by all involved in the development planning process. This Guide is presented as five key chapters comprising:

- Guidance for Spatial Planners
- Guidance for Development Management
- Guidance for Developers
- Guidance for Flood Risk Management
- Guidance for Emergency Planners

Included as appendices is further background information and explanation of the SFRA process:

- a. **Flood Risk Concepts**
- b. **Flood Risk Assessment Hierarchy**
- c. **The Planning Framework**
- d. **Stakeholder Engagement and Data Management**
- e. **Flood Risk Zones**
- f. **Flood Risk Vulnerability Classification**
- g. **Sustainable Drainage Systems**
- h. **Flood Risk Mitigation**

SFRA Mapping

A suite of strategic flood risk maps have been produced for the SFRA. In keeping with PPS25 and the associated Practice Guide, these maps should be used to locate development away from areas at high risk of flooding.

Future development planning also needs to make reference to this suite of strategic flood risk maps, as well as any updated information provided by the LPA and Environment Agency.

Use of SFRA Data

Whilst all data used in the preparation of this SFRA has been supplied to the LPA (including, for example, reports, mapping, Geographic Information Systems (GIS) and modelled data) there is a need to maintain controls over the data and how it is applied and modified. It is anticipated that the SFRA and associated maps will be published on the Council's website as PDFs. As the central source of SFRA data, these maps will be available to download.

The LPA will be able to use the modelled output (depths, hazards, velocities and extent outlines) for internal use. The use of this information must consider the context within which it was produced. The use of this data will fall under the license agreement between the LPA and the Environment Agency as it has been produced using Environment Agency data. It should be remembered that the modelling undertaken for the SFRA is of a strategic nature and more detailed FRAs should seek to refine the understanding of flood risk from all sources to any particular site.

SFRA data should not be passed on to third parties outside of the LPA. Any third party wishing to use existing Environment Agency flood risk datasets should contact External Relations in the Environment Agency North East Region. A charge is likely to apply for the use of this data.

Contents

Executive Summary	3
Contents	5
1 Introduction	13
1.1 Background.....	13
1.2 SFRA Monitoring	15
2 Guidance for Spatial Planners	16
2.1 Introduction	16
2.2 Sequential Test.....	21
2.3 Exception Test.....	22
2.4 Applying the Sequential Test and assessing the likelihood of passing the Exception Test.....	24
2.5 Flood Risk and other Land Use Policies.....	26
3 Guidance for Development Management	28
3.1 Introduction	30
3.2 The Sequential Test and Exception Test.....	30
3.3 Supporting the FRA Process	31
4 Guidance for Developers	32
4.1 Introduction	32
4.2 The Sequential Test and Exception Test.....	33
4.3 Site specific Flood Risk Assessments	34
4.4 FRA Guidance	35
4.5 Critical Drainage Areas.....	37
4.6 Considering risk of flooding from other sources	37
4.7 Drainage for new developments	38
5 Guidance for Flood Risk Management	43
5.1 Introduction	43
5.2 Strategic Approach	43
5.3 Potential mitigation measures	43
6 Guidance for Emergency Planners	47
6.1 Introduction	47
6.2 Emergency planning overview.....	47
6.3 Flood Plan recommendations.....	48
6.4 Planning Approval – Flood Plans including flood warning.....	49
6.5 Flood Awareness	49
Appendices	L
A . Flood Risk Concepts	L
B . Flood Risk Assessment Hierarchy	LX
C . The Planning Framework	LXII
6.6 Introduction	LXII
6.7 Flood Risk Management Drivers	LXII
6.8 National Planning Policy.....	LXVIII
6.9 Other Planning Policy Statements.....	LXX
6.10 Environment Agency Policy	LXXVI
6.11 Summary	LXXIX

D .	Stakeholder Engagement and Data Management	LXXX
E .	Flood Risk Zones	LXXXII
F .	Flood Risk Vulnerability Classification	LXXXVI
G .	Sustainable Drainage Systems	XCI
H .	Flood Risk Mitigation	XCVI

List of Figures

Figure 2-1: Taking flood risk into account in LDDs	18
Figure 2-2: Sequential Test and Exception Test Flow Diagram.....	20
Figure 2-3: (Where the Exceptions Test Applies).....	23
Figure 2-4: First and Second Pass of Proposed Development Sites Sequential Test.....	25
Figure 2-5: Identifying the Likelihood of Passing the Exception Test	26
Figure 3-1: Planning Applications and Flood Risk.....	29
Figure 4-1: FRA Preparation	35
Figure A1: Flooding From All Sources.....	LI
Figure A-2: (Source-Pathway-Receptor model).....	LVII
Figure C1: Tyne CFMP Policy Units.....	LXXVII
Figure G1: SUDS Management Train Principle ²¹	XCI

List of Tables

Table 1-1: Relevant Legislation, Plans, Policies and Strategies.....	14
Table 1-2: SFRA Review Triggers	15
Table 2-1: Sequential & Exception Test Key Steps	19
Table 3-1: FRA considerations and SFRA supporting evidence	31
Table 4-1: Development types and application of Sequential and Exception Tests.....	33
Table 5-1: Possible Mitigation Measures	44
Table 6-1: Flood Warning and Evacuation Plans	49
Table A1: Reservoir Consequence Classification.....	LIV
Table A2: NFCDD Condition Ratings for Flood Defences	LV
Table A3: Flood Hazard ratings.....	LVIII
Table C1: Lower Tyne CFMP Policy Unit Action Plan.....	LXXVIII
Table D1: Stakeholder Involvement.....	LXXX
Table F1: Land Use Classifications	LXXXIX
Table G1: Suitability of SUDS Techniques.....	XCII

Abbreviations

ABD	Areas Benefiting from Defences
AEP	Annual Exceedance Probability
CFMP	Catchment Flood Management Plan
CLG	Communities and Local Government
COW	Critical Ordinary Watercourses
CRR	Community Risk Register
CSO	Combined Sewer Overflow
DPD	Development Plan Document
DTM	Digital Terrain Model
EA	Environment Agency
ELA	Employment Land Availability
EU	European Union
FCERM	Flood and Coastal Erosion Risk Management
FRA	Flood Risk Assessment
FRM	Flood Risk Management
LDD	Local Development Document
LDF	Local Development Framework
LIDAR	Light Detection and Ranging
LPA	Local Planning Authority
NFCDD	National Fluvial and Coastal Defence Database
NLRF	Northumbria Local Resilience Forum
NW	Northumbrian Water
PPS	Planning Policy Statement
RFRA	Regional Flood Risk Assessment
RBMP	River Basin Management Plan
RPB	Regional Planning Body
RPG	Regional Planning Guidance
SA	Sustainability Appraisal
SCI	Statement of Community Involvement
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SMP	Shoreline Management Plan
SoP	Standard of Protection
SUDS	Sustainable (Urban) Drainage Systems
SWMP	Surface Water Management Plan
UDP	Unitary Development Plan
WCS	Water Cycle Study
WFD	Water Framework Directive

Glossary

Actual risk

The risk posed to development situated within a defended area (i.e. behind defences), is expressed in terms of the probability that the defence will be overtopped, and/or the probability that the defence will suffer structural failure and the consequences should the failure occur.

Annual exceedance probability

The estimated probability of a flood of given magnitude occurring or being exceeded in any year. Expressed as, for example, 1 in 100 chance or 1 per cent Annual Exceedance Probability (AEP).

Adoption of sewers

The transfer of responsibility for the maintenance of a system of sewers to a sewerage undertaker.

Attenuation

Reduction of peak flow and increased duration of a flow event usually by temporary storage of flood water

Catchment Flood Management Plans (CFMP)

A strategic planning tool through which the Environment Agency will seek to work with other key decision-makers within a river catchment to identify and agree policies for sustainable flood risk management.

Category 1 Responder

These are organisations at the core of the response to most emergencies (e.g. emergency services, local authorities, NHS bodies).

Climate change

Long-term variations in global temperatures and weather patterns, both natural and as a result of human activity.

Compensation storage

A floodplain area introduced to compensate for the loss of storage as a result of land raising for development purposes.

Design event

A historic or notional flood event of a given annual flood probability, against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

Design event exceedance

Flooding resulting from an event which exceeds the magnitude for which the defences protecting a development were designed (see residual risk).

Design flood level

The maximum estimated water level during the design event.

DG5 register

Register held by water companies on the location of properties at risk of flooding from public sewers

Exceedance flow

Excess flow that emerges on the surface once the conveyance capacity of a drainage system is exceeded.

Extreme Flood Outline (EFO)

Flood 'zone' maps released by the Environment Agency in showing anticipated undefended 0.1% AEP flood extents in a consistent manner throughout the UK.

Flood defence

Flood defence infrastructure, such as flood walls and embankments, intended to protect an area against flooding to a specified standard of protection.

Flood Map

A map produced by the Environment Agency providing an indication of the likelihood of flooding within all areas of England and Wales, assuming there are no flood defences. Only covers river and sea flooding.

Floodplain

Area of land that borders a watercourse, an estuary or the sea, over which water flows in time of flood, or would flow but for the presence of flood defences where they exist.

Flood and Water Management Act

The Flood and Water Management Act¹ received Royal Assent on 8th April 2010. The Act creates unifying legislation covering all forms of flooding and shifting the emphasis from building defences to managing risk.

Flood Estimation Handbook (FEH)

Provides current methodologies for the estimation of flood flows in the UK.

Flood Risk Management (FRM)

The introduction of mitigation measures (or options) to reduce the risk posed to property and life as a result of flooding. It is not just the construction of physical flood defences.

Flood risk management strategy

A long-term approach setting out the objectives and options for managing flood risk, taking into account a broad range of technical, social, environmental and economic issues.

Flood Risk Assessment (FRA)

A study to assess the risk to an area or site from flooding, now and in the future, and to assess the impact that any changes or development on the site will have on flood risk to the site and elsewhere. It may also identify, particularly at more local levels, how to manage those changes to ensure that flood risk is not increased. PPS25 differentiates between regional, sub-regional/strategic and site-specific flood risk assessments.

Flood risk management measure

Any measure which reduces flood risk such as flood defences.

Flood Risk Regulations

The Flood Risk Regulations transpose the EU Floods Directive into UK law and were introduced on 10 December 2009. These confirm the lead local flood authority role and require specific tasks to be undertaken by these authorities this year, with completion of Preliminary Flood Risk Assessments and identification of Flood Risk Areas due by June 2011.

¹ <http://www.defra.gov.uk/environment/flooding/policy/fwmb/key-docs.htm>

Flood Zone

A geographic area within which the flood risk is in a particular range, as defined within PPS25.

Fluvial

Flooding caused by overtopping of rivers or stream banks.

Freeboard

The difference between the flood defence level and the design flood level, which includes a safety margin for residual uncertainties.

Greenfield land

Land that has not been previously developed.

ISIS

ISIS is a software package used for 1-Dimensional river modelling. It is used as an analysis tool for flood risk mapping, flood forecasting and other aspects of flood risk management analysis.

JFlow

JFlow (developed by JBA) is a 2D flood model which solves depth averaged fluid flow equations to model the movement of water over the ground.

Local Development Framework (LDF)

A non-statutory term used to describe a folder of documents which includes all the Local Planning Authority's Local Development Documents (LDDs). The Local Development Framework will also comprise the statement of community involvement, the local development scheme and the annual monitoring report.

Local Development Documents (LDDs)

All development plan documents which will form part of the statutory Local Development Framework (LDF), as well as supplementary planning documents which do not form part of the statutory development plan.

Main River

A watercourse designated on a statutory map of Main Rivers, maintained by Defra, on which the Environment Agency has permissive powers to construct and maintain flood defences (and powers to control development).

Major development

A major development is:

- a) Where the number of dwellings to be provided is ten or more, or the site area is 0.5 Ha or more or
- b) Non-residential development, where the floor space to be provided is 1,000m² or more, or the site area is 1 ha or more.

Ordinary watercourse

All rivers, streams, ditches, drains, cuts, dykes, sluices, sewers (other than public sewer) and passages through which water flows which do not form part of a Main River. Local authorities and, where relevant, Internal Drainage Boards have similar permissive powers on ordinary watercourses, as the Environment Agency has on Main Rivers.

Permitted development rights

Qualified rights to carry out certain limited forms of development without the need to make an application for planning permission, as granted under the terms of the Town and Country Planning (General Permitted Development) Order (2010).

Planning Policy Statement (PPS)

A statement of policy issued by central Government to replace Planning Policy Guidance notes.

Previously-developed land

Land which is or was occupied by a permanent structure, including the curtilage of the developed land and any associated fixed surface infrastructure (PPS3 Annex B) (often referred to as Brownfield land).

Reservoir (large raised)

A reservoir that holds at least 10,000 cubic metres of water above natural ground level, as defined by the Flood and Water management Act (2010).

Residual risk

The risk which remains after all risk avoidance, reduction and mitigation measures have been implemented

Resilience

Constructing a building in such a way that although flood water may enter the building, its impact is minimised, structural integrity is maintained and repair, drying & cleaning are facilitated.

Resistance

Constructing a building in such a way as to prevent flood water entering the building or damaging its fabric. This has the same meaning as flood proof.

Return period

The long-term average period between events of a given magnitude which have the same annual exceedance probability of occurring.

Risk

The threat to property and life as a result of flooding, expressed as a function of probability (that an event will occur) and consequence (as a result of the event occurring).

Run-off

The flow of water from an area caused by rainfall.

Section 106 Agreement

Section 106 of the Town and Country Planning Act 1990 (as amended) allowing local planning authorities to negotiate arrangements whereby the developer makes some undertaking if he/she obtains planning permission. These are known interchangeably as planning agreements, planning obligations or planning gain.

Section 106 (Water Industry Act 1991)

A key section of the Water Industry Act 1991, relating to the right of connection to a public sewer.

Shoreline Management Plan (SMP)

A plan providing a large-scale assessment of the risk to people and to the developed, historic and natural environment associated with coastal processes. It presents a policy framework to manage these risks in a sustainable manner.

Standard of Protection (SOP)

The design event or standard to which a building, asset or area is protected against flooding, generally expressed as an annual exceedance probability.

Strategic Environmental Assessment (SEA)

European Community Directive (2001/42/EC) which assesses the effects of certain plans and programmes on the environment.

Strategic Flood Risk Assessment (SFRA)

The assessment of flood risk on a catchment-wide basis for proposed development in a Local Planning Authority area.

Sustainable Drainage Systems (SUDS)

A sequence of management practices and control structures, often referred to as SUDS, designed to drain water in a more sustainable manner than some conventional techniques. Typically these are used to attenuate run-off from development sites and involve infiltration to ground wherever feasible.

Sustainability Appraisal (SA)

An integral part of the plan-making process which seeks to appraise the economic, social and environmental effects of a plan in order to inform decision-making that aligns with sustainable development principles.

TUFLOW

TUFLOW is a software package used for 2-Dimensional river modelling. It is used as an analysis tool for flood risk management.

Vulnerability Classes

PPS25 provides a vulnerability classification to assess which uses of land maybe appropriate in each flood risk zone.

Washland

An area of the floodplain that is allowed to flood or is deliberately flooded by a river or stream for flood management purposes.

Water Framework Directive (WFD)

A European Community Directive (2000/60/EC) of the European Parliament and Council designed to integrate the way water bodies are managed across Europe. It requires all inland and coastal waters to reach “good status” by 2015 through a catchment-based system of River Basin Management Plans, incorporating a programme of measures to improve the status of all natural water bodies.

Windfall sites

Sites which become available for development unexpectedly and are therefore not included as allocated land in a planning authority’s development plan.

1 Introduction

1.1 Background

JBA Consulting was commissioned by Newcastle City Council to undertake a Level 2 Strategic Flood Risk Assessment (SFRA). The Level 2 SFRA has been prepared in accordance with current best practice, Planning Policy Statement 25 Development and Flood Risk (PPS25)² and the PPS25 Practice Guide³.

This User Guide has been prepared in support of the SFRA. The guidance should be used to understand the process and procedures required to support development planning and flood risk guidance in accordance with PPS25.

This User Guide has been developed to provide guidance on the use of the SFRA for Local Authority Spatial Planning, Regeneration, Flood Risk Management, Development Management and Emergency Planning.

1.1.1 Flood Risk Assessment

Flooding is a natural process that is not restricted by political demarcations or administrative boundaries. It is primarily influenced by natural factors such as rainfall, tides, geology, topography, rivers and streams and infrastructure such as flood defences, roads, buildings and sewers.

As demonstrated by the summer 2007 floods experienced across England, flooding can cause significant disruption to communities, substantial damage to property and possessions, and loss of life. For these reasons it is important to avoid, as a matter of principle, development in flood risk areas.

Where this is not possible then the vulnerability of the proposed land use to flooding should be considered and measures taken to minimise flood risk to people, property and the environment. This is the basis of the risk-based sequential approach to managing flood risk.

Current Government policy requires LPAs to demonstrate that sufficient consideration has been given to the issue of flood risk as part of the planning process. It also requires that flood risk is managed in an effective and sustainable manner. Where new development is exceptionally necessary in flood risk areas, the policy aim is to make it safe without increasing flood risk elsewhere. Whenever possible, overall flood risks should be reduced.

A Strategic Flood Risk Assessment is a planning tool that enables the Council to select and develop sustainable site allocations away from vulnerable flood risk areas. The assessment focuses on the existing site allocations within the area but also sets out the procedure to be followed when assessing sites for future development.

It is recognised that considerable land use pressures for re-generation, inward investment and economic growth exist. It will guide the Council in developing strategies, policies and decisions in respect of their Local Development Frameworks (LDFs) and Local Development Documents (LDDs).

1.1.2 The Planning Framework

The land use planning process is driven by a whole host of policy guidance at national, regional and local levels. Whilst the majority of these policies are not aimed at mitigating flood risk, there are key links at strategic and operational levels between land use, spatial planning and Flood Risk Management (FRM) planning. These should be considered as part of a planned and integrated approach to delivering sustainable development.

Table 1-1 lists relevant legislation, plans, policies and strategies. More detail on these is provided in Appendix C .

² Communities and Local Government (2006) Planning Policy Statement 25: Development and Flood Risk

³ Communities and Local Government (2008) Planning Policy Statement 25: Development and Flood Risk – Practice Guide

Table 1-1: Relevant Legislation, Plans, Policies and Strategies

Flood risk	Planning
National level	
<ul style="list-style-type: none"> • EU Floods Directive – EU (2007) • Flood and Water Management Act – Defra (2010) • Future Water – Defra (2008) • Improving Surface Water Drainage – Defra (2008) • Making Space for Water – Defra (2005) • Learning Lessons from the 2007 Floods – Sir Michael Pitt (2008) 	<ul style="list-style-type: none"> • Planning Policy 25: Development and Flood Risk – CLG (2006) • Planning Policy 25: Development and Flood Risk Practice Guide –CLG (2008) • PPS1 Delivering Sustainable Development – ODPM (2005) • Planning Policy Statement: Planning and Climate Change, supplement to PPS1 – CLG (2007) • Planning Policy Statement 12 Local Spatial Planning - CLG (2008)
Regional level	
<ul style="list-style-type: none"> • Tyne Catchment Flood Management Plan – Environment Agency (2008) • North East Regional Flood Risk Appraisal (2008) • The North East of England Plan Regional Spatial Strategy to 2021 (2006) • North East England Climate Change Adaptation Study (2008) 	<ul style="list-style-type: none"> • Northumbria River Basin Management Plan – Environment Agency (2000-2009)
Local level	
<ul style="list-style-type: none"> • Flood risk assessments for development sites (referred to as necessary in SFRA volumes) 	<ul style="list-style-type: none"> • Emerging Local Development Frameworks for Newcastle • Existing UDPs for Newcastle • Newcastle Unitary Development Plan (1998)
<p>All relevant legislation, plans, policies and strategies - October 2010</p> <p>Please note that the North East of England Plan Regional Spatial Strategy to 2021 (2006) has been removed from the regional level legislation under forth coming Localism Bill</p>	

1.1.3 The SFRA

The Level 1 element of an SFRA (completed in March 2010 by JBA Consulting) is based on existing information that is required to make an assessment of flood risk from all sources, both now and in the future. It provides the evidence for LPA officers to apply the Sequential Test and identifies the need to passed the Exception Test where required. Both of these tests are a fundamental part of PPS25.

The main tasks for the Level 1 SFRA include:

- Stakeholder consultation, data collection and review
- Assessment of current flood risk
- Delineation of PPS25 Flood Zones including the Functional Floodplain and the impact of climate change
- Assessing flood risk from ‘other’ sources including surface water, groundwater, sewers and reservoirs
- Considering the impact of climate change
- Assessing potential development sites
- Producing a range of strategic flood risk maps
- SFRA recommendations

The SFRA has been developed further and provides evidence for key communities where the Exception Test may need to be applied. It considers the detailed nature of flood hazard taking account of the presence of flood risk management measures such as flood defences. The additional detail can also inform a sequential approach to development allocation within flood risk areas and mitigation options where appropriate.

The main tasks for this Level 2 SFRA comprise:

- Development more detailed understanding of hydraulic river models along the River Ouseburn and tributaries at strategic development locations in the absence of defences.
- Detailed surface water flooding maps, delineation of Critical Drainage Areas and recommendations for SWMPs
- Assessment of the consequences of development on flood risk elsewhere
- Assessment of the hydraulic interactions between different sources of flood risk
- Development Strategy
- Recommendations for future work

1.2 SFRA Monitoring

Whilst this SFRA has been produced using the most up-to-date national guidance and flood risk data, it is recommended that the SFRA should be updated on a regular basis. The Environment Agency has suggested that this be every 3 to 4 years, unless there is a significant flood affecting the area, in which case a review should be undertaken ASAP. A review of the SFRA should also be undertaken if there are any major national policy changes.

There are a number of key outputs from possible future studies and datasets which are known to be regularly updated. These should be incorporated in any updates to the SFRA. Table 1-2 shows the triggers for revising the SFRA.

Table 1-2: SFRA Review Triggers

Trigger	Sources	Possible Timescale
Tyne CFMP	Environment Agency	Updated every 5 years
Flood Zones	Environment Agency	Updated quarterly
NFCDD	Environment Agency	Ongoing
Possible Flood Event	All	Unknown
Sewer Flood Data	Northumbrian Water	Unknown
Planning Policy	Communities & Local Government	Unknown
Surface Water Management Plans	Newcastle City Council	Ongoing (expected 2011)
Preliminary Flood Risk Assessment	Newcastle City Council	Ongoing (expected 2011)

2 Guidance for Spatial Planners

The purpose of this section of the report is to provide guidance to Spatial Planners on dealing with allocations using the SFRA.

- **Scope the Sustainability Appraisal of the *Development Plan Document***
 - *Screen development options*
 - *Produce appropriate flood risk indicators*
- **Avoid sites at high risk of flooding where no other planning objectives outweigh flood risk**
 - *Using Sustainability Appraisal and Sequential Test Spreadsheet.*
- **Carry out the Sequential Test on proposed development sites**
 - *Using information provided in the SFRA and Sequential Test Spreadsheet to avoid sites at high risk.*
- **Identify those sites where a greater understanding of flood risk is required**
 - *These should include key development sites at high risk of flooding.*
- **Identify the likelihood of sites *passing* the Exception Test**
 - *Using the Sustainability Appraisal to assess development sites with regards to other planning objectives and assign weight given to flood risk as a planning constraint;*
 - *Using information provided in the SFRA to assess the level of risk to each site and likelihood of it remaining safe. If a site cannot pass all the criteria of the Exception Test it cannot be approved.*
- **Allocate appropriate development through the Sustainability Appraisal**
 - *Produce evidence that both Tests have been applied by noting the outcome and decisions made to avoid, substitute or allocate the site.*
- **Draft flood risk policies and develop guidance on each *allocated* site within the Sustainability Appraisal**
 - *Guidance should include the need for site-specific FRAs to pass Part C of the Exception Test.*

2.1 Introduction

PPS25 provides the basis for the sequential approach. The LPA should consider flood risk, the mechanism of flooding as well as the spatial distributions and development vulnerability in all stages of the development planning process.

PPS25 promotes positive planning to deliver strategic opportunities that reduce flood risk to communities. The Practice Guide provides further advice on how flood risk should be taken into account in the LDF (See Section 2.19-2.23 of PPS25 PG).

Throughout the risk-based sequential testing process, opportunities to minimise flood risk at each stage of the planning process need to be considered. The primary aim of these actions is to ensure that risks to people and property are effectively managed. The hierarchy of management decisions and actions comprise:

- Avoidance, by locating new development outside areas at risk of flooding;
- Substitution, by changing from more vulnerable to less vulnerable land uses; and,
- Control & Mitigation of residual risks, by implementing suitable flood risk management measures.

The SFRA provides information on flood risk allowing the LPA to:

- Produce appropriate policies for development management and site allocation;
- Produce appropriate flood risk indicators that inform the Sustainability Appraisal;
- Undertake the Sequential Test and (with sufficient and suitable information) Exceptions Testing; and,
- Allocate appropriate land use for development.

It is recommended that a supporting document is prepared, by the LPA, recording decisions made for each proposed development site. This should include all evidence considered in making a decision and this record will form the evidence base that demonstrates that both the Sequential and Exception Test have been applied.

In granting planning permission it will be the requirement of Development Management officers to confirm that all parts of the Exception Test have been addressed. During the initial spatial planning stage, only the likelihood of passing the Exception Test can be assessed. To pass the Exceptions Test a site-specific FRA will be required to identify constraints and demonstrate that safe development is achievable.

The SFRA also provides information to allow planners to make strategic decisions that identify the amount and type of development that may be suitable in the community and the reality of it remaining safe from flooding if allocated. It also identifies potential strategic mitigation strategies that may be required for development to be feasible in the area.

Figure 2-1 illustrates how the flood risk analysis process is taken into account within LDDs by using the SFRA. The flow diagram has been adapted from PPS25 Practice Guide (Figure 2-2). Each colour represents a key stage in the sequential approach process. Identical colours are used throughout this Chapter to make it easier to identify what guidance relates to individual steps within the sequential approach sequence.

PPS25 Practice Guide assumes a strong link with the Sustainability Appraisal, and the SFRA influences all stages of the Sustainability Appraisal. Hence, the generic flow diagram included in both the PPS25 Practice Guide and this User Guide should be amended to take account of steps which may have previously been implemented within the first pass of the Sustainability Appraisal.

Figure 2-1: Taking flood risk into account in LDDs

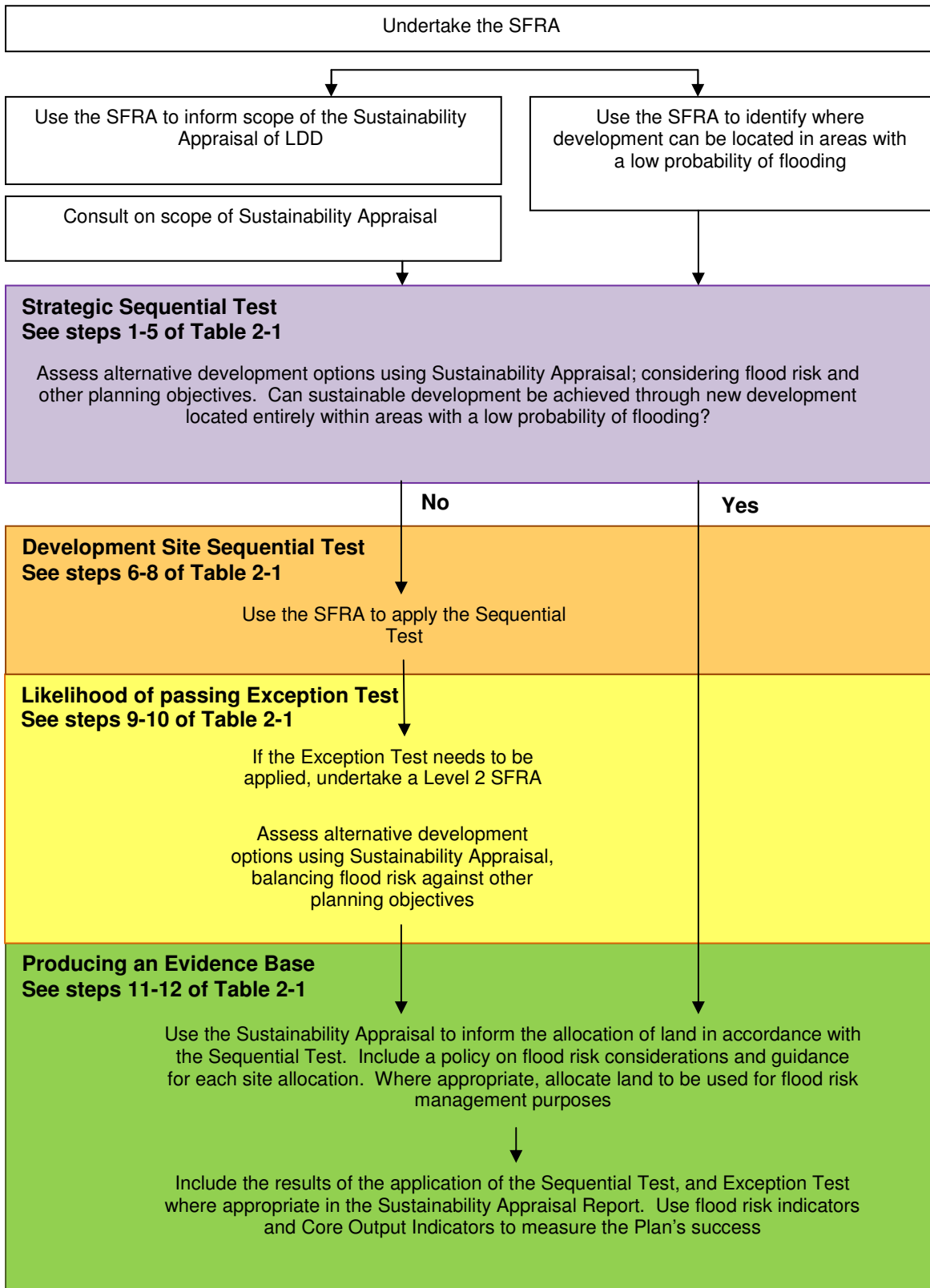


Table 2-1: Sequential & Exception Test Key Steps

Applying the Sequential Test during the SA of Development Options

- Step 1 - State the **geographical area** over which the Sequential Test is to be applied. This can be over the entire LPA area but will usually be reduced to communities to fit with functional requirements of development or objectives within RSS or Core Strategy
- Step 2 - Identify reasonably available areas of strategic growth
- Step 3 - Identify the presence of **all sources of risk** using the evidence provided in this SFRA
- Step 4 - **Screen available land** for development in ascending order from Flood Risk Zone 1 to 3, including the subdivisions of Flood Risk Zone 3
This can be achieved using the information provided in the Sequential Test Spreadsheet
- Step 5 - Could all development be located in lower risk areas? If not, move onto the next Steps

1st and 2nd Pass of the Proposed Development Sites Sequential Test

Follow Figure 2-4 using the Sequential Test Spreadsheet to:

- Step 6 - Identify those sites which should be **avoided** where risk is considered too great and there is no strategic planning objectives identified in Core Strategy
- Step 7 - Identify those sites in which the consequence of flooding can be reduced through **substitution** within the site boundary
- Step 8 - Assess yield and layout issues for remaining high risk sites to check whether development is viable

Identify the Likelihood of passing the Exception Test

Follow Key Questions imbedded within Figure 2-5 and SFRA evidence to identify the likelihood of those sites remaining at risk passing the Exception Test.

- Step 9 - Assess the compatibility of the **development vulnerability** using Table D.2 of PPS25 and identify the requirement of passing the **Exception Test** using Table D.3 of PPS25
- Step 10 - Use the SA to assess alternative development options by balancing flood risk against other planning constraints. **Proposed sites should be avoided and removed from this process if:**
 - Key Questions in Figure 2-5 attributes a significant negative response
 - Where development will require significant mitigation measures to make the site safe and to reduce impacts downstream
 - Where the requirement of loss of floodplain compensation cannot be delivered

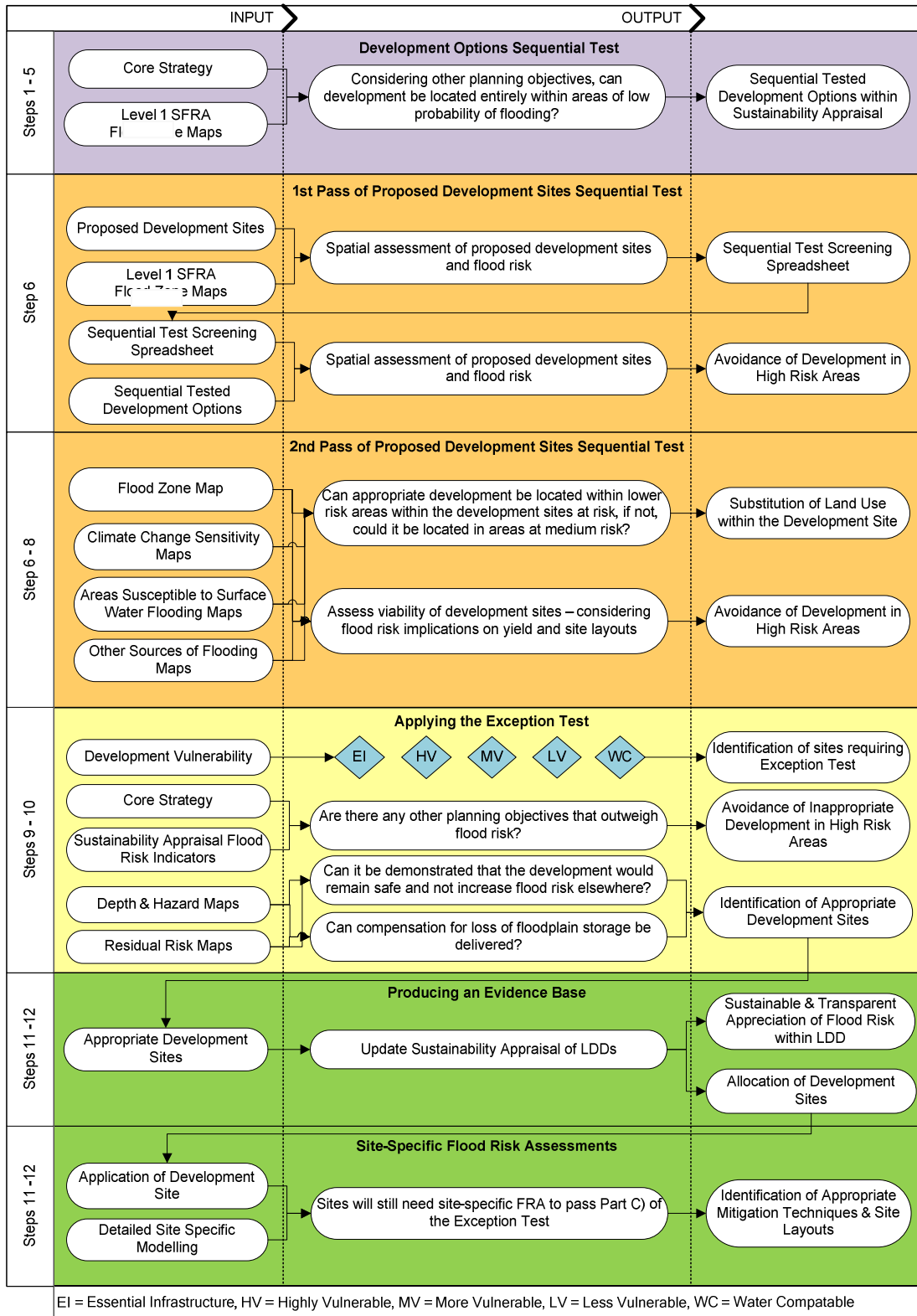
Producing an Evidence Base

The following steps should be used within the SA to produce the evidence that all Tests have been applied:

- Step 11 - **Produce a supporting stand alone document** recording all decisions made during Steps 1 to 10. Each proposed development site should be referenced and the decisions made to avoid, substitute, or allocate the site and the evidence used. This can be incorporated within the appendix of the SA
- Step 12 - **Allocated development allocations within the SA**, including appropriate flood risk policies and development guidance on each allocated site. Guidance should include the need for appropriate site-specific FRAs.

*The Environment Agency and other relevant stakeholders (such as United Utilities, British Waterways) should be **consulted** on any policies drafted that inform the application of the Exception Test and the production of FRAs within the LPA area*

Figure 2-2: Sequential Test and Exception Test Flow Diagram



2.2 Sequential Test

When allocating or approving land for development in flood risk areas, those responsible for making development decisions are expected to demonstrate that there are no suitable alternative development sites (of the type and nature proposed by the Core Strategy) located in lower flood risk areas.

PPS25 introduces a Sequential Test that is core to the SFRA process. The Sequential Test is the key driver for the SFRA. In order to carry out the Sequential Test the LPA need to know:

- Spatial extent of flood risk within the whole LPA area
- Flood Zones (See Appendix E)
- Flood Zone 1 – Low Probability: less than 0.1% AEP fluvial flood event
- Flood Zone 2 – Medium Probability: between a 1% AEP and 0.1% AEP fluvial flood event
- Flood Zone 3a – High Probability: with a 1% AEP or greater fluvial flood event
- Flood Zone 3b – Functional Floodplain: land where water has to flow or be stored in times of flood. This is land which would flood with an annual probability of 1 in 20 (5% AEP) or greater in any year or is designed to flood in an extreme (0.1% AEP) flood.
- Flooding from other sources
- Location of proposed development sites and the proposed vulnerability of that development in flood risk terms (See Appendix E)

There are a number of steps that Spatial Planners may follow when Sequentially Testing sites and assessing the likelihood that a site will pass the Exception Test. These are:

- The LPA is required to prioritise the allocation of land for development in ascending order from FZ 1 to FZ 3 (including subdivisions of FZ 3);
- The general approach to be followed when assessing sites is included as Figure 2-4. This, combined with the information provided in the Sequential Test spreadsheet, should be used to identify those sites to be avoided where risk is considered too great;
- Identify those sites where substitution is possible due to high percentage of land within lower flood risk areas;
- Using Figure 2-5, identify those sites that may pass the Exception Test (See section 2.3 for further detail on the requirements for Exceptions Testing). Remove those sites where:
 - i. *There is little or no planning justification to pass Part A of the Test;*
 - j. *Where sites are located on Greenfield land;*
 - k. *Where development will require drastic and complicated mitigation measures to make the site safe.*
- Produce a supporting document recording all decisions made during the decision-making process. Each proposed development site should be referenced and the decisions made to avoid, substitute, or allocate the site and the evidence and/or reasoning used to make the decision should be recorded.
- Those sites which have been allocated must be identified in the relevant LDD accompanied by appropriate FRM policies which the LPA must then use when considering planning applications. These should include the need for an appropriate site-specific FRA.

There are a number of key challenges faced by the LPA in applying the Sequential Test. The Sequential Test is purely based on the Flood Zones as defined by Table D.1 of PPS25, but these zones only take account of fluvial and tidal flooding, which ignore the presence of flood risk management measures such as defences. Other sources of

flooding must also be considered in the spatial distribution of development. However, it can be problematic to map the spatial extent of flooding from other sources as well as matching the level of risk associated with other sources with those presented within the three Flood Zones. For instance, Flood Zone 3 cannot be directly related to a high susceptible area at risk of surface water flooding as the probability and consequences are significantly different.

Whilst it may not be appropriate to avoid development at risk from other sources of flooding, risk should be considered when taking a sequential approach to land use or the substitution of lower development vulnerability in higher risk areas within a development site.

2.3 Exception Test

If the Sequential Test has been successfully applied, following the steps in Figure 2-2, and the LPA cannot allocate development in lower flood risk areas, Table D.2 of PPS25 and the vulnerability of development should be referred to.

Only once the vulnerability of the development is defined using Table D.3 of PPS25 should an assessment be made of whether or not that development is appropriate within that Flood Zone and whether the Exception Test needs to be applied.

Figure 2-3 below has been produced from Table D.3 of PPS25.





















Where new development is exceptionally necessary within areas at risk of flooding, Government policy aims to make it safe without increasing flood risk elsewhere and where possible reducing overall flood risk. This is in accordance with paragraph 19 of PPS25, which states:

“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 economical blight and the need for essential civil infrastructure to remain operational during floods...”




PPS25 explains where and for what type of development the Exception Test needs to be applied. In some situations, for certain types of development, it is not appropriate to use the Exception Test to justify development. For example, highly vulnerable development cannot be justified within the high risk zone through the use of the Exception Test.

Figure 2-3 shows flood risk vulnerability and flood zone compatibility, indicating situations where it is necessary and appropriate to apply the Exception Test, the Exception Test must not be used to bypass the Sequential Test.

Figure 2-3: (Where the Exceptions Test Applies)

Zone	Category				
	EI	HV	MV	LV	WC
1					
2					
3a					
3b					

EI = Essential Infrastructure, HV = Highly Vulnerable, MV = More Vulnerable, LV = Less Vulnerable, WC = Water Compatible

-  Denotes that development would be permitted. An FRA would be required in Zones 2 & 3 and may be required in Zone 1 sites
-  Denoted where Exception Test is required
-  Denotes that development should not be permitted in this zone

There are three stringent conditions, all of which must be fulfilled before the Exception Test can be passed. These conditions (see paragraph D9 of PPS25) are as follows:

- 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 LDD has reached the 'submission' stage (see Figure 4.1 of PPS12: Local Development Frameworks) the benefits of the development should contribute to the Core Strategy's Sustainability Appraisal (SA);
- b. The development must be on developable previously-developed land or, if it is not on previously-developed land, that there are no reasonable alternative sites on developable previously-developed land; and
- c. A site-specific FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

It will be the requirement of Development Management officers to make sure all parts of the Exception Test have been passed in granting planning permission (see Section 3). At a Spatial Planning stage, only the likelihood of passing the Exception Test can be assessed, as actually passing the Test will require the completion of a site-specific FRA to determine if the site and its occupiers will be safe during times of flood.

What should be done at this early stage of the planning process is to identify those sites in which the Exception Test is required and to avoid those sites in which flood risk is too great, using the information provided in the SFRA, or there is no overriding planning objectives for that development.

2.4 Applying the Sequential Test and assessing the likelihood of passing the Exception Test

This section provides the following guidance on how Spatial Planners are to apply the Sequential and Exception Test within the Sustainability Appraisal of LDDs.

Figure 2-1 identifies how flood risk is taken into account in LDD and introduces the use of the Sustainability Appraisal in applying the Sequential and Exception Tests.

What the guidance below will do, if followed appropriately, is produce clear and transparent evidence that both the Sequential and Exception Test have been applied, which can then feed into the Sustainability Appraisal process of LDDs. This can either be reported within the Sustainability Appraisal itself or a supporting stand alone document which then feeds into the Sustainability Appraisal.

The guidance provided in this SFRA User Guide should not supersede PPS25 or other plans and policies, but should be seen as a practicable approach in how the LPA should apply the Sequential and Exception Tests within the preparation of the LDF.

2.4.1 Spatial Planning Flow Diagrams and Tables

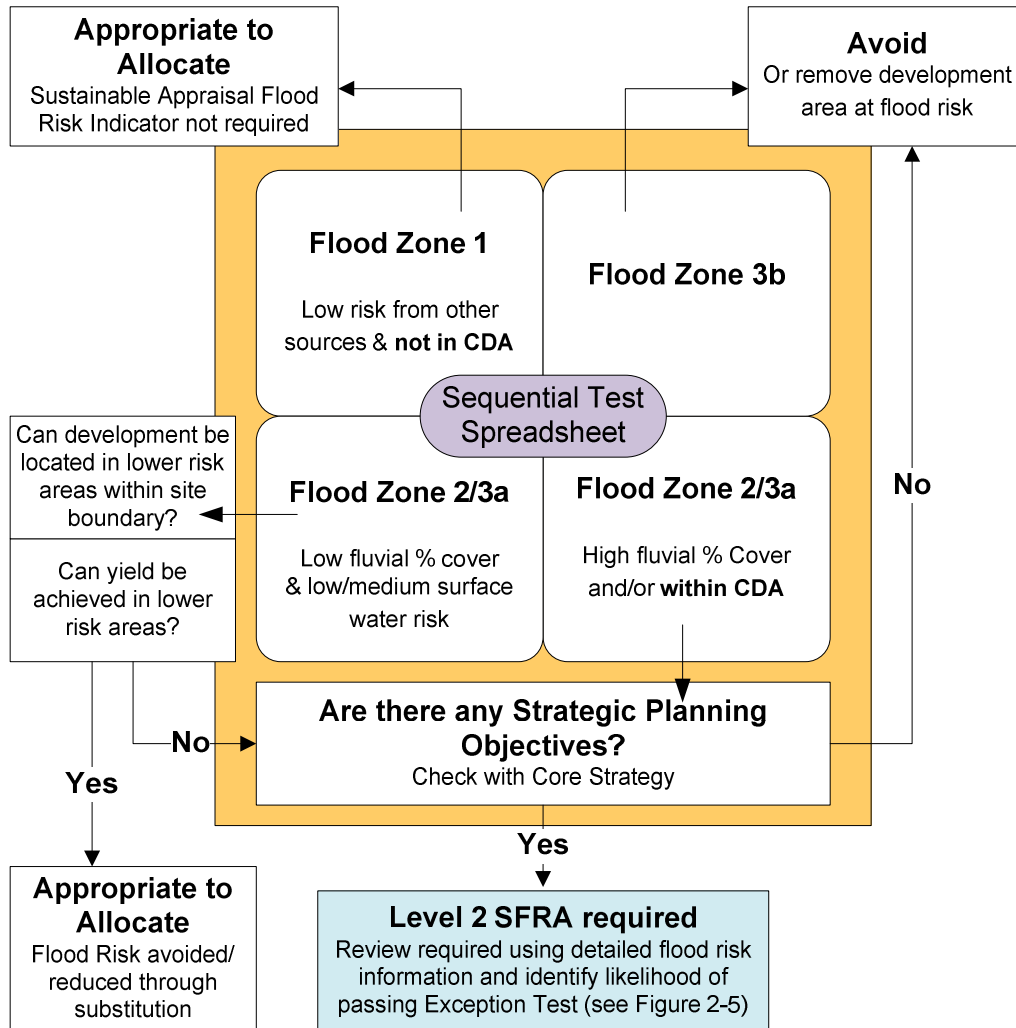
The following flow diagrams and tables provide a recommended approach for Spatial Planners in applying the two tests, keeping in mind the flood risk management hierarchy of avoid, substitute, control and mitigate, whilst identifying and allocating sustainable development sites.

Figure 2-4, illustrates the Sequential and Exception Tests as a process. The main inputs being the evidence provided in the SFRA and the LPA Core Strategy and Sustainability Appraisal. The flow diagram begins by the LPA assessing alternative development options at a strategic scale using the Sustainability Appraisal. This expands to use evidence provided in the SFRA to avoid inappropriate development sites, substitution within the site boundary and identifying those sites requiring Exception Testing. The flow diagram concludes by revisiting and updating the Sustainability Appraisal with the allocation of development sites. Figure 2-4 can be linked to Table 2-1 which provides a more detailed descriptive step by step guide of the illustrated flow process.

During this process there is a need to identify which sites should be avoided, substituted, those which can go forward, or once the Sequential Test has been applied how to assess if the site will remain safe during the Exception Test. This is a step wise process and must be documented, but a challenging one as a number of the criteria used are qualitative and based on experienced judgement.

Figure 2-4 provides additional guidance on using the Sequential Test spreadsheet produced in the SFRA. Figure 2-5 provides guidance on how to assess the likelihood of sites passing the Exception Test using key questions and evidence.

Figure 2-4: First and Second Pass of Proposed Development Sites Sequential Test



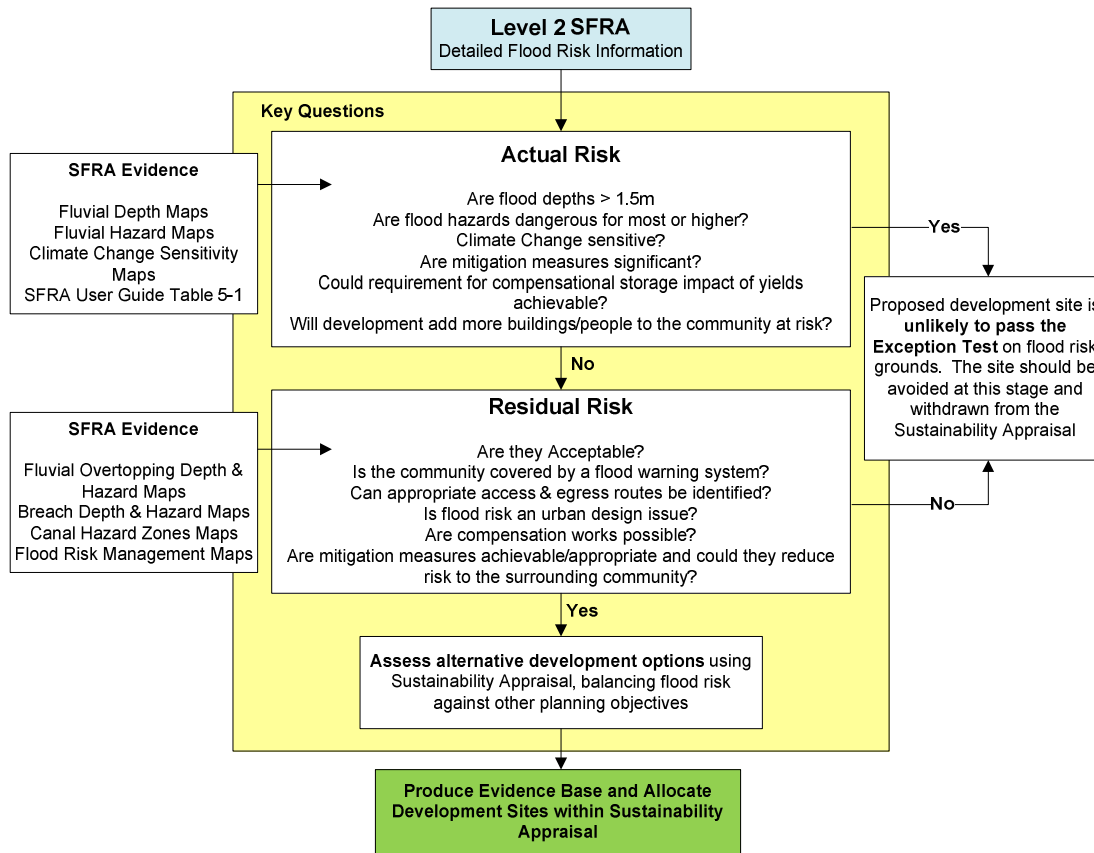
Spatial Planners will need to assess the likelihood of sites passing the Exception Test. This is seen as a critical part of the spatial planning process by avoiding inappropriate development being allocated. The Environment Agency and/or Development Management are likely to object to inappropriate development.

During Steps 9 and 10, Spatial Planners are asked to assess whether or not a site highlighted at flood risk has the potential to pass the Exception Test. This requirement can be linked to Figure 2-5.

By following the process outlined in Figure 2-4, Spatial Planners should be able to obtain a greater understanding on the level of flood risk present at each key development site that remains following the application of the Sequential Test.

During Steps 9 and 10, following Figure 2-2, Spatial Planners should use the Sustainability Appraisal process to assess alternative sites against flood risk indicators and other planning considerations. Once this has been completed, Steps 11 and 12 can be carried out, producing the evidence base for the Sustainability Appraisal, allocating appropriate development sites, producing flood risk policies and development guidance.

Figure 2-5: Identifying the Likelihood of Passing the Exception Test



2.5 Flood Risk and other Land Use Policies

Flood risk is a material consideration in land use planning decision making and can greatly impact on the sustainability of various land uses in all locations. Having applied the Sequential Test and Exception Test where necessary, the resultant assessment of appropriateness and associated flood risk information will then influence the land use planning decision at whatever level it is being considered.

Land use policies and wider strategic decisions involving social and economic development in the LDDs will be influenced and shaped by the sequential approach informed by this SFRA.

For instance, the Green Infrastructure (GI) of Newcastle is a planned and managed network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and rural fringe consisting of:

- Open Spaces – parks, woodlands, nature reserves, lakes
- Linkages – River corridors, pathways and cycle routes and greenways
- Networks of “urban green” – private gardens, street trees, verges and green roofs

With regards to flood risk, green spaces can be used to manage storm flows and free up water storage capacity in existing infrastructure to reduce risk of damage to urban property, particularly in city centres and vulnerable urban regeneration areas. Green infrastructure (GI) can also improve accessibility to waterways and improve water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity.

GI should be incorporated into master planning and individual sites, directed by the need to retain exceedance flood paths and natural attenuation of flood flows.

The evidence provided in the Level 2 SFRA should be used to identify opportunities for delivering FRM measures through GI. River corridors identified as functional floodplain are an excellent linkage of GI and can provide storage during a flood event. Areas identified within the urban environment or upstream of a critical surface water flood areas should be incorporated into council GI strategies. Opening up land to create flow paths or flood storage areas can help protect current and future developments.

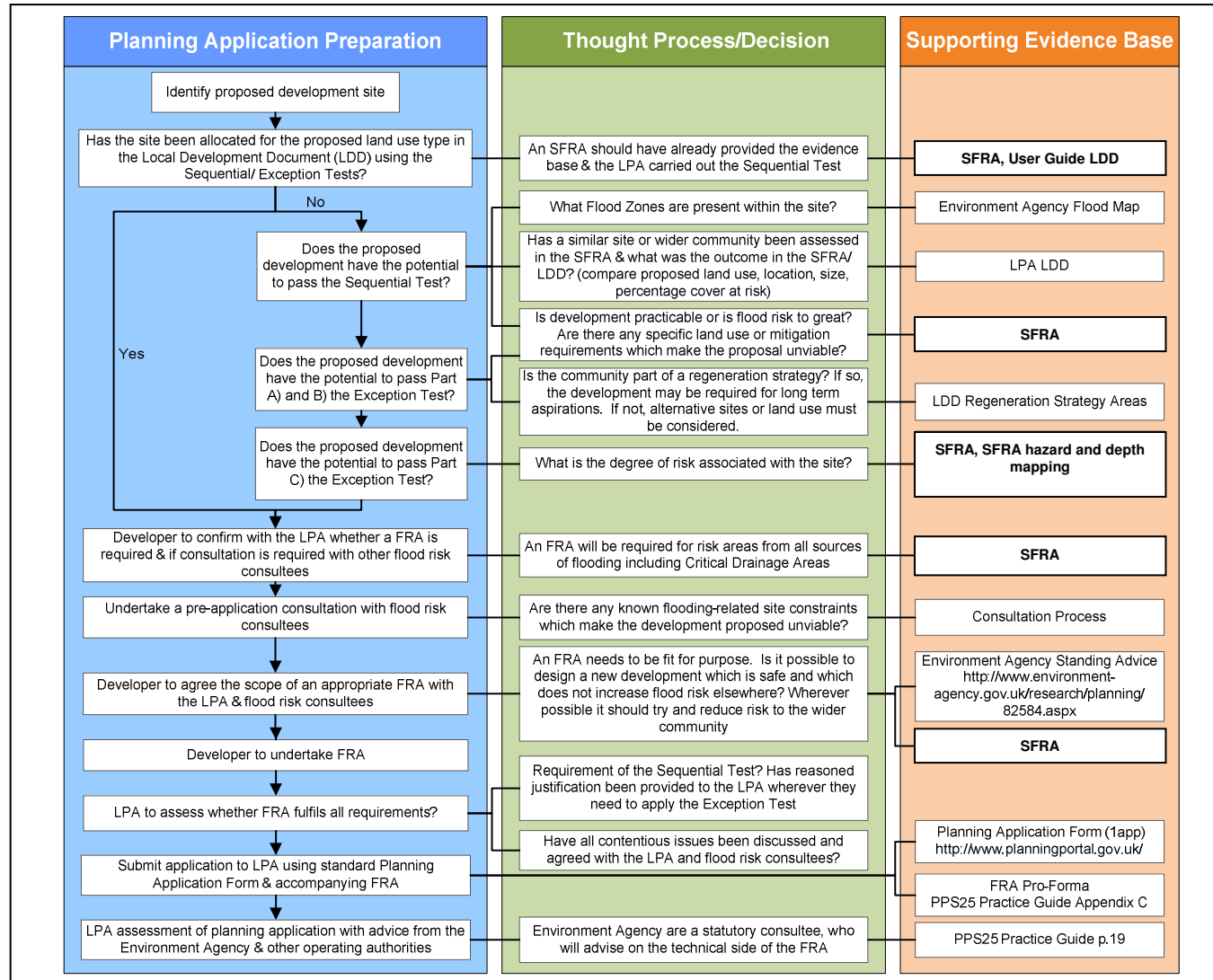
3 Guidance for Development Management

The aim of this section is to provide guidance on the use of the SFRA by Development Management.

When reviewing individual planning applications, Planners should use the Guidance in this SFRA User Guide, PPS25 and its Practice Guide to:

- **Check whether the Sequential Test and/or the Exception Test have already been applied**
 - *Refer developer to LDD and supporting evidence to identify if the Sequential Test has been applied and development is likely to pass the Exception Test (a site may have already been assessed) ;*
 - *If evidence is available, the Sequential Test and likelihood of passing the Exception Test have been assessed. If no evidence is available, developers must carry out the Sequential and Exception Tests.*
- **Refer developer to the following in order for them to apply the Sequential and Exception Tests**
 - *SFRA (to inform Sequential Test);*
 - *Sequential Test Spreadsheet (to compare similar sites already assessed);*
 - *SFRA (to inform Exception Test);*
 - *SFRA maps (to review scale and nature of flood risk and residual risk);*
- **Consult with Environment Agency and other relevant stakeholders to**
 - *Assess flood risk constraints identified on site using the SFRA*
- **Scope an appropriate FRA**
 - *What is the scale and nature of risk from all sources?*
 - *Does the site lie within a CDA?*
 - *Are there any strategic mitigation requirements identified in the SRA or LDD?*

Figure 3-1: Planning Applications and Flood Risk



3.1 Introduction

The LPA are the decision-makers on planning applications for new development. Whilst it is the developer's responsibility to fully consider flood risk issues, the LPA should be involved during any pre-application discussions.

Following on from recommendations made in the Pitt Review, Development Management must take some of the roles and responsibilities from the Environment Agency as the first point of call in Flood Risk Management and planning applications.

Flood risk needs to be considered at a strategic level by Development Management officers, even though applications for proposed developments are submitted on a site by site basis. Applications may need to fit within a wider flood risk management strategy for an area rather than on a site by site basis.

Consideration of flood risk within the context of an individual planning application is shown on Figure 3-1. It highlights flood risks that may be taken into account using information provided within the Newcastle SFRA, as well as the guidance provided in PPS25 and the EA's Standing Advice.

Development Management officers must always consider development from a strategic view point and the accumulative effect of all proposed development taking place, even though applications for developments are submitted at a site level. It should not be presumed that flood risk has been understood at a strategic high level and that one application may need to fit within a flood risk management strategy for an area.

3.2 The Sequential Test and Exception Test

If the proposed site is already identified in a Sequentially Tested LDD, which is supported by the findings of the SFRA and transparent evidence that the Sequential Test has been carried out, the site will already have been through the Sequential Test. The developer must still apply the sequential approach to site layout when matching land use vulnerability.

However, where a site has not been identified within a Sequentially Tested LDD, the Sequential Test will need to be applied i.e. the developer will need to provide evidence to the LPA that there are no other reasonable available sites where the development could be located. The LPA will then use this information to apply the Sequential Test. This particularly applies to Windfall Sites that have not been allocated in the LDF.

Developers will need to provide evidence that the Exception Test can be passed. This will be needed for allocated and windfall sites, if required according to the vulnerability of the proposed land use, areas requiring redevelopment or regeneration, redevelopment of existing single properties or changes of use. Development Management will then need to review the evidence provided and decide whether a site passes the Exception Test.

Development in certain existing communities may find it difficult to pass both the Sequential Test and Exception Test due to the nature of flood risk and/or the scale of mitigation which would be required in order to make the development safe. These should be transformed into flood risk policies within the appropriate LPA LDDs. More detail on mitigation options is also provided in Section 5 of this User Guide.

PPS25 Practice Guide Section 4.20 to 4.39 provides more detail and recommended approach on how to apply the Sequential Test and Exception Test to individual planning applications, windfall sites, existing and single properties and change of use and should be referred to.

3.3 Supporting the FRA Process

All development applications must be supported by an appropriate site-specific FRA in accordance with the guidance provided in PPS25 Practice Guide Section 3.70 to 3.89.

At the earliest practical stage, Development Management should refer developers to the SFRA including the associated flood risk mapping. The developer should also be referred to the appropriate LDD and flood risk policies which could potentially influence their development proposals.

If a site has been identified as being at risk of flooding from any source, Development Management and the developer should consult the Environment Agency and other relevant flood risk consultees, such as Northumbrian Water to identify known flood-related site constraints and agree the scope of an FRA.

The Environment Agency Standing Advice should be used at this stage. This can be accessed online (<http://www.environment-agency.gov.uk/research/planning/82584.aspx>).

The Environment Agency is a statutory consultee for specific categories of development where flood risk is an issue. Table 3-1 outlines when a more detailed FRA may be required.

Table 3-1: FRA considerations and SFRA supporting evidence

Considerations	Supporting evidence in the SFRA
The development other than minor development is situated in Flood Zone 2 and 3	Flood Zone Maps or Flood Zones on Environment Agency website if updated. See PPS25 Practice Guide Section 2.43 for definition of minor developments
The development is >0.5 hectares situated in Flood Zone 1, but there are critical drainage problems (i.e. the development lies within a Critical Drainage Area) or the site has been identified as being at risk of flooding from other sources	Critical Drainage Area Maps
The development is at risk of flooding from other sources of flooding	Refined Surface Water maps and Other Sources of Flooding maps
The development is situated behind flood defences (possibility of overtopping during extreme flood event or breach)	Flood Risk Management maps, ABDs and Defences maps, Depth and Hazard maps for the 1 in 100 year flood events, including the consideration of climate change
The development exceeds 1ha in size	Consult Environment Agency
The development is within 20m of the bank top of a Main River – the Environment Agency will have to consent to any work within 5m of a Main River and are likely to object in principal to any development within these areas	Consult Environment Agency
Any culverting operation or development which controls the flow of any river or stream	Consult Environment Agency

4 Guidance for Developers

The aim of this section is to provide guidance to Developers on using the SFRA.

Developers should use the Guidance in this SFRA User Guide, PPS25 and its Practice Guide to:

- **Assess whether the site is a**
 - *Windfall development, allocated development within the LDF, within a regeneration area, single property or change of use to identify if Sequential and Exception Tests are required.*
- **Check whether the Sequential Test and/or the Exception Test have already been applied**
 - *Request information from the LPA on whether the Sequential Test or likelihood of the site passing the Exception Test have been assessed;*
 - *If not, provide evidence to the LPA that the site passes the Sequential Test and will pass the Exception Test.*
- **Consult with LPA Development Management, the Environment Agency and the wider group of flood risk consultees where appropriate to scope an appropriate FRA if required.**
 - *Guidance on FRAs provided in this SFRA User Guide;*
 - *Refer to Outline Mitigation Strategy identified in the SFRA;*
 - *Also refer to Environment Agency Standing Advice, CIRIA Report C624, PPS25 and its Practice Guide;*
 - *Consult LPA emergency planners if required.*
- **Submit FRA to Development Management and Environment Agency for approval, where necessary**

4.1 Introduction

The SFRA provides the evidence base for developers to assess flood risk at a strategic level and determine the requirements of an appropriate site-specific FRA.

Developers will need to liaise closely with the LPA in the first instance to determine if a site is suitable for development. If a site is considered suitable then developers should prepare a site-specific FRA.

Developers should consider all sources of flood risk when assessing the suitability of a site. Guidance on developing within CDAs and areas at risk from sources other than fluvial flooding is provided in this section.

Figure 4-1 provides a useful overview of the consideration of flood risk within the context of an individual site planning application.

4.2 The Sequential Test and Exception Test

The Sequential Test and Exception Test are fundamental to PPS25 in determining the suitability of land for development in regard to flood risk and avoidance of flood risk to new development. These tests may still be required at an individual site level. Table 4-1 identifies when the Sequential and Exception Tests are required for certain types of development and who is responsible for providing the evidence and those who need to apply the tests. Further information is provided in Section 4 of the PPS25 Practice Guide.

If the developer is required to provide evidence that the site can pass the Sequential Test and/or Exception Test if appropriate, then further guidance on these can be found in Section 2 of this User Guide.

Table 4-1: Development types and application of Sequential and Exception Tests

Development / PPS25 PG Reference	Sequential Test Required	Who Applies the Sequential Test?	Exception Test Required?	Who Applies the Exception Test?
Allocated Sites	No	LPA should have already carried out the test during the allocation of development sites within their LDD	Dependent on land use vulnerability	LPA to advise on the likelihood of test being passed. But the developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Windfall Sites	Yes	Developer provides evidence that the test can be passed to the LPA. An area of search to be agreed, but should be within local community boundary.	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Regeneration Sites Identified Within LDD	No	-	Dependent on land use vulnerability	LPA to advise on the likelihood of test being passed. But the developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Redevelopment of Existing Single Properties	No	-	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA

Development / PPS25 PG Reference	Sequential Test Required	Who Applies the Sequential Test?	Exception Test Required?	Who Applies the Exception Test?
Changes of Use	No	-	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA

4.3 Site specific Flood Risk Assessments

The principal aims of an FRA are to determine the level of flood risk to a site and to confirm that suitable flood management measures can be developed to control flooding, and safeguard life and property, without increasing risk to the surrounding area.

Once the site has been Sequentially Tested, and has been identified as being likely to pass the Exception Test, a site-specific FRA should be undertaken. The LPA and EA should be consulted in order to determine the content and scope of the FRA.

There are three levels of FRA:

- Level 1 is a screening study used to identify whether there are any flooding or surface water management issues that need to be considered further;
- Level 2 is a scoping study that should be undertaken if the Level 1 FRA indicates that there are flood risk issues that need further consideration; and,
- Level 3, which is a detailed study, where further quantitative analysis is required to fully assess flood issues and confirm that effective mitigation measures can be implemented to control flood risk.

The SFRA is an assessment of flood risk at a strategic level. This information can be used to provide evidence for Level 1 and Level 2 FRAs. Where a more detailed FRA is required, then a developer should undertake a detailed assessment of the flood risk at the site. The scope of the FRA should be agreed by the developer through consultation with the LPA and EA.

Where a more detailed FRA is required the developer should undertake a detailed assessment of the flood risk to the site, using the SFRA to appraise flood risk issues and referring to the guidance in the SFRA User Guide, PPS25, its Practice Guide and CIRIA Report Development and Flood Risk. Developers should satisfy themselves that the data provided in this SFRA is up-to-date and accurate for use in their development proposals.

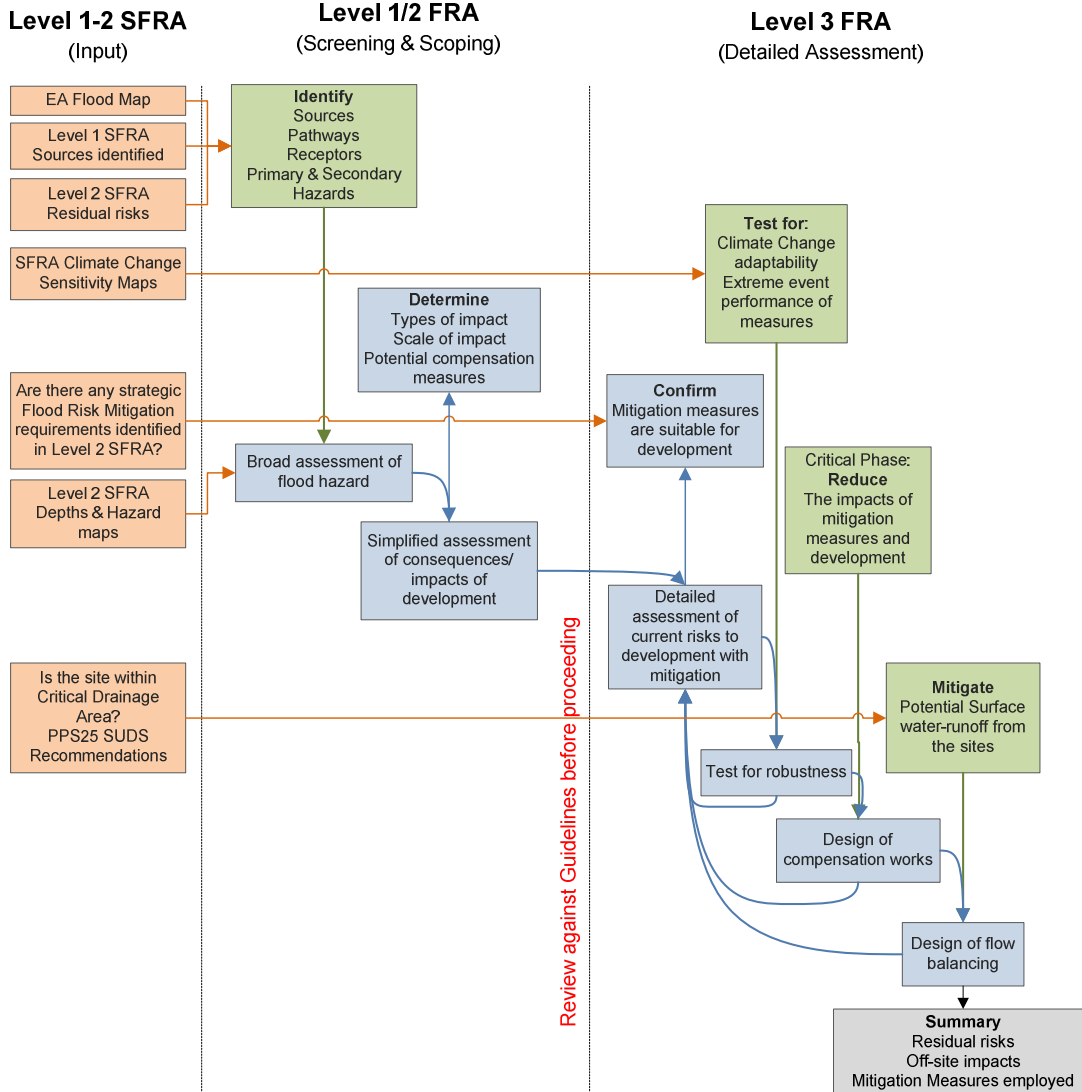
Table 3-1 indicates when a more detailed FRA is likely to be required. The actual scope of the FRA should be agreed between the developer, LPA and Environment Agency before it is undertaken.

The detail required for each level of FRA is highlighted in Figure 4-1. The production of a site-specific FRA can be seen as an iterative process with those carrying out a Level 1 FRA before moving on to a Level 2 and finally a Level 3. It is appropriate to review the level of risk present and assess whether development is appropriate and achievable at each stage of the assessment.

Significant consultation with the LPA and EA may be required for complex development proposals. Complex developments may need to include flood mitigation measures and compensatory storage.

Figure 4-1 also links the evidence provided in the SFRA which can inform the decision making process.

Figure 4-1: FRA Preparation



4.4 FRA Guidance

Flood Risk Assessments should follow the approach recommended by:

- The Environment Agency Standing Advice (<http://www.environment-agency.gov.uk/research/planning/82584.aspx>)
- CIRIA Report C624 Development and Flood Risk (Guidance for the Construction Industry) and;
- PPS25 and its Practice Guide

These documents describe when an FRA is required and the general issues that should be considered. The key requirements of an FRA are provided in Section 3 of the PPS25 Practice Guide. In general, the FRA should address the following issues:

1. Development Description and Locations

- What is the type of development and where will it be located?
- What is the vulnerability classification (Table D.2 of PPS25) of the current and future building use?

- Has the development site been assessed in the SFRA and is it in keeping with LDDs? (If so has the Sequential and Exceptions Testing been completed already?)

2. Definition of Flood Hazard

- What are the sources of flooding at the site?
- For each source how would flooding occur, referencing any historical records.
- What existing surface water drainage infrastructure is present on the site? (Consult with LPA, EA and Northumbrian Water)

3. Probability

- Confirm the FZ designation for the site (refer to the Flood Zone (FZ) Maps)
- Determine the actual and residual risks at the site (refer to the FZ Maps, depth and hazards maps and defences maps)
- What are the discharge rates and volumes generated by the existing site and proposed development?

4. Climate Change

- How is flood risk at the site likely to be affected by climate change?

5. Flood Risk Management Measures

- How will the site be protected from flooding, including the potential impacts of climate change, over the lifetime of the development?

6. Off Site Impacts

- How will the proposed development and measures be implemented to protect the site from flooding and control surface water run-off be designed and implemented?

7. Residual Risks

- What flood-related risks will remain after mitigation measures has been implemented?
- How, and by whom, will these risks be managed over the lifetime of the development?
- Developers should refer to section 6 of this volume for guidance on developing an emergency Flood Plan for a development site.

8. Groundwater

- Although groundwater flooding has not been identified as a major risk within the Newcastle area, this mechanism of flooding should be considered particularly when determining the acceptability of SUDs schemes as a way of managing surface water drainage. Developers should consult with the LPA and EA at an early stage of the assessment.

9. Sewer systems

- Where the SFRA has identified a risk of surface water flooding, any water that escapes from the sewer system would tend to follow similar flow paths and pond in similar locations.
- Developers should take account of the guidance for development in CDAs. Where required, liaison with Northumbrian Water should be undertaken at an early stage in the assessment process to confirm localised sewer flooding problems that could affect the site.
- Future development should be designed so that it does not increase existing sewer flooding problems.

4.5 Critical Drainage Areas

In certain locations an increase in the rate of surface water runoff is known to make development susceptible to localised flooding. Insufficient capacity in the surface water drainage system may exacerbate localised flood risk in areas outside of the EA Flood Zones.

A detailed FRA would be expected for planned development within these areas regardless of Flood Zone designation. This should demonstrate that new development is not at risk of flooding from existing drainage systems, will not increase risk to adjacent development or land and will include appropriate mitigation measures to safely control surface water runoff.

Critical Drainage Areas (CDAs) have been mapped as part of the SFRA. Ideally developers shall work closely with the LPA, EA and Northumbrian Water to develop strategies that manage surface water runoff. Where greenfield development is proposed, the aim should be to not increase runoff rates above the existing greenfield rate. Where brownfield development is proposed then the EA actually seek a reduction in the overall runoff rate.

Planning Policy Statement 1⁴ allows local planning authorities to stipulate high levels of flood risk where there are local circumstances allow and warrant it. As such, LPAs can designate CDAs as high flood risk areas.

Wherever possible, this should be achieved through the use of SUDs, constructed within the development site. The effectiveness of a flow management scheme within a single site is limited by site constraints including (but not limited to) topography, geology (soil permeability), development density, adoption issues and available area. The design, construction and ongoing maintenance regime of such a scheme must be carefully defined at an early stage.

4.6 Considering risk of flooding from other sources

Flood Risk Assessments (FRA) must take account of flood risk from all sources. The SFRA provides a more detailed analysis of actual and residual risk associated with flooding. At some locations there may be hydraulic interactions between different flooding sources. Where this is the case the FRA should look at the possible interactions in more detail. A FRA should reference any completed Surface Water Management Plan for guidance.

This section should be used by spatial planners to inform the development of policies in the Core Strategy on considering the risk of flooding from other sources.

4.6.1 Reservoirs

As part of a FRA, the developer should undertake a zone of search around their site to identify any reservoirs that lie on higher land. The risk of flooding from reservoirs should be considered in the FRA (which will be subject to the available data and national security implications of such an assessment).

Where this identifies smaller reservoirs, the FRA should determine the owner and maintenance regime of the reservoir. A more detailed investigation of the effects of the reservoir overtopping or failing should be undertaken. The developer should then liaise with the LPA and reservoir owner to determine applicable emergency planning requirements or mitigation needs. Where there is significant flood hazard identified to the site from such failure, and especially from un-maintained reservoirs, the developer should liaise closely with the LPA about the suitability of the site for development.

⁴ DCLG (2007) *Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1*

4.7 Drainage for new developments

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and a consequent potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure. It should be borne in mind that the sewer network in places across the Newcastle area was designed to drain less development than exists today. Development has added flow over time and the network is known to be at capacity in many places.

Controlling surface water discharges from new development is a crucial consideration if flood risk to new and existing development downstream is to be effectively managed. Planned development can also play a role in reducing the number of properties that are directly at risk from surface water flooding. The Planning System has a key role to play in settings standards for sustainable drainage from new developments and ensuring that developments are designed to take account of the risk from surface water flooding. Sustainable drainage plays an important part in reducing flows in the sewer network and in meeting environmental targets, alongside investment in maintenance and new capacity by Northumbrian Water.

Sustainable drainage and the use of Sustainable Drainage Systems (SUDS) is supported by the policy direction in *Future Water*⁵, *Making Space for Water*⁶, the Pitt Review⁷ and the Flood and Water Management Act⁸ that provides for more sustainable management of the water cycle, working in partnership across different agencies and new responsibilities for local flood risk management. In particular, the Flood and Water Management Act requires developers where practical, to include sustainable drainage in new developments to reduce flood risk and improve water quality. It includes ‘a requirement on developers to demonstrate that they have met national standards for the application of SUDS techniques before they can connect any residual surface water drainage to a public sewer (amending section 106 of the Water Industry Act 1991).’ As part of their new responsibility for local flood risk management, local authorities will be responsible for approving SUDS for new developments and adopting and maintaining them.

Recognising the above, drainage from new developments should incorporate storage, with residual discharge of surface water to the following networks in order of preference:

- Infiltration drainage (e.g. soakaways).
- Discharge to a watercourse
- Discharge to a public sewer

The choice of system will be determined by local ground conditions (including groundwater levels). Whilst infiltration SUDS may be the most suitable for new development, developers must consider the risk of contamination to underlying aquifers.

The guidance below should be used in addition to the Environment Agency Standing Advice⁹.

⁵ Defra (2008) *Future Water*

⁶ Defra, Department for Transport, HM Treasury and Office of the Deputy Prime Minister (2005) *Making Space for water: Taking forward a new Government strategy for flood and coastal erosion risk management in England; First Government response to the autumn 2004 Making space for water consultation exercise*

⁷ The Pitt Review (2008) *Learning lessons from the 2007 floods*

⁸ Defra (2010) Flood and Water Management Act © Crown Copyright

⁹ Environment Agency. Flood Risk Standing Advice for England - PPS25 National Version 2.0. Can be accessed online at <http://www.environment-agency.gov.uk/research/planning/82584.aspx>

4.7.1 Development sites in the wider local authority districts

Developers should use the following guidance regarding surface water runoff from new developments:

Allowable discharge rates

- Development should deliver Greenfield runoff on Greenfield sites up to a 1 in 100 year storm event, considering climate change
- Development should aim for a reduction in surface water runoff rates of at least 30% for Brownfield sites up to a 1 in 100 year storm event, considering climate change
- Development should be designed so that there is no flooding to the development in a 1 in 30 year event and so that there is no property flooding in a 1 in 100 year plus climate change event
- There may be local variations on this where outfalls are directly to larger watercourses and hence surface water discharges from development sites can pass downstream before the main peak on the watercourse.

Wherever possible, this should be achieved through the implementation of SUDS. Source control should be considered firstly. There may be opportunities to deliver SUDS through integrated solutions for collections of strategic sites. The future ownership and maintenance of SUDS systems should be discussed at the planning application stage with the relevant sections of the LPA (including Highways and Drainage), Northumbrian Water and the Environment Agency. More detail on SUDS is available in Appendix G.

The developer should liaise closely with the local authority drainage engineer, the Environment Agency and Northumbrian Water to determine appropriate discharge rates. The developer should prove that surface water discharges from the site will not have an adverse impact on flood risk elsewhere, with reference to investment planning by Untied Utilities that may increase the capacity of the sewer network in the area.

Overland flow paths

Underground drainage systems have a finite capacity and regard should always be given to larger events when the capacity of the network will be exceeded. Hence there is a need to design for exceedance. This should be considered alongside any surface water flows likely to enter a development site from the surrounding area.

Master planning should ensure that existing overland flow paths are retained within the development. As a minimum the developer should investigate, as part of a FRA, the likely depths and extents of surface water flooding on a development site when the national Areas Susceptible to Surface Water Flooding map and/or the surface water mapping produced for the Level 2 SFRA indicate that there is a risk of surface water flooding. This is a precautionary, but an appropriate approach to reduce the risk of flooding to new developments. Green infrastructure should be used wherever possible to accommodate such flow paths. Floor levels should always be set a minimum of 300mm above adjacent roads to reduce the consequences of any localised flooding.

The effectiveness of a flow management scheme within a single site is heavily limited by site constraints including (but not limited to) topography, geology (soil permeability), development density, existing drainage networks within the site and surrounding area, adoption issues and available area. The design, construction and ongoing maintenance regime of such a scheme must be carefully defined at an early stage and a clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential.

4.7.2 Critical Drainage Areas

Certain locations are particularly sensitive to an increase in the rate and volume of surface water runoff from new development. There are generally known local flooding problems associated with these areas. These areas have been defined as Critical Drainage Areas (CDAs) in the SFRA. Specific drainage requirements are required in these areas to help reduce local flood risk. The SFRA has designated CDAs as high flood risk areas.

These are areas with complex surface water flooding problems that would benefit from a drainage strategy, which is most effectively done in a Surface Water Management Plan.

The CDAs provided in the SFRA should be refined over time as more detailed information on flood risk and local flood management assets, including sewer catchments, becomes available.

In these areas, a detailed FRA is required regardless of which Flood Zone that applies for all developments over 0.5 hectares. This should demonstrate that new development is not at risk from flooding from existing drainage systems or potential overland flow routes. It should also demonstrate that the development will not adversely affect existing flooding conditions by the use of appropriate mitigation measures. The FRA should define and address the constraints that will govern the design of the drainage system and layout of the development site.

The Environment Agency Standing Advice allows developers to screen online for the level of flood risk assessment that is appropriate for a development with regard to the PPS25 Flood Zones. This highlights the need for a FRA in Flood Zones 2 and 3 and in Flood Zone 1 where there are critical drainage problems. The Standing Advice notes that for developments in Flood Zone 1 FRA Guidance Note 1¹⁰ should be followed:

'In areas where the Local Planning Authority has identified drainage problems through a Strategic Flood Risk Assessment or Surface Water Management Plan and they have indicated that a formal flood risk assessment is required'. FRA Guidance Note 1 requires FRAs to provide 'Proposals for surface water management that aims to not increase, and where practicable reduce the rate of runoff from the site as a result of the development (in accordance with sustainable drainage principles, and the Local Planning Authority's published SFRA).'

Proposals for development in Critical Drainage Areas as defined by this SFRA should follow the guidance and standards as set out below for developments that are within any flood zone.

Allowable discharge rates

Development should seek to reduce existing local flooding problems and not add to them. The following guidance should be followed:

- Development should deliver Greenfield runoff on Greenfield sites up to a 1% AEP storm event, considering climate change
- Development should aim for a minimum reduction in surface water runoff rates of 50% for Brownfield sites, with an aim of reducing runoff to Greenfield rates up to a 1% AEP storm event, considering climate change
- Development should be designed so that there is no flooding to the development in a 1 in 3.33 AEP event and so that there is no property flooding in a 1 in 100 year plus climate change event

Over time, it is envisaged that local authorities will commission drainage strategies (see below) to determine in more detail and establish the evidence base for set reductions in surface water runoff from development sites. With regard to this, the developer should liaise closely with the Environment Agency, Northumbrian Water and LPA as soon as possible to determine an appropriate reduction in runoff rate and volume with reference to discharge limits as laid down by any completed SWMP or drainage strategy for that area.

Wherever possible, this should be achieved through the implementation of SUDS. Source control should be considered firstly. There may be opportunities to deliver SUDS through integrated solutions for collections of strategic sites. The future ownership and maintenance of SUDS systems should be discussed at the planning application stage with the relevant sections of the LPA (including Highways and Drainage), Northumbrian Water and the Environment Agency. This approach should be taken unless the developer can

¹⁰ Environment Agency. Flood Risk Assessment (FRA) Guidance Note 1, Development Greater Than 1 Hectare (ha) in Flood Zone 1 (and Critical Drainage areas less than 1ha) Can be accessed online at <http://www.environment-agency.gov.uk/static/documents/Research/FRAGuidanceNote1.pdf>

demonstrate that this is not feasible and that there will be no adverse impact caused by the development elsewhere.

This is supported by Category 4 of the Code for Sustainable Homes, which requires developers to ensure that peak run-off rates and run-off volumes will be no greater than the pre-development conditions as a minimum. However, the code recommends that attenuation of the additional flows caused by development should be related to the degree of flood risk in an area. In 'high flooding risk areas', 100% of the additional volume should be attenuated.¹¹ Planning Policy Statement 1¹² allows local planning authorities to stipulate high levels of the code where there are local circumstances that allow and warrant it. **The SFRA has designated CDAs as high flood risk areas.**

4.7.3 Building Regulations

At the end of July external partners were invited to submit their ideas and evidence on ways to improve the Building Regulations, on reducing the regulatory burdens and on ways to deliver even better levels of compliance.

Several hundred responses were received providing helpful and valuable information which we have used in developing the programme. The key theme to emerge has been that partners believe the regime is generally fit-for-purpose, but that there are things that can be improved.

The plan now is to take forward a programme of work to examine a number of areas and to develop detailed proposals for consultation. This programme will have a particular focus on deregulation and streamlining of the technical and procedural aspects of the regulations.

Future Changes to the Building Regulations

A number of respondents also raised the issue of flooding and whether the regulations should specifically address flood resilience and resistance. The Government has undertaken some initial work that indicates there may be a cost-benefit case for incorporating certain measures in buildings at a high risk of flooding. However, there remains a question as to whether it is best done through national regulation. There are arguments that a voluntary approach may be better, to allow flexibility for local authorities or homeowners to decide what flood resilience measures best suit their individual circumstances. We want to fully explore the scope for non-regulatory measures to improve flood resilience before we consider regulatory intervention. In particular, we need to understand what the market failure is that prevents the take-up of resilient repairs by individuals.

In addition, the need to consider climate change adaptation has been raised as part of this process, for example, our intention to consider overheating in the context of the next review of Part L is mentioned above. Generally, the Department is committed to ensuring that wherever possible future changes to the Building Regulations seek to incorporate consideration of designing buildings for not only the existing, but also the future climate too. More specifically, significant adaptation issues such as overheating and flooding are being considered as part of the Government's wider consideration of adaptation issues.

Finally, there is also a third group of issues that we believe currently lack clear evidence to support regulation in 2013, but which we would not wish to definitively rule out. This includes whether to expand the provisions for radon gas protection and whether flood resilience/resistance should be incorporated into regulations.

4.7.4 Integrated drainage

There is the potential for groups of development sites coming forward to share a central and integrated solution for managing surface water runoff. This is best investigated further through a Surface Water Management Plan (SWMP) or a Drainage Strategy, which may or may not be undertaken at the same time as a SWMP. Such solutions can provide great

¹¹CLG (2006) Code for Sustainable Homes

¹²CLG (2007) Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1

benefits besides water management, including providing recreational facilities, improving biodiversity and making communities a better place to live. Where there are several sites that would share a communal facility, such sites may be funded through developer Section 106 or Community Infrastructure Levy payments. Drainage Strategies can be particularly useful for considering, recommending the implementation of and long term management arrangements for SUDS and setting appropriate runoff rates from new development. Recommendations for SWMPs and Drainage Strategies have been made in the SFRA.

5 Guidance for Flood Risk Management

5.1 Introduction

Throughout the risk-based sequential approach, opportunities should be taken to minimise flood risk at every stage of the planning process.

Mitigation measures should be seen as a last resort to address flood risk issues.

Mitigation measures must be designed to provide an appropriate level of protection to a site for the lifetime of the development. At many sites it may be technically feasible to mitigate or manage flood risk. However, the potential impacts of mitigation measures on flood risk to the surrounding community must be considered. Where the depth of flooding is substantial, these mitigation measures may result in practical constraints to development with significant financial implications.

The minimum acceptable standard of protection against flooding for new property within flood risk areas is the 1% AEP flood event for fluvial flooding, including allowance for climate change over the lifetime of the development.

5.2 Strategic Approach

Mitigation measures should be considered on a strategic basis to avoid a piecemeal approach and partnership is advocated between the LPA and EA. Measures should also be integrated with wider EA flood risk management works and strategies such as the CFMP. Refer to Appendix H for further details.

Outline flood risk mitigation strategies should consider the wider, cumulative impacts of mitigation. This requires master-planning an area from a flood-risk perspective.

In summary, taking a strategic approach to flood risk management involves consideration of:

- Avoidance of development in flood risk areas;
- Implementing a sequential approach to site layout, substituting higher vulnerability development in lower flood risk areas;
- Considering flooding from all sources;
- Wherever possible, using open land or green infrastructure to reduce risk, (e.g. by providing compensatory flood storage);
- Adopting mitigation measures that contribute to the wider community objectives for flood risk management in risk areas, (developers should aim to reduce risk to the wider community);
- The design and use of SUDs; and,
- Preparing emergency flood plans.

5.3 Potential mitigation measures

Table 5-1 summarises the evidence base used in the SFRA to identify what development could be seen as appropriate within a certain flood risk area and what mitigation measures could potentially be adopted to reduce the level of risk. Mitigation measures should fit into the wider strategic FRM approach, that is advocated for a community and ensure that there is no increase in flood risk to the surrounding community. The developer should liaise closely the Environment Agency and Development Management as to what mitigation measures may be suitable.

The Newcastle SFRA summarises a range of mitigation measures that could be appropriate. A summary of the measures has been reproduced in Appendix H.

Table 5-1: Possible Mitigation Measures

Flood Source	Risk Zone	Appropriate Development (See categorisation Table F1 Appendix F) ¹	Comments	Possible Mitigation
Fluvial Depths & Hazards	Flood Zone 1	EI, WC, HV, MV & LV	All development is viable within Flood Zone 1; however other sources of flooding should be investigated.	None required for fluvial but may be for other sources.
	Flood Zone 2, <0.3m depths and/or Very Low Hazard	EI, WC, HV, MV & LV	Low depth and hazards can be manageable with minor mitigation required.	Sequential approach to site layout. Flood resilient construction.
	Flood Zone 2, >0.3 depths, Dangerous for some and/or Dangerous for all	EI, WC, MV & LV	All development must be designed to remain safe up to the 1 in 100 + climate change event, however residual risks must be considered if the development is situated behind defences.	Sequential approach to site layout. Raising floor levels may be a possibility. Additional measures can be put in place to reduce damage to existing properties and increase the speed of recovery (i.e. temporary and permanent barriers and wet-proofing). These measures should not be relied on as the only mitigation method. Emergency planning must be considered and safe access and egress routes should be identified.
	Flood Zone 3, 0.3-1m depths and/or Dangerous for some	EI, WC, MV & LV	Sustainable mitigation and flood risk management may be feasible for both housing and employment purposes. There is a greater likelihood of passing the Exception Test. Areas may still have residual risks.	Sequential approach to site layout. Raising floor levels is acceptable and they should be raised to 600mm (floor levels are subject to agreed freeboard level with EA and Council) above the maximum water level during a 1% AEP event + climate change. Compensatory flood storage must be provided, and should be on a level for level, volume for volume basis. Emergency planning must be considered and safe access and egress routes

Flood Source	Risk Zone	Appropriate Development (See categorisation Table F1 Appendix F) ¹	Comments	Possible Mitigation
				should be identified.
	Flood Zone 3, 1–1.5m depths and/or Dangerous for most	EI, WC & LV	Mitigation is likely to be costly and may not be economically justifiable for low value land uses. Housing allocations are not suitable. The likelihood of passing the Exception Test is lower.	Floor level raising for employment purposes is unlikely to be economically viable and employment allocations should be reconsidered in favour of alternative lower risk sites. Emergency planning must be considered and safe access and egress routes should be identified. Opportunities for floodplain and river restoration and/or buffer strips should be investigated.
	Flood Zone 3, >1.5m depths and/or Dangerous for all	None	Flood risk mitigation measures are unlikely to be economically justifiable and all development should be avoided. Development is unlikely to be sustainable and the likelihood of passing the Exception Test is low.	Large mitigation schemes would be required including raised defences. However, this is not a preferred option, as a residual risk of flooding will remain. Compensatory storage must be provided where raised defences remove storage from the floodplain. Emergency planning must be considered and safe access and egress routes should be identified. Opportunities for floodplain and river restoration and/or buffer strips should be investigated.
Surface Water	High, Medium & Low	EI, WC, HV, MV & LV	Although surface water flooding will not directly impact on the spatial allocation of development, it should be considered within site layout. Surface water will also need to be controlled on site.	Opportunities should be sought to open up land were surface water is expected to flow or pool. SUDS should also be adopted to reduce risk on site and to the surrounding community by first storing water and managing run-off rates. The additional guidance for developing in CDAs should be considered if appropriate.

Flood Source	Risk Zone	Appropriate Development (See categorisation Table F1 Appendix F) ¹	Comments	Possible Mitigation
Reservoirs	Location only	EI, WC, HV, MV & LV	Flood risk from reservoirs is residual. Although this will not directly impact on the spatial planning of development, it should influence site emergency planning. Smaller reservoirs could potentially pose the greatest risk.	The risk of flooding should be assessed as part of the FRA. Smaller reservoirs should be assessed to identify the risk and appropriate mitigation put in place.

6 Guidance for Emergency Planners

This section provides guidance on how Local Authority Emergency Planners can use the outputs of the SFRA to update Multi-agency Flood Plans and provide advice on Flood Plans written by developers for new development.

Emergency Planners should use the Guidance in this SFRA User Guide, PPS25 and its Practice Guide to:

- **Update Multi-agency Flood Plans**
 - *Using the overall assessment of flood risks provided in the SFRA*
- **Provide advice on developer Flood Plans for new development**
 - *Using outputs from the SFRA*
- **Raise awareness of flood risk from all sources**
 - *Using outputs from the SFRA*

6.1 Introduction

This section provides guidance on how Local Authority Emergency Planners can use the outputs of the SFRA to update Multi-agency Flood Plans and provide advice on Flood Plans written by developers for new development.

6.2 Emergency planning overview

Under the Civil Contingencies Act (2004) the council is classified as a Category 1 Responder. During an emergency such as a flood event, coordination with the other Category 1 Responders (including the emergency services and the Environment Agency) is essential to guarantee the safety of residents. Under the Civil Contingencies Act, the Local Authority holds a statutory duty to provide civil protection to their communities to ensure human welfare; environmental stability and UK security are not affected. Under the Act, risk assessments and planning are coordinated through Local Resilience Forums (LRF). Newcastle City Council is part of the Northumbria Local Resilience Forum (NLRF).

The LRF is working to address Emergency Planning issues and ensure that there is an appropriate level of preparedness to enable an effective multi-agency response to emergency incidents that may have a significant impact on the communities of Northumbria. The Forum is made up of all Category 1 Responders, Police, Fire, Ambulance, Local Authorities and Health representatives.

Strategic decision-making and resource allocation are determined by reference to the Northumbria Local Resilience Forum Community Risk Register (CRR), which highlights potential hazards in the county. The Forum's work is coordinated through an annual strategy and work programme.

The aim of the SFRA so far has been to try to avoid development in flood risk areas in the first instance. However, it has also been accepted that there is current development in flood risk areas and there will need to be a level of continued regeneration. Minimising flood risk to people, property and the environment should be considered. Flood defences go some way in reducing the current flood risk by providing a standard of protection, however there is still a residual risk associated with them as they can be overtopped or be breached. Flood Warnings is an integral part of flood risk management, for which the

Environment Agency are the lead authority responsible for warning the public, local authorities and emergency services.

Along with the Environment Agency Flood Warning maps, there are a range of Flood Plans at a sub-regional and local level, outlining the major risk of flooding and the strategic and response framework for key responders. In a major flood requiring strategic coordination, these plans would operate under the command and control framework described in the Emergency Response Action Guide.

This SFRA contains useful data to allow emergency planning processes to be tailored to the needs of the area and be specific to the flood risks faced. The detailed maps and GIS layers provided should be made available for consultation by emergency planners during an event and in the planning process.

6.3 Flood Plan recommendations

The SFRA provides a number of flood risk data sources that should be used when producing or updating flood plans. Plans currently in place or under preparation which impact on Newcastle include;

- Newcastle City Council Emergency Response Plan
- Environment Agency Flood Warning Plan
- Emergency Response Action Guide
- Multi-Agency Flood Plans (MAFPs) are all produced in line with DEFRA guidance on developing MAFPs.

The data in the SFRA can be used to update these Flood Plans and the Local Authority Emergency Planners may wish to use the assessment to help them in considering and understanding the possibility, likelihood and spatial distribution of all sources of flooding, including fluvial, tidal, surface water and sewer, man-made bodies of water including reservoirs and groundwater flooding, as discussed in the SFRA and associated mapping for the report. This information may support emergency responders in planning for and delivering a proportionate, scalable and flexible response to the level of risk. Relevant sections and maps include:

- Understanding the risk from different sources of flooding
- Flood zone maps
- Climate change maps

Consider and understand the residual risk associated with flood risk management infrastructure using the information provided in the SFRA and the flood depth maps to develop plans proportionate to the risk posed;

- Flood defences, overtopping
- Detailed surface water maps

Use the data in the SFRA to:

- Update the Newcastle City Council Emergency Response Plan where necessary to reflect the above findings
- Consider the need for evacuation plans for existing vulnerable institutions and people in the floodplain and other areas at high flood risk
- Develop appropriate warning and informing strategies
- Consider reviewing and updating safe evacuation routes and access routes for emergency services from any existing area of flood risk to rest centres, avoiding routes that may be flooded
- Review the Newcastle Community Risk Register (CRR)

6.4 Planning Approval – Flood Plans including flood warning

As a condition of planning approval, it is recommended that flood evacuation plans should be provided by the developer that aim to safely evacuate people out of flood risk areas. These plans should detail any prearranged emergency arrangements including dry evacuation routes, flood warning, location of rest centres and safe assembly points.

Precise pathways for flood evacuation plan review are being taken for consideration by the Environment Agency. The plan owner must put in place the plan if the development goes ahead, and maintain and update the plan.

According to the PPS25 Practice Guide, flood warning and evacuation plans should include the information outlined in Table 6-1. More detailed analysis should be done within a site-specific FRA that should inform these plans.

Table 6-1: Flood Warning and Evacuation Plans

How flood warning is to be provided
Availability of existing flood warning system
Rate of onset of flooding
How flood warning is given
What will be done to protect the development and contents
How easily damaged items will be relocated
The availability of staff/occupants/users to respond to a flood warning
The time taken to respond to a flood warning
Ensuring safe occupancy and access to and from the development
Occupants awareness of the likely frequency and duration of flood events
Designing and locating safe access routes
Preparing evacuation routes
Identify safe locations for evacuees
Vulnerability of occupants
Expected time taken to re-establish normal use following an event

6.5 Flood Awareness

Emergency Planners should also use the outputs from the SFRA to raise awareness within local communities. This should include raising awareness of measures that people can take to make their homes more resilient to flooding from all sources and encouraging all those at fluvial flood risk to sign up to the Environment Agency’s Floodline Warnings Direct service.

Appendices

A . Flood Risk Concepts

Introduction

Flooding is a natural process and can happen at any time in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when people, infrastructure and development and environmental assets are present in the area which floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and the environmental and cultural heritage.

Climate change predictions are that flood risk will increase due to more frequent severe storms bringing higher intensity rainfall and increasing run-off from land and buildings. This will cause rivers and streams to experience higher than normal flood flows and levels, and sewers and drains to surcharge more frequently than at present. The focus of activity in meeting these challenges in the future will be on flood risk management as opposed to simply providing flood defences. It is now widely recognised that whilst we cannot always prevent flooding we can manage the risks of it happening and reduce the consequences when flooding does happen.

As authorities the EA and LPA, should embrace effective flood risk management issues and actions. The focus should aim to reduce flood risks through a variety on measures including:

- Through the planning process ensuring that vulnerable land uses are located away from high flood risk areas;
- Providing flood warning and emergency planning in flood risk areas;
- Raising awareness of flood risks amongst vulnerable communities;
- Constructing and maintaining appropriately designed surface water sewers and culverts;
- Using temporary and demountable flood defences and various flood prevention systems to buildings where appropriate;
- Constructing new flood defences where they are sustainable, and improving and maintaining those already existing; and
- Constructing weirs, sluices and other flood flow control and management structures.

Pro-active land use planning has a key role to play in flood risk management as it is one of the few activities that can result in the avoidance of flood risk as opposed to other activities that can only hope to reduce it. Effective flood risk management through the planning system is achieved through a hierarchy where:

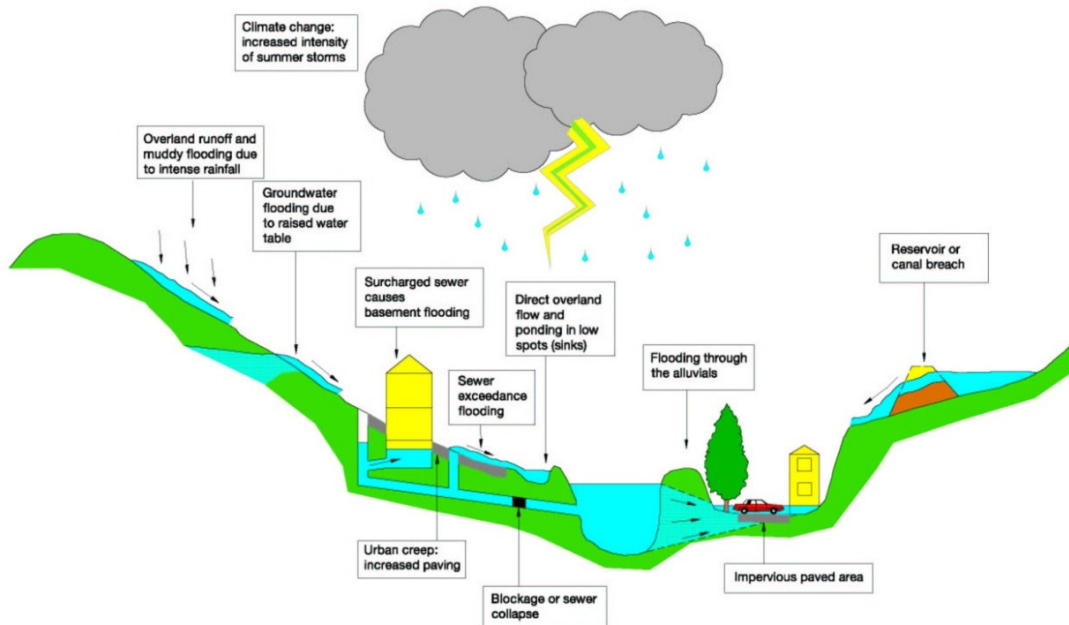
- Avoidance of inappropriate development in high risk zones takes priority;
- Substitution of lower vulnerability uses when avoidance is not considered possible; and
- Mitigation if avoidance and substitution are not possible, then mitigation of risks using a variety of techniques may be considered.
- Flood risk assessment at all levels of planning and for all major developments is critical to inform decision-making by planners and developers.

Sources of Flooding

Flooding can occur from many different sources and may be experienced in isolation or as a combined flooding event. Different types and forms of flooding present a range of different risks. The associated hazards of speed of inundation, depth and duration of flooding can vary greatly (See Figure A1).

With climate change, the frequency, pattern and severity of flooding are expected to change and become more damaging with time.

Figure A1: Flooding From All Sources



Major causes of flooding are:

- Coastal flooding is caused by higher sea levels than normal causing tidal water to overflow onto the land;
- Inland flooding is caused by prolonged and/or intense rainfall resulting in excess water flowing overland, ponding in natural hollows and low-lying areas or behind obstructions;
- River flooding occurs when the capacity of a watercourse is exceeded or a channel is blocked and excess water spills out from the channel onto adjacent low lying areas or floodplain;
- Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its discharge capacity, it becomes blocked or it cannot discharge due to a high water level in the receiving watercourse;
- Groundwater flooding occurs when the level of water stored in the ground rises as a result of prolonged rainfall to ground level;
- Estuarial flooding may occur due to a combination of tidal and fluvial flows, with tidal levels being dominant in most cases; and
- A less frequent form of flooding arises from the failure of infrastructure designed to store or carry water (for example, the breach of a dam or a burst water main), or to protect an area against flooding (e.g. breach of a flood defence, failure of a flap valve or pumping station or blockage of a pipe or culvert). Because of the sudden onset, the impacts of this form of flooding can be severe.

Prior to the major flood events in summer 2007, non Main River flooding was based on anecdotal evidence or described with Critical Ordinary Watercourse (COW) investigations undertaken by the Environment Agency. Little data could be abstracted from the water companies on sensitive drainage catchments where runoff impacts of new development could be significant on combined sewer systems. However, a significant proportion of recent flood

insurance claims are due to flooding from non main river sources, so this issue is likely to increase with climate change.

Historically the adopted approach in many SFRAs has been not to consider other sources of flooding as a spatial or strategic issue. Through good design and attenuation of drainage inputs to sensitive watercourses, mitigation was the accepted way forward.

Summer 2007 provided a stark reminder that the significance of capacity exceedance of artificial and natural drainage systems can be severe for many communities. Therefore, a clear example was provided that flooding from all sources should be included in SFRAs, and that new methods of rapid screening of these risks are required. Following the Pitt Review, the EA has prepared a national map showing areas vulnerable to surface water flooding. This was developed by Jeremy Benn Associates Ltd from research into the Making Space for Water programme.

Increases in flooding impacting on people and property, due to development can be caused:

- Upstream by restricting the capacity and conveyance function of the watercourse and floodplain system;
- Downstream by decreasing the volume available for flood storage on the floodplain, altering flow routes on the floodplain or by changes to the channel which can increase the flow discharged to downstream locations; and
- By increasing runoff from reduced permeability surfaces, such as roads, roofs and car parks.

Fluvial Flooding

Flooding from watercourses is associated with the exceedance of channel capacity during higher flows. The process of flooding from watercourses depends on a number of catchment characteristics including; geographical location, variation in rainfall, steepness of the channel and surrounding floodplain and infiltration and rate of runoff (linked to land use i.e. degree of urbanisation). It is possible to generalise catchments into; large and relatively flat or small and steep, the two giving very different responses during large rainfall events.

According to PPS25, "in a large, relatively flat catchment, flood levels will rise slowly and natural floodplains may remain flooded for several days, acting as the natural regulator of the flow. In small, steep catchments, local intense rainfall can result in the rapid onset of deep and fast-flowing flooding with little warning. Such "flash" flooding, which may only last a few hours, can cause considerable damage and possible threat to life."

The form of the floodplain, either natural or urbanised, can influence flooding from watercourses. The location of buildings and roads can significantly influence flood depths and velocities by altering flow directions and reducing the volume of storage within the floodplain. Critical structures such as bridge and culverts can also significantly reduce capacity creating pinch points within the floodplain. These structures are also vulnerable to blockage by natural debris within the channel or by fly tipping and waste.

Surface Water Flooding

Flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours and follows natural valley lines, creating flow paths along roads and through and around developments and ponding in low spots, which often coincide with fluvial floodplains in low lying areas. Hence any area at risk of fluvial flooding will almost certainly be at risk of surface water flooding.

Flooding in urban areas can also be attributed to sewers. Sewers are normally designed to a maximum of a 1 in 30 year design standard and hence sewer flooding problems will often be associated with more frequent storm events, when sewers can become blocked or fail. In the larger events that are less frequent but have a higher consequence, surface water will exceed the sewer system and flow across the surface of the land, often following the same flow paths and ponding in the same areas as overland flows.

Both 'Making Space for Water' and 'Future Water' recognise the importance of integrated urban drainage and the summer flooding of 2007 highlighted that surface water flooding can cause mass distress, damage and disruption. The Foresight Report (2004) estimated that 80,000 properties are at very high risk from surface water flooding (1 in 10 chance of occurring in any one year).

Groundwater Flooding

The occurrence of groundwater flooding is usually very local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can persist for a long period and cause significant damage to property, especial in urban areas, if not considered in development planning. In most cases groundwater flooding cannot easily be eliminated although the impact on buildings can be mitigated to some extent through various measures.

Flooding from Drainage Systems

Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its discharge capacity, it becomes blocked or it cannot discharge due to a high water level in the receiving watercourse.

Foul sewers and surface water drainage systems are spread extensively across the urban areas with various interconnected systems discharging to treatment works and into local watercourses.

Typically foul systems will comprise a network of drainage sewers, sometimes with linked areas of separate and combined drainage, all discharging to sewage treatment works. Combined Sewer Overflows (CSOs) provide an overflow release from the drainage system into local watercourses or surface water systems during times of high flows.

Surface water systems will typically collect surface water drainage separately from the foul sewerage and discharge directly into watercourse.

A major cause of sewer flooding is often due to the connection of surface water drains to discharge into the combined sewer systems. Sewer capacity can then become an issue in large rainfall events causing the backing up of flood waters internally within properties or discharging through manholes.

Insufficient capacity can also become an issue where urban areas develop over time, with improved sewerage infrastructure provision not always provided to accommodate the additional flows.

English and Welsh water companies are required to maintain a register of flooding incidences due to hydraulic capacity problems on the sewage network. This database identifies properties where flooding has occurred on a frequency of 1 in 5 years and 1 in 10 years. The database is known as DG5 and DG10 registers. A register for 1 in 20 years is also recorded which includes properties under investigation.

Whilst this data can give an idea of those areas with limited drainage capacity, it must be acknowledged that it is a register of properties that have flooded due to the hydraulic inadequacies of the sewer systems, not properties at risk of flooding. Therefore it has limiting usefulness in predicting future flooding.

Data generated using hydraulic network models such as InfoWorks potentially provides a very useful tool with which to predict more widespread potential for sewer flooding and the use of such tools should be investigated during a Surface Water Management Plan.

Flooding from Reservoirs

Reservoirs can be a major source of flood risk, as experienced during the 2007 summer floods, where 18 reservoirs were affected across England. Whilst the probability of dam

failure or breaching occurring is very small, the consequences of such an event can be devastating thereby presenting a risk of flooding which has to be considered.

Flooding from reservoirs is noted as an issue within the Pitt Review Recommendations and acknowledged by Hilary Benn, the Secretary of State for Environment, Food and Rural Affairs. £1million has been pledged to improve reservoir safety specifically to produce inundation mapping for all reservoirs falling under the Reservoirs Act (i.e. those with a capacity of over 10,000 cubic metres).

Reservoirs are classified on a consequence of failure basis outlined below in Table A1 and it is now suggested that a better risk-based approach to reservoir safety is needed, focusing on those reservoirs that pose the greatest risk to the public, even if they are not currently covered by the Act.

Table A1: Reservoir Consequence Classification

Dam Category	Potential Consequence of Reservoir Failure
A	At least 10 lives at risk and extensive property damage
B	Fewer than 10 lives at risk or extensive property damage
C	Negligible risk to human life but some property damage
D	Negligible risk to human life and very limited property damage

The Environment Agency has produced simplified inundation maps for all reservoirs under the Reservoirs Act as required by Recommendation 57 of the Pitt Review. Trial projects were run in the North West to develop the specification for these maps and the Environment Agency produced maps for all reservoirs under the Act during 2009.

The Water Act 2003, which amended the Reservoirs Act 1975, requires all reservoir undertakers to prepare Flood Plans for those reservoirs where the dam failure could put people's lives at risk or lead to major damage.

The reservoir Flood Plans will include:

- An inundation analysis to identify the extent and severity of flooding which could result from an uncontrolled release of water (i.e. breaching or failure)
- An on-site plan setting out what the undertaker would do in an emergency to try and to contain and limit the effects of the incident
- A communications plan with external organisations, mainly the emergency services

Defra is currently funding a project to produce a 'Guide to Emergency Planning for UK Reservoirs', which will ultimately use the Flood Plans.

Any allocations or applications for development immediately downstream of a reservoir should be considered carefully in liaison with the Environment Agency. It should be noted that the hazard is well managed through legislation and it is unlikely that the impact zone downstream of a reservoir would be a reason to stop permitted development. It is likely that the flood risk would be mitigated through emergency planning.

Defence Failure

The condition of existing flood defences is an important consideration for local authority planners when allocating new development. PPS25 considers that defended areas (i.e. those areas that are protected to some degree against flooding by the presence of a formalised flood defence) are still at risk of flooding, and therefore sites within these areas must be assessed with respect to the adequacy of the defences.

The condition of existing defences is provided in the form of a 'rating' (1 to 5), and is a reflection of any signs of 'obvious' structural problems. The condition rating is determined on the basis of visual inspection, focussing on obvious signs of structural defect (e.g. slippage, cracking, poor maintenance), designed to inform the maintenance programme. The

Environment Agency's National Flood and Coastal Defence Database (NFCDD) condition ratings are shown in Table A2.

Table A2: NFCDD Condition Ratings for Flood Defences

Condition Rating	Condition	Condition Description
1	Very Good	Fully serviceable.
2	Good	Minor defects.
3	Fair	Some cause for concern. Requires careful monitoring.
4	Poor	Structurally unsound now or in the future.
5	Very Poor	Completely failed and derelict.

The condition of existing flood defences and whether they will continue to be maintained and/or improved in the future, is an issue that needs to be considered as part of the risk based sequential approach and in light of this, whether proposed land allocations are appropriate and sustainable. In addition, detailed FRAs will need to explore the condition of defences thoroughly, especially where these defences are informal and contain a wide variation of condition grades.

Defences that are not in good condition could be prone to failure during a flood event. Defences that offer a low standard of protection are likely to overtop during flood events that are more extreme than the event that they were designed to protect against. Flood risk associated with defence infrastructure is residual; however, the risks can be significant due to sudden onset and velocities reached by flood waters should a defence overtop or fail.

Flood Warning

The Environment Agency has the lead role in providing flood warnings in England and Wales. The aim of the flood warning service is to reduce risk to life, distress to people and damage to property caused by flooding by providing accurate, timely flood warnings to residents within the floodplain of rivers, estuaries and coasts; to the media and partner organisations.

It is crucial that people at risk receive appropriate flood warnings and take action to protect themselves and their property. Within the Environment Agency corporate plan "Creating a Better Place"¹³ the Agency has highlighted three main targets:

- To have 80% of properties at risk in the floodplain in England and Wales receiving and appropriate flood warning service
- 75% of people who live in flood risk areas take appropriate action by 2011
- To have major incident plans in place for high flood risk areas

Flood Warning Codes include:

Flood Alert		Flooding is possible. Be prepared.
Flood Warning		Flooding is expected. Immediate action required.

¹³ Environment Agency (2006) Creating a Better Place: Corporate Strategy 2006-2011

Severe Flood
Warning



Severe flooding. Danger to life.

The flood warnings are used to reduce the overall impact of flooding of people and property by lowering the vulnerability of the receptor. This is done by providing a warning which can then be used to remove people at risk or to relocate valuable possession to higher levels.

Overview

Flooding in urban areas can come from a variety of sources and when flooding occurs it is often not clear where the water has come from. The Flood and Water Management Act defines local flood risk, for which local authorities will have a local leadership role, as the risk of flooding from ordinary watercourses (smaller watercourses that are not under the jurisdiction of the Environment Agency), surface water and groundwater.

Prior to the major flood events in summer 2007, the understanding of non Main River flooding was based on anecdotal evidence or described within Critical Ordinary Watercourse (COW) investigations undertaken by the Environment Agency. Little data could be abstracted from the water companies on sensitive drainage catchments where runoff impacts of new development could be significant on combined sewer systems. However, a significant proportion of recent flood insurance claims are due to flooding from non Main River sources, so this issue will become larger with climate change.

Historically the adopted approach in many SFRA has been not to consider other sources of flooding as a spatial or strategic issue.

Summer 2007 provided a stark reminder that the significance of capacity exceedance of artificial and natural drainage systems can be severe for many communities. Therefore a clear example was provided that flooding from all sources should be scoped into a SFRA and they should be taken into account through the planning system, and that new methods of rapid screening of these risks are required. On the back of the Pitt review, the Environment Agency has prepared a national map showing areas susceptible to surface water flooding. This was developed by JBA from research for the Making Space for Water programme and has been used within this SFRA.

Development can increase flood risk elsewhere in the following ways:

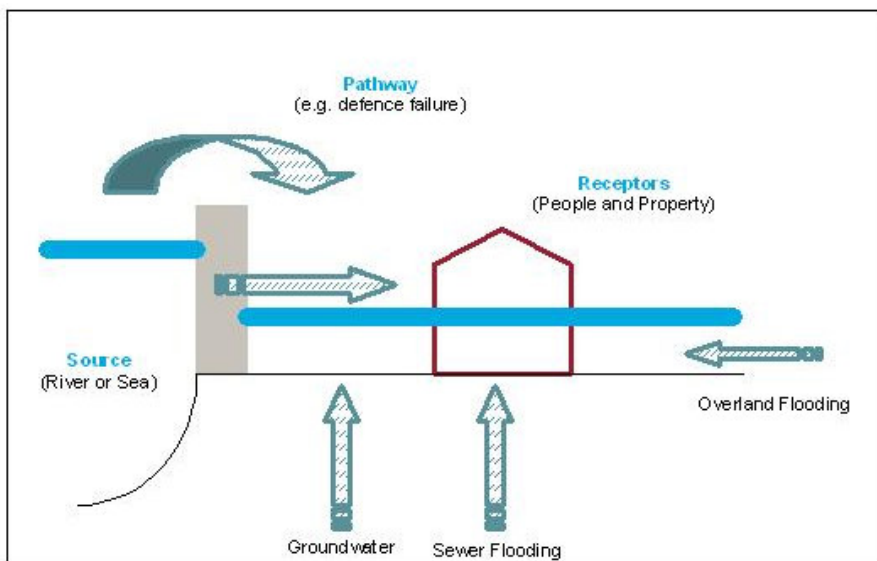
- Upstream by restricting the capacity and conveyance function of the watercourse and floodplain system
- Downstream by decreasing the volume available for flood storage on the floodplain, altering flow routes on the floodplain or by changes to the channel which can increase the flow discharged to downstream locations
- By increasing run-off from reduced permeability surfaces, such as roads, roofs and car parks

Flooding Likelihood & Consequence

Flood risk is generally accepted to be a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the source – pathway – receptor model as shown in

Figure A-2 below. This is a standard environmental risk model common to many hazards and should be starting point of any FRA. However, it should be remembered that flood risk can occur from many different sources and pathways and not simply those shown in the simple form below.

Figure A-2: (Source-Pathway-Receptor model)



The principal sources of flooding are rainfall or higher than normal sea and river levels, the principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets. The receptors may include people, their property and the environment. All three elements must be present for flood risk to arise. Mitigation measures have little or no effect on sources of flooding but they can block or impede pathways or remove receptors.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk.

It is important to define the components of flood risk in order to apply this guidance in a consistent manner.

- **Likelihood**

Likelihood of flooding is normally expressed as a percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates the flood level that is expected to be exceeded on average once in 100 years, i.e. it has a 1 in 100 chance of occurring in any one year.

Considered over the lifetime of development, such an apparently low frequency or rare flood has a significant probability of occurring.

- **Consequence**

Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age and structure, of the population, presence and reliability of mitigation measures etc).

Flood risk is then normally expressed in terms of the following relationship:

- Flood risk = Probability of flooding x Consequences of flooding

Flooding Impacts on Property, People & the Environment

Flooding has a wide range of social impacts which may be difficult to delineate as they are interconnected, cumulative and often not quantifiable.

In small urban or steep upland catchments which have a very rapid response to rainfall, or with flooding due to infrastructure failure, flood waters can rise very quickly and put life at risk.

Even shallow water flowing at 2m/s can knock children and many adults off their feet and vehicles can be moved by water of 300mm depth. The risks rise if the flood water is carrying debris.

The impact on people as a result of the stress and trauma of being flooded, or even of being under the threat of flooding, can be immense. This also extends to whole communities. Long term impacts can arise due to chronic illnesses and stress. Flood water contaminated by sewage or other pollutants (e.g. chemicals stored in garages or commercial properties) is particularly likely to cause such illnesses, either directly as a result of contact with the polluted flood water or indirectly as a result of sediments left behind.

The degree to which populations are at risk from flooding is, therefore, not solely dependent upon proximity to the source of the threat or the physical nature of the flooding. Social factors also play a significant role in determining risk. Although people may experience the same flood, in the same area, at the same time, their levels of suffering are likely to differ greatly as a result of basic social differences. These differences will affect vulnerability in a variety of ways including an individuals or community’s response to risk communication (flood warning) and physical and psychological recovery in the aftermath of a flood. How individuals and communities experience the impact will also vary depending on their awareness of the risk of flooding, preparedness for the flood event and the existence or lack of coping strategies.

Flood hazard is based on a multiplier of flood depth, flood velocity and a debris factor¹⁴ and is presented on the following scale:

Table A3: Flood Hazard ratings

Hazard to people	Hazard to people classification
No Hazard	
Very Low Hazard “Flood zone with shallow flowing water or deep standing water”	Caution
Danger for some “Danger: flood zone with deep or fast flowing water”	Includes children, the elderly and the infirm
Danger for most “Danger: flood zone with deep fast flowing water”	Includes the general public
Danger for all “Extreme danger: flood zone with deep fast flowing water”	Includes the emergency services

Flooding Impacts on Property

Flooding can cause severe property damage. Flood water is likely to damage internal finishes, contents, electrical and other services and possibly cause structural damage. The physical effects can have significant long-term impacts, with reoccupation sometimes not being possible for over a year. The costs of flooding are increasing, partly due to increasing amounts of electrical and other sophisticated equipment within developments.

The damage flooding can cause to businesses and infrastructure, such as transport or utilities like electricity and water supply, can have significant detrimental impacts on local and regional economies. The long-term closure of businesses, for example, can lead to job losses and other economic impacts.

¹⁴ Defra and Environment Agency (2006) The Flood Risks to People Methodology, Flood Risks to People Phase 2, FD2321 Technical Report 1, HR Wallingford et al. wrote the report for Defra/EA Flood and Coastal Defence R&D Programme, March 2006.

Placing new development or regenerating in flood risk areas has its additional short and long-term costs. The need to build resistant and resilient properties could significantly increase overall costs of development, whilst ongoing maintenance and insurance increase future expenditure.

Flooding Impacts on the Environment

Environmental impacts can be significant and include soil erosion, bank erosion, landslips and damage to vegetation as well as the impacts on water quality, habitats and flora and fauna caused by bacteria and other pollutants carried by floodwater.

Flooding can have a beneficial role in natural habitats. Many wetland habitats are dependent on annual flooding for their sustainability and can contribute to the storing of flood waters to reduce flood risk elsewhere. It is important to recognise the value of maintenance or restoration of natural riparian zones such as grasslands which protect the soils from erosion and 'natural' meadows which can tolerate flood inundation. The use of Green Infrastructure throughout the river corridor can also play a vital role in enhancing the river environment as well as safeguarding land from future development, protecting people and buildings from flooding and reducing flood risk downstream.

A natural floodplain can help accommodate climate change and improve the quality of rivers and associated wetlands to help achieve 'good ecological status' by 2015 under the Water Framework Directive (WFD). Meeting WFD objectives involves not only ecosystems, water quality, drought and flood impact considerations but also the physical characteristics and morphology of the river channel, floodplain and associated structures.

B . Flood Risk Assessment Hierarchy

Flooding is a natural process and does not respect political demarcations or administrative boundaries; it is influenced principally by natural elements of rainfall, tides, geology, topography, rivers and streams and manmade interventions such as flood defences, roads, buildings, sewers and other infrastructure. As was seen in the summer 2007 floods, flooding can cause massive disruption to communities, damage to property and possessions and even loss of life.

For this reason it is important to avoid developing in flood risk areas in the first instance. Where this is not possible development should be directed to areas with the lowest possible level of flood risk. Having exhausted all opportunities to direct development away from areas of flood risk then the allocation of land for development must consider the vulnerability of the proposed land use to flooding and take measures to minimise flood risk to people, property and the environment. This is the thrust of the risk based sequential approach to managing flood risk and it is the backbone of PPS25.

Current Government policy requires local authorities to demonstrate that due regard has been given to the issue of flood risk as part of the planning process. It also requires that flood risk is managed in an effective and sustainable manner and where new development is as an exception necessary in flood risk areas, the policy aim is to make it safe without increasing flood risk elsewhere and wherever possible reduce flood risk overall.

Within the hierarchy of regional, strategic and site-specific flood-risk assessments, a tiered approach ensures that the level of information is appropriate to the scale and nature of the flood-risk issues and the location and type of development proposed, avoiding expensive flood modelling and development of mitigation measures where it is not necessary.

As stated in PPS25 the three principle levels of assessment comprise:

- **Regional Flood Risk Appraisal (RFRA)** – a broad overview of flood risk issues across a region to influence spatial allocations for growth in housing and employment as well as to identify where flood risk management measures may be required at a regional level to support the proposed growth.
- **Strategic Flood Risk Assessment (SFRA)** – an assessment of all types of flood risk informing land use planning decisions. This will enable the LPA to apply the Sequential Test in PPS25 and allocate appropriate sites for development, whilst identifying opportunities for reducing flood risk.
- **Site Specific Flood Risk Assessment (FRA)** – site or project specific flood risk assessment to consider all types of flood risk associated with the site and propose appropriate site management and mitigation measures to reduce flood risk to and from the site to an acceptable level.

Implementation of the sequential risk-based approach requires forward planning. Policy decisions are best made within LDF/LDDs, guided by information on flood risk, ensuring that the allocation of land inappropriate for development does not unnecessarily raise expectations of landowners and developers. Policy decisions should be informed through the preparation of RFRA and SFRA. These assessments are broad-brush assessments of the risk of flooding, to guide strategic planning decisions. They involve the collection and collation of data on flooding and flood-risk management to provide information at the appropriate level of detail to allow decision-makers to:

- Prepare appropriate policies for flood-risk management within LDFs
- Produce a strategic understanding of the scale, extent and nature of the flood risk at a community level and how that would alter with any proposed development
- Apply a risk-based, sequential approach, providing risk data to confirm the compatibility between the flood risk vulnerability and inform the Exception Test and of the proposed allocation and the Flood Zone
- Inform the strategic environmental assessment of LDFs

- Translate the national guidance into locally specific guidance, including the identification of areas of floodplain that should be safeguarded for flood management purposes
- Identify the level of detail required for site-specific flood-risk assessments in particular locations
- Determine the acceptability of flood risk in relation to emergency planning capability and how the existing and proposed community would respond to a flood event

C . The Planning Framework

6.6 Introduction

The purpose of this section of the report is to identify and outline those high level documents which must be taken into account in preparing this SFRA, from a national to a local level.

The land use planning process is driven by a whole host of policy guidance on a national, regional and local level. Whilst the majority of these policies are not aimed at mitigating flood risk, there are key links at strategic, tactical and operational levels between land use and spatial planning (Regional and Local Government), and Flood Risk Management (FRM) planning (Environment Agency), which should be considered as part of a planned and integrated approach to delivering sustainable development.

The sustainability appraisal will help draw together these links and balance the application of wider social, economic and environmental planning policy and guidance. Flood risk assessment is required at all levels of the planning process and for all major developments in flood risk areas; these play an increasingly important role in assisting effective delivery of key planning objectives.

6.7 Flood Risk Management Drivers

The principal FRM policy drivers are brought together in the Government's recently released Flood and Water Management Act and it is an important part of the Government's response to Sir Michael Pitt's Report on the summer 2007 floods. It also gives effect to a number of commitments in the Government's "Future Water" strategy document. In addition, the Act responds to a number of climate change challenges including more frequent extreme weather events causing a greater risk of flooding and drought, increased population, increased water demand and more water quality problems. It provides the Environment Agency with a strategic overview role for all sources of flood risk in England and Wales and gives local authorities in England a clear leadership role in local flood risk management. An improved integrated and risk based approach is proposed for the future management of flood risk and this requires other concerns such as sustainability, biodiversity and the whole water cycle to be taken into account by local authorities and other relevant organisations.

A core policy thread running through all current policy drivers is the fundamental shift in emphasis from building defences to prevent flooding, to one of managing flood risk by using a suite of measures. All operating authorities are required to invest in the provision of sustainable flood risk management and this includes LPAs adopting a flood risk management hierarchy of assessing, avoiding, substituting, controlling and mitigating flood risk through the land use planning system. They should have regard to flooding from all sources (particularly surface water and not just from rivers and the sea). Government does however; recognise that in some circumstances, appropriate mitigation measures may still involve new, or improving and maintaining existing flood defences where justified, to protect increasingly vulnerable communities.

Current key policy related documents provide LPAs with important and valuable knowledge on the strategic direction of flood risk management and assist their strategic land use planning decision making for re-generation, inward investment and growth etc.

Key documents currently influencing FRM policy are:

- EU Floods Directive – EU (2007)
- Floods and Water Management Act – Defra (2010)
- Future Water – Defra (2008)
- Improving Surface Water Drainage – Defra (2008)
- Making Space for Water – Defra (2005)
- Planning Policy 25: Development & Flood Risk – CLG (2006)
- Planning Policy 25: Development & Flood Risk Practice Guide –CLG (2008)

- Learning Lessons from the 2007 Floods – Sir Michael Pitt (2008)
- Catchment Flood Management Plans – currently being implemented
- Shoreline Management Plans – currently being revised

EU Floods Directive

The “EU Floods Directive” aims to reduce and manage the risk floods pose to human health, the environment, cultural heritage and economic activity. Member States have two years in which to transpose its provisions into domestic legislation and the first requirements of the Directive begin at the end of 2011. By this date, an evidence base for flood risk should be developed to map the risk and then produce plans to manage it. Preliminary Flood Risk Assessments (PFRAs) for all sources of flooding need to be prepared showing the impact of historic flooding and the potential impact of a repeat event. Following this, areas of potentially Significant Flood Risk (SFR) need to be defined. In addition, and by the end of 2013, flood hazard and flood risk maps for the SFR areas are required and should be co-ordinated with, and possibly integrated into, the reviews of River Basin Districts under the Water Framework Directive (WFD). Finally, by the end of 2015, Flood Risk Management Plans (FRMPs) must be established, which aim to reduce the potential adverse consequences of flooding and/or reduce its likelihood.

The Government proposes to use existing flood risk planning outputs of RFRAs and SFRAs to deliver the requirements of PFRAs. It is also proposed that local authorities extend their Level 2 SFRAs to look at the impact of flooding on the environment and cultural heritage when determining SFR areas. In addition, it is proposed that SWMPs will be FRMPs under the Directive, and will also be a tool more generally for local flood risk management. This integrated approach will underpin the planning system and guide the location of future development to avoid and minimise flood risk, whilst also meeting the requirements of the Floods Directive. Local authorities, through their land use planning activities, have a key role to play.

The Flood Risk Regulations transpose the EU Floods Directive into UK law and were introduced on 10 December 2009. These confirm the lead local flood authority role and require specific tasks to be undertaken by these authorities this year, with completion of Preliminary Flood Risk Assessments and identification of Flood Risk Areas due by June 2011.

Flood & Water Management Act 2010

The Flood and Water Management Act¹⁵ received Royal Assent on 8th April 2010. The Act creates unifying legislation covering all forms of flooding and shifting the emphasis from building defences to managing risk. The Act creates clearer roles and responsibilities and provides for a more risk-based approach. Local authorities have a new lead role in managing local flood risk (from surface water, ground water and ordinary watercourses) and a strategic overview role for all flood risk for the Environment Agency (EA).

Risk management authorities will be expected to begin putting in place the organisational framework and strategic development ahead of the anticipated commencement date of April 2011.

The Act aims to:

- Reduce the likelihood and impacts of flooding
- Improve the ability to manage the risk of flooding, by clarifying who is responsible for what
- Reduce pollution and improve water quality
- Give water companies better powers to conserve water during drought
- Reduce red tape and other burdens on water and sewerage companies,

¹⁵ <http://www.defra.gov.uk/environment/flooding/policy/fwmb/key-docs.htm>

- Improve the overall efficiency of the industry

The content and implications of the Act provide considerable opportunities for improved and integrated land use planning and flood risk management by local authorities and other key partners. The integration and synergy of strategies and plans at national, regional and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth. Key areas of the Act have particular implications for local authorities, land use planning and related flood risk. These include:

- To give the Environment Agency an overview of all flood and coastal erosion risk management and unitary and county councils the lead in managing the risk of all local floods.
- Local authorities will have an enhanced leadership role in local flood risk management which includes ensuring that flood risk from all sources, including from surface run-off, groundwater and ordinary watercourses, is identified, taken account of in the spatial planning process and managed as part of locally agreed work programmes
- Local authorities will develop a suite of measures for managing local flood risk, for example, surface water mapping, appropriate development planning and collating information on flood risk and drainage assets
- County and unitary authorities will be responsible for local flood risk assessment and lead in ensuring the production of SFRA and SWMPs
- SFRA will provide the evidence to allow LPAs to factor flood risk into their LDFs, DPDs and individual planning proposals, and help to determine where SWMPs are needed
- County and unitary authorities will lead new local partnerships and have responsibility for adopting and maintaining sustainable drainage systems (SUDS) in new development, where they affect more than one property
- County or unitary authorities, the Environment Agency and IDBs will have powers to formally designate natural and man-made features (similar in principle to the Listed Buildings classification), which help to manage flood or coastal risk; they will give formal consent before anyone can change or remove the feature and use enforcement powers where needed
- To encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt SUDS for new developments and redevelopments.
- Surface water connection to public sewers will be conditional on meeting new national standards for SUDS, and the approval of a SUDS approving body will be needed, and a certificate issued, before development can begin
- Increased emphasis is needed on enabling flood water to safely flow overland with green infrastructure and safe flow routes being identified as part of flood risk assessments
- All relevant authorities will have a duty to cooperate and share information
- Right to Connect (Water Industry Act, 1991) S106 of the act has been amended by the FWM Act so that for new developments the approved sustainable drainage system must be constructed to connect to the public sewer network.
- This will need to be approved to the new National SUDS standards (currently being devised) by the Lead Local Flood Authority (LLFA – County or Unitary Authority)
- Once constructed, the LLFA will adopt the system and becomes responsible for maintaining it.

Improving Surface Water Drainage

The “Improving Surface Water Drainage” consultation document was produced in support of the Government’s water strategy and in line with Sir Michael Pitt’s initial conclusions. Many of

the proposals identified have been carried forward into the new Flood and Water Management Act. The consultation considers policy measures to improve the way surface water runoff is managed. In particular, it proposes:

- Using SWMPs as a tool to improve co-ordination between stakeholders involved in drainage and local management of flood risk
- Increasing uptake of SUDS by clarifying responsibilities for adoption and management
- Reviewing the ability for premises to connect surface water drainage automatically into the public sewer system

Current roles and responsibilities were considered along with various options for improving the current surface water drainage situation. In particular the document recognises that SFRA and SWMPs already form part of the PPS25 planning framework and there is an aim to enhance their role and make stronger links between surface water drainage and strategic planning.

Making Space for Water Strategy

The “Making Space for Water Strategy” is a milestone document that confirms the Government’s strategic direction for Flood and Coastal Erosion Risk Management (FCERM). Over the 20-year lifetime of the new strategy, Government will implement a more holistic approach to managing flood and coastal erosion risks in England. The approach will involve taking account of all sources of flooding, embedding flood and coastal risk management across a range of Government policies, and reflecting other relevant Government policies in the policies and operations of operating authorities for flood and coastal erosion risk management.

The 2004 consultation document “Making Space for Water” sets out the following vision:

“...we want to make space for water so that we can manage the adverse human and economic consequences of flooding and coastal erosion while achieving environmental and social benefits in line with wider government objectives.”

In other words, the aim of the strategy is to balance the three pillars of sustainability, managing flood risk and ensuring that the social and economic benefits which accrue from growth and development are attained. This balanced approach, integrating sustainable development with responsible risk management, has underpinned this SFRA.

Section 7 of the consultation document deals with measures to reduce flood risk through land-use planning, which emphasises the Government’s commitment to ensuring that the planning system aims to reduce flood risk wherever possible and, in any event, should not add to it. However, it is acknowledged that 10% of England is already within mapped areas of flood risk and that contained within these areas are some of the Brownfield sites which other areas of Government policy has identified as a priority for future housing provision. The document asserts that over the past five years, 11% of new houses were built in flood-risk areas. The document identifies three sets of measures which may be undertaken to manage flood risk when development is sited in such areas:

- Protection measures to provide, at minimum, the standards of protection specified in PPS25
- Provision of features such as sacrificial areas and compartmentalisation to reduce the consequences of a flood event should one occur (such as functional floodplain)
- Use of construction techniques that increase the flood resistance and resilience of buildings

The document proposes that LDFs should take full account of flood risk and incorporate the sequential approach in PPS25. Moreover, the document encourages integration with other planning systems, in particular Catchment Flood Management Plans. Use of European Union (EU) funding streams, such as Interreg IIIB is recommended where applicable, to enable Local Authorities to undertake projects aimed at advancing knowledge and good practice in flood risk management.

Making Space for Water: Programme of Work

The “Making Space for Water: Programme of Work” was developed following consultation and takes account of any relevant recommendations that emerged from the Pitt Review into the 2007 floods that affected many parts of England.

One of Defra’s and CLG’s early outputs from the Making Space for Water Programme was the publication of PPS25 in December 2006. This work, together with the Practice Guide forms the Governments required approach to managing and reducing flood risk through the land use planning system.

A valuable piece of work looking at “Developing a Broader Portfolio of Options to Deliver Flooding and Coastal Solutions” has been carried out as part of this programme and is very useful to local authorities and other operating authorities, in their strategic planning of flood risk management. Outputs from this work are available from Defra.

Quarterly update reports are released providing details of progress made and key achievements. These reports can be access via the Making Space for Water website at

<http://www.defra.gov.uk/environ/fcd/policy/strategy.htm>

The Pitt Review

The “Pitt Review” was carried out following the severe floods of summer 2007 and is a key document for local authorities in their consideration of flood risk management. Sir Michael Pitt was asked by Ministers to conduct an independent review of events and report on the lessons that should be learned. The Review collected evidence by visiting affected areas and examining over 600 written statements submitted by victims of the floods.

The final report was released in June 2008 and contains detailed findings, conclusions and 92 recommendations for action, covering all aspects of strategic and local flood risk management. These interim conclusions are intended to shape the National approach to flood management and can be accessed via the Defra website. Some of the recommendations which are relevant to this SFRA include;

- **Recommendation 11** – Building Regulations should be revised to ensure that all new or refurbished development in high flood risk areas are flood resistant or resilient.
- **Recommendation 14** – Local Authorities should lead on the management of local flood risk, with support of the relevant organisations.
- **Recommendation 17** – All relevant organisations should have a duty to share information and cooperate with local authorities and the Environment Agency to facilitate the management of flood risk.
- **Recommendation 18** – Local Surface Water Management Plans, as set out under PPS25 and coordinated by local authorities, should provide the basis for managing all local flood risk.
- **Recommendation 52** – In the short term, the Government and infrastructure operators should work together to build a level of resilience in critical infrastructure assets that ensures continuity during worst case flood event.
- **Recommendation 57** – The Government should provide Local Resilience Forums with the inundation maps for both large and small reservoirs to enable them to assess risks and plan for contingency, warning and evacuation.

Pitt’s findings, conclusions and recommendations for action are challenging but will be extremely important in guiding local authorities and other operating authorities in their consideration of future flood risk management activities, including land use planning. They have also been a key driver in shaping the content of the draft Flood and Water Management Act.

Flood & Water Management Act 2010

The Flood and Water Management Act¹⁶ received Royal Assent on 8th April 2010. The Act creates unifying legislation covering all forms of flooding and shifting the emphasis from building defences to managing risk. The Act creates clearer roles and responsibilities and provides for a more risk-based approach. Local authorities have a new lead role in managing local flood risk (from surface water, ground water and ordinary watercourses) and a strategic overview role for all flood risk for the Environment Agency (EA).

Risk management authorities will be expected to begin putting in place the organisational framework and strategic development ahead of the anticipated commencement date of April 2011.

The Act aims to:

- Reduce the likelihood and impacts of flooding
- Improve the ability to manage the risk of flooding, by clarifying who is responsible for what
- Reduce pollution and improve water quality
- Give water companies better powers to conserve water during drought
- Reduce red tape and other burdens on water and sewerage companies,
- Improve the overall efficiency of the industry

The content and implications of the Act provide considerable opportunities for improved and integrated land use planning and flood risk management by local authorities and other key partners. The integration and synergy of strategies and plans at national, regional and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth. Key areas of the Act have particular implications for local authorities, land use planning and related flood risk. These include:

- To give the Environment Agency an overview of all flood and coastal erosion risk management and unitary and county councils the lead in managing the risk of all local floods.
- Local authorities will have an enhanced leadership role in local flood risk management which includes ensuring that flood risk from all sources, including from surface run-off, groundwater and ordinary watercourses, is identified, taken account of in the spatial planning process and managed as part of locally agreed work programmes
- Local authorities will develop a suite of measures for managing local flood risk, for example, surface water mapping, appropriate development planning and collating information on flood risk and drainage assets
- County and unitary authorities will be responsible for local flood risk assessment and lead in ensuring the production of SFRA's and SWMPs
- SFRA's will provide the evidence to allow LPAs to factor flood risk into their LDFs, DPDs and individual planning proposals, and help to determine where SWMPs are needed
- County and unitary authorities will lead new local partnerships and have responsibility for adopting and maintaining sustainable drainage systems (SUDS) in new development, where they affect more than one property
- County or unitary authorities, the Environment Agency and IDBs will have powers to formally designate natural and man-made features (similar in principle to the Listed Buildings classification), which help to manage flood or coastal risk; they will give formal consent before anyone can change or remove the feature and use enforcement powers where needed

¹⁶ <http://www.defra.gov.uk/environment/flooding/policy/fwmb/key-docs.htm>

- To encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt SUDS for new developments and redevelopments.
- Surface water connection to public sewers will be conditional on meeting new national standards for SUDS, and the approval of a SUDS approving body will be needed, and a certificate issued, before development can begin
- Increased emphasis is needed on enabling flood water to safely flow overland with green infrastructure and safe flow routes being identified as part of flood risk assessments
- All relevant authorities will have a duty to cooperate and share information
- Right to Connect (Water Industry Act, 1991) S106 of the act has been amended by the FWM Act so that for new developments the approved sustainable drainage system must be constructed to connect to the public sewer network.
- This will need to be approved to the new National SUDS standards (currently being devised) by the Lead Local Flood Authority (LLFA – County or Unitary Authority)
- Once constructed, the LLFA will adopt the system and becomes responsible for maintaining it.

6.8 National Planning Policy

This SFRA has been prepared in a period during which planning authorities have been implementing the provisions of the Planning and Compulsory Purchase Act 2004 and accompanying planning guidance, including PPS1 Delivering Sustainable Development and PPS12 Local Development Frameworks. This affected all tiers of the planning system and has necessitated major changes at both the regional and local level which will impact on the way in which planned development is approached in the regional strategy and delivered locally.

PPS25 Development and Flood Risk

In December 2006 the Government published PPS25: Development and Flood Risk.

The aim of PPS25 is 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. The key planning objectives are that *“Regional Planning Bodies (RPBs) and Local Planning Authorities (LPAs) should prepare and implement planning strategies that help to deliver sustainable development by:*

- Identifying land at risk and the degree of risk of flooding from river, sea and other sources in their areas;
- Preparing Regional or Strategic Flood Risk Assessments (RFRAs / SFRAs) as appropriate, as a freestanding assessment that contributes to the Sustainability Appraisal of their plans;
- 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 suitable alternative sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding;



- 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 cause and impacts of flooding e.g. SWMPs; making the most of the benefits of green infrastructure for flood storage, conveyance and SUDS; re-creating functional floodplain; and setting back defences;
- 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; and
- Ensuring spatial planning supports flood risk management policies and plans, River Basin Management Plans and emergency planning.”

In addition to setting out the roles and responsibilities for LPAs and RPBs, PPS25 identifies that landowners also have a primary responsibility for safeguarding their land and other property against natural hazards such as flooding. Those promoting sites for development are also responsible for:

- Demonstrating that is consistent with PPS25 and Local Development Documents (LDDs)
- Providing a Flood Risk Assessment (FRA) demonstrating whether the proposed development: is likely to be affected by current or future flooding; satisfies the LPA that the development is safe; and identifies management and mitigation measures

PPS25 also introduces an amendment to Article 10 of The Town and Country Planning (General Development Order) 1995 which makes the Environment Agency a Statutory Consultee on all applications for development in flood risk areas and those within 20m of a Main River.

The Direction also introduces the requirement for LPAs to notify the Secretary of State where they are minded to approve a planning application contrary to a sustained objection by the Environment Agency.

The introduction of PPS25 enables local authorities to make a direction under Article 4 of the Town and County Planning (General Permitted Development) Order 1995. This will enable Local Authorities to remove permitted development rights where those rights threaten to have a direct, significant and adverse effect on a flood risk area, or its flood defences and their access, or the permeability and management of surface water, or flood risk to occupants.

PPS25 Development and Flood Risk Practice Guide

The Practice Guide to PPS25 was published by the Department for Communities and Local Government (CLG) in June 2008. It provides advice on the practical implementation of PPS25 policy and reflects extensive discussion with local authorities, the Environment Agency and other key stakeholders and practitioners. The guide provides further guidance on the preparation of SFRA's and FRA's, the Sequential and Exception Test and outlines potential mitigation measures e.g. SUDS and risk management techniques.

Local Authority planners and developers are advised to refer to and use PPS25 and the practice guide in conjunction with the further advice contained within this report.

Proposed Updates to PPS25 Practice Guide

On 11 August 2009, CLG published a Consultation Paper on proposed amendments to PPS25. The consultation relates to proposed clarifications to some aspects of the existing national spatial planning policy on development and flood risk, to help ensure the policy is applied effectively.

The proposed amendments affect tables D.1 (Flood Zones) and D.2 (Flood Risk Vulnerability Classification) in Annex D of PPS25.

It is proposed that the definition of the functional floodplain is updated to:

"..The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But 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, should provide a starting point for consideration and discussions to identify the functional floodplain"

The reasoning behind this was that by simply stating it should be based on probability rather than local circumstance, leads to areas of land that are not intended to allow for floodwater to flow or be stored being inappropriately identified as functional floodplain, and potentially also for areas that are designed to flood being wrongly excluded from identified functional floodplain.

There are four amendments proposed in Table D.2 including:

- Moving water treatment and sewage treatment works from 'less vulnerable' to 'essential infrastructure'. This means they will now need to pass the Exception Test if planned in Flood Zone 3a rather than just Flood Zone 3b. As usual, they will have to be designed to the appropriate uses and policy aims within Table D.1
- Allowing police, ambulance and fire stations to be defined as 'less vulnerable' only if they are not required to be operational during flooding. This will stop the exclusion of new emergency services facilities from communities they service in high flood risk areas.
- To allow facilities requiring hazardous substances consent, which are required to be located in flood risk areas, due to their need to be co-located with other facilities (i.e. the need to be located near ports, or processed or manufactured facilities) to be defined as 'essential infrastructure' rather than 'highly vulnerable'.
- Adding wind turbines to the 'essential infrastructure' category. However, in keeping with PPS25, the Sequential Test is not required but Parts A) and C) of the Exception Test would need to be passed if located in Flood Zone 3a and 3b.

Until the proposed changes have been agreed and PPS25 updated, the current PPS25 (2006) and its Practice Guide (2008) should be used for planning policy guidance, but users should be aware of possible future changes.

6.9 Other Planning Policy Statements

PPS1 Delivering Sustainable Development published in February 2005 sets out the overarching planning policies for the delivery of sustainable development across the planning system and sets the tone for other planning policy statements. PPS1 explicitly states that development plan policies should take account of flooding, including flood risk. It proposes that new development in areas at risk from flooding should be avoided. Planning authorities are also advised to ensure that developments are "sustainable, durable and adaptable" including taking into account natural hazards such as flooding.

PPS1 also places an emphasis on 'spatial planning' in contrast to the more rigid 'land use planning' approach which it supersedes. Planning authorities will still produce site specific allocations and a proposals map as LDDs, but their Core Strategy will be more strategic and visionary in content and will take into account the desirability of achieving integrated and mixed use development and will consider a broader range of community needs than in the past. With regard to flood risk, it will be important for the Core Strategies and accompanying Supplementary Planning Documents to recognise the contribution that non-structural measures can make to flood management.

Planning Policy Statement: Planning and Climate Change, a supplement to PPS1, published in December 2007, sets out how the Government expects the planning system to address

climate change. It explains that there is a compelling scientific consensus that human activity is changing the world's climate. The evidence that climate change is happening, and that man-made emissions are its main cause, is strong. The Intergovernmental Panel on Climate Change highlights that we are already experiencing the effects of climate change and if these changes deepen and intensify, as they are predicted to do without the right responses locally and globally, we will see even more extreme impacts.

One of the predicted impacts of climate change is more intense periods of rainfall and consequent flooding. The PPS1 supplement requires Regional Spatial Strategies and Local Development Frameworks to shape sustainable communities that are resilient to such effects. A key objective of the planning system is securing new development and shaping places that minimise vulnerability and provide resilience to climate change in ways that are consistent with social cohesion and inclusion. Accordingly new development should be planned to minimise future vulnerability in a changing climate. The SFRA incorporates Sequential and Exception Test information that is essential in meeting the objectives of the PPS1 supplement Planning and Climate Change.

Planning Policy 12 (PPS12) Local Spatial Planning advocates the importance of considering flooding when local authorities are preparing their development documents. The SFRA provides the evidence on flood risk to feed in the application of LDF and adopted proposals maps.

Whilst not directly relevant to the development of an SFRA, it is important to recognise that the exercise takes place within the context of other planning policy guidance and statements, some of which also require sequential testing of site allocations and development proposals. PPS3 (Housing), emerging PPS4 (Planning for Sustainable Economic Development) and PPS6 (Planning for Town Centres) are intrinsic within the planning process and, therefore, an understanding of the constraints faced as a result of this additional policy guidance is required.

Northumbria River Basin Management Plan

In accordance with the Water Framework Directive (WFD), implemented in December 2000, a River Basin Management Plan (RBMP) must be produced for each of the 11 River Basin Districts by 2009. The Environment Agency state that:

“RBMPs will have a number of functions, but are primarily intended:

- To establish a strategic plan for the long term management of the River Basin District.
- To set out objectives for water bodies and in broad terms what measures are planned to meet these objectives
- Act as the main reporting mechanism to the European Commission”

The Northumbria River Basin District is one of only two that cross the England-Scotland border. The Environment Agency recognise that cross-board RBDs can,

“Raise issues for the relationship between those responsible for the delivery of the WFD's objectives, the devolved governments, local authorities and government agencies.”¹⁷

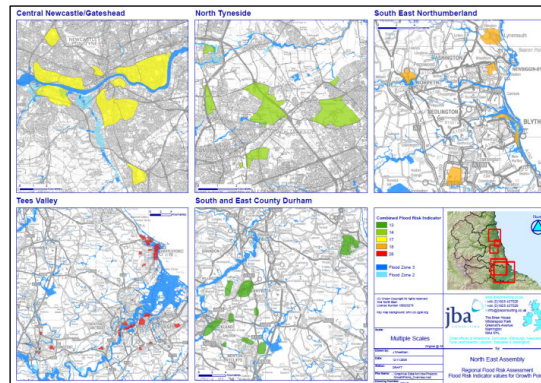
¹⁷ The Environment Agency (2005) Briefing Note: Cross-border River Basin Districts and the Water Framework Directive www.environment-agency.gov.uk/commondata/acrobat/bn_cb_2005_1184314.pdf

North East Regional Flood Risk Appraisal

JBA Consulting was commissioned by the North East Assembly (NEA) in conjunction with One Northeast to undertake a scoping study for the RFRA. The scoping study examines the Strategic Flood Risk Assessments undertaken across the North East region, and considers how these could form the basis for a more strategic flood risk appraisal.

The appraisal is displayed through maps which have been structured:

- Regionally through economic indicators;
- At City regions via a range of flood risk indicators presented at Growth Point Level; and
- At Growth Areas using a broad range of combined flood risk indicators.



The scoping report and associated maps can be found on the Association of North East Councils website.

The primary objective of a Regional Flood Risk Appraisal (RFRA) is to provide an appraisal of strategically significant flood risk issues in a region in order to guide strategic planning decisions.

The RFRA assists decisions on key land use factors such as need for employment, inward investment, re-generation, provision of housing and open/green space, major road and other infrastructure provision to deliver sustainable growth whilst taking full account of flood risks, now and in the future. The appraisal also drives and informs policy development for the strategic management of flood risk and, in turn, assists local authority planners in their consideration and implementation of land use policies in Local Development Frameworks (LDFs) and Local Development Documents (LDDs). In addition, it provides important strategic flood risk input to the Regional Sustainability Appraisal (RSA) and the Strategic Environmental Assessment (SEA).

The outputs of the RFRA help to identify where there may be a need for further flood risk assessment work to be undertaken, particularly in respect of Strategic Flood Risk Assessments (SFRAs) and where strategically significant developments are proposed in areas currently at risk of flooding. Even where SFRAs already exist, the RFRA helps to place specific local authority flood risks into a regional context, showing the variation of risk and the interdependency between neighbouring authorities and river sub-catchments. Flooding does not respect local authority administrative boundaries and the RFRA provides a mechanism to help local authorities work better together, and with key stakeholders, to consider, communicate and share common or similar flood risk management policy objectives, opportunities and constraints.

Climate Change Action Plan for the North East

The North East England Climate Change Adaptation Study was published in 2002 based on the UKCIP 2002 scenarios. This was followed by the North East Climate Change Adaptation Study in 2008.

The Climate Change Action Plan for North East England identifies what is needed to be done to tackle climate change in North East England. It shows how all sectors have the opportunity to actively engage with this work, take direct action and influence how the plan is developed.

Climate change action plans already exist or are being developed at a sub-regional and local level. The action plan for North East England provides a regional framework that coordinates and facilitates action at a regional level, incorporating both adaptation and mitigation measures, ensuring that a regional evidence base is developed to inform those local action plans.

Climate change impacts continue to provide an increasing challenge to sustainable flood risk management for government and operating authorities. The severe flooding experienced across the country in recent years and in particular during the summer 2007 were, in the words of Sir Michael Pitt, “a wake up call”.

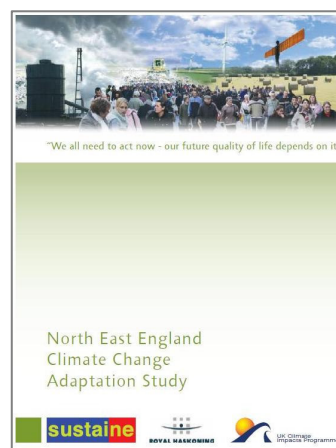
Flood risk related climate change issues are extremely important to the future management of flood risk in the UK and beyond. These issues need to be taken seriously and mitigation and adaptation measures planned and adopted by Regional and Local Authorities.

Principal adverse flood risk effects of climate change threatening people and property include:

- More frequent and intense rainfall events causing flash flooding to low-lying areas;
- More and faster surface water runoff and overland flows causing sewers, drains, rivers and streams to overflow;
- Increased sea level rise, storminess and frequency of storm surges threatening low-lying coastal communities; and
- Rising groundwater levels causing increased spring-source activity and higher spring flows increasing the risk of flooding.

If not addressed, these effects are likely to have a significant impact on many communities and in particular new developments in areas at high risk of flooding. Recent climate change trends are contained within a UK Climate Impacts Programme document: The Climate of the United Kingdom and Recent Trends published in December 2007 and is available on their website. The next UKCIP09 report is planned for launch in late 2009.

In recognition of the Government's increasing concerns about the effects of climate change on flood risk management, Defra produced a “Supplementary Note to Operating Authorities – Climate Change Impacts” in October 2006 in which they updated the climate change policy for flood and coastal management. This document is available on the Defra website. In conjunction with Defra, DCLG then provided the recommended climate change contingency allowances for sea level rise and precautionary sensitivity ranges for peak rainfall intensities and peak river flows etc. in Annex B of PPS25. These figures should be used in all aspects of flood risk management including the consideration of new developments and changes of land use in flood risk areas.



Local Planning Policy

Following the introduction of the Planning and Compulsory Purchase Act 2004, the way in which development plans are prepared is changing. With the aim of speeding up and simplifying plan preparation and improving community involvement, development plans in their current form are to be abolished and replaced with a new development plan system, the Local Development Framework (LDF).

Newcastle Unitary Development Plan

The Newcastle upon Tyne Unitary Development Plan was adopted in January 1998 and is the current local plan for the city. Under the Planning and Compulsory Order Act 2004 a selected number of UDP policies have been saved until such time as they are superseded in LDF Development Plan Documents.

POL 14: Development which would be at direct risk from flooding or likely to increase the risk of flooding elsewhere will not be allowed.

The supporting text confirms that 'areas at highest risk from flooding in the City are limited and confined largely to the upper reaches of the Ouseburn. The City Council, in consultation with the Environment Agency, wishes to ensure that new development will not increase the risk of flooding which could endanger life or damage property. Development anywhere in the catchment may increase surface water runoff, adding to the flood risk downstream, and, may increase the risk of pollution and damage to river habitats'.

The Emerging Local Development Framework

The Local Development Framework (or LDF for short) is the land-use and transportation planning framework being introduced in Newcastle. The system was brought in by the Planning and Compulsory Purchase Act 2004 and related regulations and guidance.

The LDF will take the form of a portfolio of plans and documents made up of several Local Development Documents (LDDs). Some of them will have statutory status (Development Plan Documents) and others will be adopted as local guidance documents. LDDs can either deal with different issues or different geographical areas, but when taken together they will set out the Council's policies for how it will assess development proposals and direct future growth.

The Local Development Scheme of 2007 includes a timetable for preparation of six DPDs. However, please note that as at summer 2009 this programme is under complete review. The full list of DPDs as proposed in the LDS of 2007 is as follows:

- Core Strategy
- Walker Riverside Area Action Plan
- Benwell Scotswood Area Action Plan
- City Centre Area Action Plan
- Site Specific Land Allocations
- Development Control Policies

The LDF includes a Statement of Community Involvement (SCI) that describes how the local planning authority intends to carry out its public consultation arrangements. The SCI and all other DPDs will be submitted to the Secretary of State. They will be subject to an independent examination that is led by a planning inspector.

Also in the LDF are:

- The Local Development Scheme (LDS), which is in effect the 'project plan' for the LDF as a whole – the latest version came into effect in April 2007 but it is under comprehensive review as at summer 2009 and a formal revision will be brought forward in autumn 2009.

- Annual Monitoring Reports (AMRs), which are produced by the end of December each year, reporting on the previous financial year. We have four in place as at the end of 2008.

The full Newcastle Local Development Framework is currently being prepared and will eventually comprise the following documents. Some documents have already been adopted whilst others are still in the early stages of preparation.

One Core Strategy 2030

Newcastle and Gateshead will be preparing a joint Core Strategy called the One Core Strategy Newcastle Gateshead 2030 over the next few years that will be the key Development Plan Document in both Newcastle's and Gateshead's Local Development Framework (LDF) (see Newcastle's and Gateshead's respective web sites for individual LDFs) for both Councils.

Once adopted, the One Core Strategy Newcastle Gateshead will replace the existing Unitary Development Plan as the document that sets out the long term strategic policies for Gateshead and Newcastle's future development and will form the framework that planning applications will be assessed against. Newcastle and Gateshead are currently preparing the One Core Strategy scheduled for adoption in 2012.

The timetable for its preparation is set down in the City Council's Local Development Scheme. Sustainable development will be at the heart of our Core Strategy and to ensure this, a Sustainability Appraisal is being undertaken alongside the preparation of the Core Strategy.

The following sets out the key stages and timescales associated with the development of the Strategy:

- Draft Core Strategy – October/November 2010
- Publication of 'Submission Draft' Document – July 2011
- Submission of Document to Secretary of State – September 2011
- Pre-examination Meeting – November 2011
- Examination in Public – December 2011
- Inspector's Report – April 2012
- Adoption of document by Councils – July 2012
-

Newcastle and Gateshead Council are currently working on the required evidence base for the One Core Strategy and will publish joint Topic Papers that summarise the emerging evidence in March 2010. Once published, these will be available to view online at Topic Papers (<http://oncorestrategyng-consult.limehouse.co.uk/portal>)

Additionally as a part of this process a number of studies have been commissioned in order to provide a sound evidence base for formulating policies. The first phase of this work will be to put in place the evidence base for the One Core Strategy. Information on these studies can be found under Evidence at <http://oncorestrategyng-consult.limehouse.co.uk/portal>

List of studies currently underway:

- Surface Water Management Plan (SWMP),
- Water Cycle Study,
- Strategic Flood Risk Assessment (SFRA),
- Strategic Housing Land Availability Assessment (SHLAA),
- Tyne & Wear Strategic Housing Market Assessment (SHMA),
- Employment Land Review (ELR),
- Office Capacity Study (OCS),
- Office Needs Assessment (ONA),

- Affordable Housing Viability Assessment,
- Retail Capacity Study,
- Biodiversity study,
- Sustainable Construction & on-site Renewables,
- Commercial Scale Renewables,
- Tyne & Wear Gypsy, Traveller and Travelling Showpeople Accommodation Needs Assessment,
- Newcastle Gateshead Urban Hotel Study,
- Rural Accommodation Study,
- Sustainability Appraisal,
- Infrastructure Study.

6.10 Environment Agency Policy

Tyne Catchment Flood Management Plan

The Tyne CFMP was published in 2008 is a high level policy document covering the whole of the River Tyne catchment. The CFMP is investigating what factors influence flood risk at the catchment scale and will assess the impacts that climate change, land use change and urbanisation may have on flood risk over the next 50 to 100 years.

The CFMP has established a policy framework for flood risk management across the catchment through which future flood defence management strategies and programmes will be formulated. Recognition of these strategic plans is very important to local authority planners when planning for the future and considering long term land use options for regeneration, inward investment and growth.

The CFMPs help to prioritise activities, focus resources where there is greatest need, and determine what flood risk management responses need to be considered further (and which responses will not be effective). The responses to flood risk will be broader than those traditionally used for flood defence to reflect the full range of management options available. CFMPs support an integrated approach to spatial planning and river basin management, in line with the Water Framework Directive and the EU Directive on the assessment and management of flood risk; they cover all geographical areas in England and Wales and are crucial in the planning of sustainable flood risk management.

The Tyne CFMP has been split into seven policy units as outlined in Figure C1.

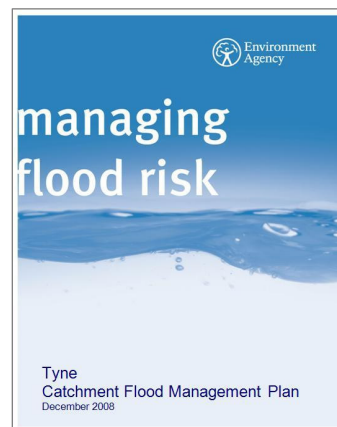
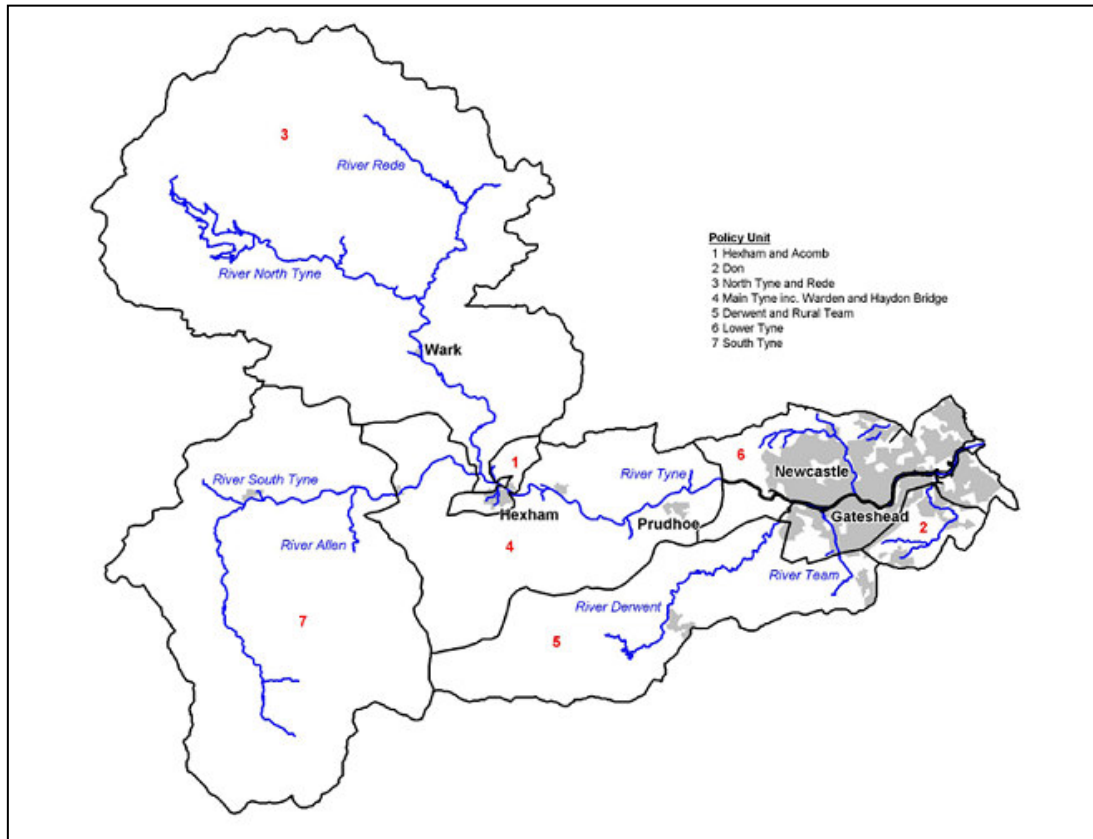


Figure C1: Tyne CFMP Policy Units¹⁸



Rivers in Newcastle fall under the Policy Unit ‘The Lower Tyne’, for which the policy is to “Take further action to sustain flood risk at the current level in future.” This means that flooding of residential, commercial and community buildings and infrastructure does not increase, and flood depth and velocity stay the same even if flows increase under climate change. It has to be noted that this policy does not fully address the tidal flood risk in the Main River Tyne channel. The management of the tidal flood risk areas will be outlined further within the shoreline management plan for the area.

There are several flood risk management policy messages relevant to the Newcastle SFRA to emerge from the CFMP (summarised in Table C1).

Whilst the actions outlined below are for the whole Lower Tyne Policy Unit there are a number of Generic Actions which are centred on the Local Authority under the Local Area Agreement NI189.

¹⁸ Environment Agency (2008) Draft Tyne CFMP Main Stage Summary Report June 2008

Table C1: Lower Tyne CFMP Policy Unit Action Plan¹⁹

Action	Lead Organisation	Timescale
Produce and implement a System Asset Management Plan (SAMP) for the policy unit to determine the most sustainable approach to sustaining the currently level of flood risk throughout the policy unit.	Environment Agency	1-6 years
Undertake detailed studies to identify the true level of flood risk in the policy unit where this is not known, and implement recommendations.	Environment Agency	1-6 years
Work in partnership to develop a FRM Strategy for the Lower Tyne. This strategy should take into account all sources of flooding as well as the implications of climate change to develop the most sustainable long term approach to managing flood risk within the Lower Tyne.	Environment Agency	1-6 years
Work in partnership to develop an assessment into the risk of flooding from surface water through undertaking a Surface Water Management Plan (SWMP) for the policy unit. Where locations of surface water flood risk are identified, ensure that cross-boundary issues are taken into account and fed into the management of surrounding policy units.	Local Authorities (Newcastle City Council)	1-6 years
Determine in greater detail the risk of flooding to educational facilities and the consequences of loss of the site during flooding. Where practically possible ensure that the site remains operational during flood events. Following the identification of flood risk to these facilities, ensure evacuation plans and alternative accommodation is identified.	Local Authorities (Newcastle City Council)	1-20 years
Determine in greater detail the risk of flooding to health facilities and the consequences of loss of the site during flooding. Where practically possible ensure that the site remains operational during flood events.	Health Authority	1-20 years
Determine in greater detail the risk of flooding to gas and electricity installations and the consequences of loss of the site during flooding. Where practically possible ensure that the site remains operational during flood events.	Northern Electric Distribution Ltd/ National Grid	1-20 years
Investigate securing Local levy funding to reduce localised flood risk.	Environment Agency	1-20 years

In accommodating future development in Newcastle, there is a range of planning policies to consider and balance on a national, regional and local level. Future development needs have been broadly specified in regional plans and are being refined on a local level in the emerging LDF.

PPS25 and its Practice Guide provides the overarching national guidance with respect to development and flood risk, emphasising the need to effectively manage flood risk within the planning system, rather than relying on reactive solutions to flooding. This includes a responsibility for LPAs to reduce flood risk to people and property as a result of new development. It also identifies the preparation of SFRAs as a key process in the understanding and management of flood risk for planning purposes.

¹⁹ Environment Agency (2008) Tyne Catchment Flood Management Plan

It is widely recognised that flood risk is one of a whole raft of policy constraints placed upon the local planning system. Development must facilitate the socio-economic needs of a community, and spatially must sit within an existing framework of landscape and infrastructure. For this reason, a balance must be sought between development need and the risk it may pose upon existing and future dwellers of the area as a result of flooding.

The aim of this SFRA is to provide a better understanding of flood risk in Newcastle that can feed into the emerging LDF and enable informed and balanced planning decisions to be made.

6.11 Summary

In accommodating future development in Newcastle there is a range of planning policies to consider and balance on a national, regional and local level. Future development needs have been broadly specified in regional plans and are being refined on a local level in the emerging LDF.

PPS25 and its Practice Guide provides the overarching national guidance with respect to development and flood risk, emphasising the need to effectively manage flood risk within the planning system, rather than relying on reactive solutions to flooding. This includes a responsibility for LPAs to reduce flood risk to people and property as a result of new development. It also identifies the preparation of SFRAs as a key process in the understanding and management of flood risk for planning purposes.

It is widely recognised that flood risk is one of a whole raft of policy constraints placed upon the local planning system. Development must facilitate the socio-economic needs of a community, and spatially must sit within an existing framework of landscape and infrastructure. For this reason, a balance must be sought between development need and the risk it may pose upon existing and future dwellers of the area as a result of flooding.

The aim of this SFRA is to provide a better understanding of flood risk in Newcastle that can feed into the emerging LDF alongside the North East RFRA and enable informed and balanced planning decisions to be made.

D . Stakeholder Engagement and Data Management

Introduction

The majority of data provided in both the SFRA has been obtained through consultation with those stakeholders with specific interest in or knowledge of sources of flooding within the study area.

PPS25 outlines a number of key consultees to the planning process. Stakeholders and their involvement within the preparation of the SFRA are discussed in Table D1.

Table D1: Stakeholder Involvement

Stakeholder	Involvement
LPA	<p>Newcastle Council was the main stakeholder for the preparation of this SFRA. They focused the scope of the SFRA and provided the detail needed for its production.</p> <p>An initial SFRA meeting was held to discuss the requirements of PPS25 in producing the SFRA and to determine the main tasks that needed to be completed. The meeting also outlined the council's own timetable relating to preparing an evidence base for their LDF process.</p> <p>There have been regular progress meetings outlining progress to date and further data requests.</p>
Environment Agency	<p>The Environment Agency is a statutory consultee for LDDs, Sustainability Appraisals and Strategic Environmental Assessments.</p> <p>They are also a statutory consultee for planning applications. With regards to the SFRA, the Environment Agency has discretionary powers under the Water Resources Act (1991) to manage flood risk and, as a result, hold the majority of flood risk data in the UK. Separate departments were consulted via the External Relations Team including Development Management, Flood Risk Mapping and Data Management and Reservoir Safety Teams on the SFRA approach and available data.</p> <p>The Environment Agency was also one of the main consultees throughout the preparation of the SFRA and their comments and guidance have been included within report revisions.</p>
Northumbrian Water	<p>The main source of information requested from Northumbrian Water was DG5 records, location of drainage areas and sewers networks.</p> <p>The council should continue to liaise with Northumbrian Water in conjunction with the Environment Agency to explore how they can contribute to the understanding of flood risk now or in the future.</p>

SFRA Data Management

The SFRA should be viewed as a 'living' document for use in the day-to-day process of planning and development. It is therefore important that datasets collected for the SFRA are transparent and accessible. A Data Register has been produced and supplied to the Council listing all data received throughout the SFRA process.

All data was reviewed on receipt and its quality and confidence rated for use in the SFRA. This process was purely based on professional judgement and rated on a high to low scale.

Most data requested was of the quality and accuracy expected. Whilst the majority of the datasets could be mapped geographically using Geographic Information Systems (GIS),

helping to visualise the risk of flooding, others were not, reducing the quality score. Historical flooding information was generally marked as both medium quality and confidence, as whilst it could be placed on a map, there was generally information on the source of flooding. The confidence in its precision was also questionable, as expected for historical flood records.

The Data Register will allow intended users of the SFRA to review the accuracy, currency and relevance of all datasets used and for a central group to manage and update datasets when needed. The Data Register also provides details of contacts who supplied the data. The organisations listed should be the first contact for any update to the SFRA to make sure the most up-to-date datasets are used.

Supplying SFRA Data

Whilst all data collected and produced during the SFRA process has been supplied to Newcastle City Council (report, maps, GIS, modelled output, data register) there should be controls on its use. It is anticipated that the SFRA report and associated maps will be published on the Council website as PDFs as the central source of SFRA data and available to download.

The LPA will be able to use the modelled output (depths, hazards and outlines) for internal use. This use of this information must consider the context within which it was produced. The use of this data will fall under the license agreement between the LPA and the Environment Agency as it has been produced using Environment Agency data. It should be remembered that the modelling undertaken for the SFRA is of a strategic nature and more detailed FRAs should seek to refine the understanding of flood risk from all sources to any particular site.

SFRA data should not be passed on to third parties outside of the LPA. Any third party wishing to use existing Environment Agency flood risk datasets should contact External Relations in the Environment Agency North East Region. A charge is likely to apply for the use of this data.

E . Flood Risk Zones

Appendix E provides Flood Zone categorisations in accordance with PPS25 and the EA's Flood Zone Maps. The EA maps provide an indication of the likely extent of flooding in the absence of flood defences. The flood limiting impact of defences can be determined with reference to the "Areas Benefiting from Defences" mapping. In Newcastle, existing defences generally assist in managing flood water to a 2% or 2.5% AEP event scenario.

The EA do not have any detailed mapping that defines areas of functional floodplain (Zone 3b). The SFRA includes mapping of potential FZ3b areas (and associated hazard mapping data) **in the absence of defences**. Flood mapping of a potential 5% AEP event, in the absence of defences is included as drawing number D001a. All other mapping includes for the presence of flood defences in accordance with the design maintenance outlined in the EA NFCDD database.

Inspection of the defence asset data provided by the EA indicates that the majority of watercourses within the Newcastle area are defended to some extent in excess of the 5% AEP criteria. It should be noted that issues such as structural integrity of these defences, variations in crest levels and levels of maintenance have not been considered as part of the SFRA.

Areas of low-lying land behind defences, which are defended to a level in excess of the 5% AEP criteria, have been classified as FZ3. The FZ3 categorisation allows the Council to considered development proposals within existing defended areas. Residual risks associated with proposed development, located behind defences, needs to be considered in detail as these risks are potentially significant due to the rate and depth of inundation if a defence were to fail.

Inspection of the mapping including "Areas Benefiting from Defences" indicates that the maximum extent of Flood Zone 3 is not influenced, to any significant extent, by the presence of existing defences.

Similarly the EA do not have flood zone outlines that including the impact of climate change. Climate change outlines, including a 20% increase in design flows have been developed for this SFRA using strategic mapping techniques.

Flood Zone Definitions from PPS25

Zone 1: Low Probability
<p>Definition This zone comprises land assessed as having a less than 1 in 1000 annual probability of river and sea flooding in any year (<0.1%).</p> <p>Appropriate uses All uses of land are appropriate in this zone</p> <p>FRA requirements For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in an FRA [Flood Risk Assessment]. This need only be brief unless the factors above or other local considerations require particular attention. See Annex E (of PPS25) for minimum requirements</p> <p>Policy aims In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and the appropriate application of sustainable drainage techniques.</p>

Zone 2: Medium Probability
<p>Definition This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) and between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.</p> <p>Appropriate uses The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure listed in... [The Flood Risk Vulnerability Classification] are appropriate in this zone. Subject to the Sequential Test being applied, the highly vulnerable uses in Table D.2 (of PPS25 and Table F1 of this report) are only appropriate in this zone if the Exception Test is passed</p> <p>FRA requirements. All development proposals in this zone should be accompanied by a FRA. See Annex E (of PPS25) for minimum requirements</p> <p>Policy Aims In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques.</p>

Zone 3a: High Probability

Definition

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

Appropriate uses

The water-compatible and less vulnerable uses of land listed in Table D.2 (of PPS25 and Table F1 of this report) are appropriate in this zone.

The highly vulnerable uses listed in Table D.2 (of PPS25 and Table F1 of this report) should not be permitted in this zone.

The more vulnerable and essential infrastructure listed in the Table D.2 (of PPS25 and Table F1 of this report) should only be permitted in this zone if the Exception Test is passed. Essential Infrastructure permitted in this zone should be designed and constructed to remain operational and safe for user in times of flood.

FRA requirements

All development proposals in this zone should be accompanied by a FRA, See Annex E (of PPS25) for minimum requirements.

Policy Aims

In this zone, developers and local authorities should seek opportunities to:
 reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;
 relocate existing development to land in lower Flood Zones; and
 Create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocation and safeguarding open space for flood storage.

Zone 3 with climate change: High Probability

Definition

This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) and a 1 in 200 or greater annual probability of flooding from the sea (>0.5%), plus a climate change sensitivity allowance as outlined in Table B.2 of Annex B of PPS25, in any given year.

Appropriate uses

The water-compatible and less vulnerable uses of land listed in Table D.2 (of PPS25 and Table F1 of this report) are appropriate in this zone.

The highly vulnerable uses listed in Table D.2 (of PPS25 and Table F1 of this report) should not be permitted in this zone.

The more vulnerable and essential infrastructure listed in the Table D.2 (of PPS25 and Table F1 of this report) should only be permitted in this zone if the Exception Test is passed. Essential Infrastructure permitted in this zone should be designed and constructed to remain operational and safe for user in times of flood.

FRA requirements

All development proposals in this zone should be accompanied by a FRA, See Annex E (of PPS25) for minimum requirements.

Policy Aims

In this zone, developers and local authorities should seek opportunities to:
 reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;
 relocate existing development to land in lower Flood Zones; and
 Create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocation and safeguarding open space for flood storage.

Zone 3b: The Functional Floodplain

Definition

This zone comprises land where water has to flow or be stored in times of flood. SFRA 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 LPA and the Environment Agency, including water conveyance routes).

Appropriate uses

Only the water-compatible uses and the essential infrastructure listed in Table D.2 that has to be there should be permitted in this zone. It should be designate and constructed to:

- Remain operational and safe for users in times of flood;
- Result in no net loss of floodplain storage;
- Not impede water flows; and
- Not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception test.

FRA requirements

All development proposed in this zone should be accompanied by a FRA. See Annex E for minimum requirements.

Policy Aims

In this zone, developers and local authorities should seek opportunities to:
 Reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and
 Relocate existing development to land with a lower probability of flooding.

F . Flood Risk Vulnerability Classification

Flood risk vulnerability classifications are provided in Table D.2 of PPS25 and Appendix F of this report. These provide recognition that not all land uses have the same vulnerability to flooding. Some land uses such as residential developments are more vulnerable to the potential loss of life and damage to personal property and possessions than say shops and offices. Five flood risk vulnerability classifications are contained in PPS25 and these are:

- Essential infrastructure
- Highly vulnerable
- More vulnerable
- Less vulnerable
- Water compatible development

Flood Zone 1 – Low Probability

From a flood risk perspective all land uses are acceptable within Flood Zone 1. Flood risk is not considered to be a significant constraint to development and all land uses listed below are appropriate in this zone.

- Essential infrastructure
- Highly vulnerable
- More vulnerable
- Less vulnerable
- Water compatible development.

A Screening Study, as per PPS25 Practice Guide, will be required for development in this zone. This will determine whether further assessment of flood risk is required. This will take account of historical flood records of localised flooding, site specific considerations and the surface water proposals for the development, including mitigation.

However, due to their potential impact on the local flood risk, a full FRA will be required for all developments greater than 1ha in size. This will include further consideration of surface water drainage and onsite mitigation measures that may be required, particularly where the capacity of the surface water sewer or receiving watercourse is limited. This assessment will be undertaken by the developer of the site and should be appropriate to the scale, nature and location of the development. The Council's Drainage Engineers and the EA will be able to advise potential developers as to their specific requirements on a site by site basis.

Flood Zone 2 – Medium Probability

Subject to the application of the Sequential Flood Risk Test, PPS25 specifies suitable types of development in Flood Zone 2 as:

- Essential infrastructure
- More vulnerable
- Less vulnerable
- Water compatible development.

Highly vulnerable uses should only be permitted in this zone if the Exception Test is passed. The SFRA is unable to assess whether the site will pass parts a. and b. of the Exception Test. However, the Council must be able to demonstrate the need for development through the spatial planning process.

An FRA will be required for all development in this zone. The FRA will need to assess the current level of flood risk as well as the level of flood risk following development. Development plans for the site will need to demonstrate that flood risk can be effectively and safely managed without increasing flood risk elsewhere.

Proposals will also need to demonstrate that access and egress to the development can be maintained during an extreme flood event and that development is set at an appropriate level. A further level of analysis may be required where development is planned behind or adjacent to existing defences in order to test the sustainability and robustness of the mitigation measures. In keeping with Flood Zone 1 other flood risk constraints, such as incidents of localised flooding and other site-specific considerations will need to be addressed. Again, detailed FRAs will be undertaken by the developer of the site and the EA will be able to advise potential developers as to their specific requirements on a site by site basis. The FRA will need to address part c of the Exceptions Test and should only be commenced when the planning justification is clearly established.

Flood Zone 3 – High Probability

A Sequential Flood Risk Test is used to prioritise sites in order of vulnerability to flood risk and their acceptability for development. Developers should primarily focus on lower Flood Zones in preference to Flood Zone 3. Any proposals for development within Flood Zone 3 will require developers to undertake a detailed FRA. It should be noted that constraints to development are likely to be significant and developers should seek advice from the Council and the EA as to the specific requirements for assessment.

Flood Zone 3 is subdivided into Zones 3a and 3b. Flood Zone 3b is the portion of floodplain that provides natural and/or managed attenuation. It can be all or part of the flow area and owing to the frequency of inundation, Zone 3b areas are considered to be Functional Floodplain. Urban areas are generally considered to be Zone 3a, so for the purpose of this SFRA, Brownfield sites will be assumed Zone 3a.

Zone 3a is potentially suitable for water-compatible and less vulnerable land uses. The more vulnerable and essential infrastructure uses should only be permitted in this zone if the Exception Test is passed. Highly vulnerable development should not be permitted in this zone.

In Zone 3b, only essential infrastructure (subject to Exception Testing) and water-compatible uses may be permitted. Where sites are partially located within Flood Zone 3b, it is recommended that Council should avoid development by specifying water-compatible uses or public open space for these areas.

Land use vulnerability classifications and flood zones are carried forward into Table D.3 for application of the Exception Test.

Proposed Updates to PPS25 Practice Guide Vulnerability Classification

On 11 August 2009, CLG published a Consultation Paper on proposed amendments to PPS25. The consultation relates to proposed clarifications to some aspects of the existing national spatial planning policy on development and flood risk, to help ensure the policy is applied effectively. The consultation process is due to end in November 2009.

There are four amendments proposed in Table F1 including:

10. Moving water treatment and sewage treatment works from 'less vulnerable' to 'essential infrastructure'. This means they will now need to pass the Exception Test if planned in Flood Zone 3a rather than just Flood Zone 3b. As usual, they will have to be designed to the appropriate uses and policy aims within Table F1
11. Allowing police, ambulance and fire stations to be defined as 'less vulnerable' only if they are not required to be operational during flooding. This will stop the exclusion of new emergency services facilities from communities they service in high flood risk areas.
12. To allow facilities requiring hazardous substances consent, which are required to be located in flood risk areas, due to their need to be co-located with other facilities (i.e. the need to be located near ports, or processed or manufactured facilities) to be defined as 'essential infrastructure' rather than 'highly vulnerable'
13. Adding wind turbines to the 'essential infrastructure' category. However, in keeping with PPS25, the Sequential Test is not required but Parts A) and C) of the Exception Test would need to be passed if located in Flood Zone 3a and 3b.

The proposed changes have been agreed and PPS25 updated, the current PPS25 (2010) and its Practice Guide (2009) should be used for planning policy guidance.

Table F1: Land Use Classifications

Classification	Description
Essential Infrastructure	<ul style="list-style-type: none"> Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk and strategic utility infrastructure, including electricity generating power stations and grid and primary substations. Wind Turbines
Highly Vulnerable	<ul style="list-style-type: none"> Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. Emergency dispersal points. Basement dwellings. Caravans, mobile homes and park homes intended for permanent residential use. Installations requiring hazardous substances consent (1)
More Vulnerable	<ul style="list-style-type: none"> Hospitals. Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. Non-residential uses for health services, nurseries and educational establishments. Landfill and sites used for waste management facilities for hazardous waste. (2) Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan
Less Vulnerable	<ul style="list-style-type: none"> Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in 'more vulnerable'; and assembly and leisure. Land and buildings used for agriculture and forestry. Waste treatment (except landfill and hazardous waste facilities). Minerals working and processing (except for sand and gravel working). Water treatment plants. Sewage treatment plants (if adequate pollution control measures are in place).
Water-compatible Development	<ul style="list-style-type: none"> Flood control infrastructure. Water transmission infrastructure and pumping stations. Sewage transmission infrastructure and pumping stations. Sand and gravel workings. Docks, marinas and wharves. Navigation facilities. MOD defence installations. Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. Water-based recreation (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Note 1: This classification is based on advice from the Environment Agency on the flood risks to people and the need of some uses to keep functioning during flooding.

Note 2: Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood sensitivity.

(1)DETA Circular 04/00 – para. 18: Planning controls for hazardous substances.

(2)See Planning for Sustainable Waste Management: Companion Guide to Planning Policy Statement 10 for

Classification	Description
definition.	

G . Sustainable Drainage Systems

Assessment of the Application of SUDS

Sustainable Drainage Systems (SUDS) are management practices which enable surface water to be drained in a more sustainable manner.

For Greenfield developments, the aim is to not increase runoff from the undeveloped situation; for Brownfield re-developments, the aim is to reduce existing runoff rates. Wherever possible, this should be achieved through the implementation of a sustainable drainage or flow retention systems, constructed within the boundaries of the development site.

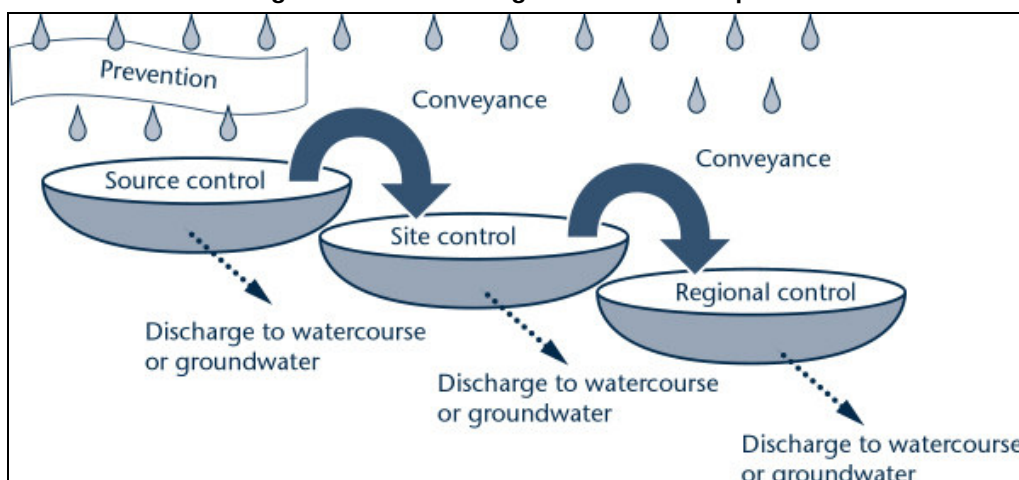
There are many different SUDS techniques. As a result, there is no one correct drainage solution for a site. In most cases, a combination of techniques, using the Management Train principle, will be required. Figure G1 shows the SUDS Management Train principle where source control is the primary aim.

Just as in a natural catchment, drainage techniques can be used in series to change the flow and quality characteristics of the runoff in stages. The management train starts with **prevention**, for individual premises, and progresses through local **source controls** to larger downstream **site and regional controls**. Runoff need not pass through all the stages in the management train. It could flow straight to a site control, but as a general principle it is better to deal with runoff locally, returning the water to the natural drainage system as near to the source as possible. Only if the water cannot be managed on site should it be conveyed elsewhere. This may be due to the water requiring additional treatment before disposal or the quantities of runoff generated being greater than the capacity of the natural drainage system at that point. Excess flows would therefore need to be routed off site.

The design of SUDS will require active decisions between different options, often depending on the risks associated with each course of action. The risks of an area flooding have to be balanced with the costs of protecting the area from different levels of floods.

The management train concept promotes division of the area to be drained into **sub-catchments** with different drainage characteristics and land uses, each with its own drainage strategy. Dealing with the water locally not only reduces the quantity that has to be managed at any one point, but also reduces the need for conveying the water off the site.

Figure G1: SUDS Management Train Principle²¹



²¹ CIRIA (2008) Sustainable Drainage Systems: promoting good practice – a CIRIA initiative

SUDS can reduce the amount and rate of runoff by a combination of: Infiltration, Storage, and Conveyance

There are a number of SUDS techniques which may be. However their suitability relies on site conditions, such as permeability and ground water levels, as summarised in Table G1.

Table G1: Suitability of SUDS Techniques

SUDS Technique	Infiltration	Storage	Conveyance
Green Roofs	x	✓	✓
Permeable Paving	✓	x	✓
Rainwater Harvesting	x	✓	x
Swales	✓	✓	✓
Detention Basins	✓	✓	✓
Ponds	x	✓	✓
Wetlands	x	✓	✓

Source: PPS25 Practice Guide

PPS25 stresses that Local Planning Authorities (LPAs) should:

- Promote the use of SUDS for the management of run-off
- Ensure their policies and decisions on applications support and complement the Building Regulations on sustainable rainwater drainage, giving priority to infiltration over first watercourses then sewers
- Adopt policies for incorporating SUDS requirements in Local Development Documents
- Encourage developers to utilise SUDS wherever practicable, if necessary through the use of appropriate planning conditions
- Develop joint strategies with sewerage undertakers and the Environment Agency to further encourage the use of SUDS

The Newcastle SFRA includes a SUDS site suitability table for each identified development site. This information should be treated with caution. Its inclusion does not negate the need for site-specific investigations as to the suitability of SUDS within a development site.

SUDS Guidance

For further information on the design of SUDS see CIRIA publications (www.ciria.org):

- Interim Code of Practice for SUDS
- C521 : SUDS design manual for Scotland and N. Ireland (2000)
- C522 : SUDS design manual for England and Wales (2000)
- C523 : SUDS - best practice Manual (2001)
- C582 : SUDS - Source control using constructed pervious surfaces (2002)
- C609 : SUDS - hydraulic, structural and water quality advice (2004)
- C625 : Model Agreements for SUDS (2004)
- C697 : The SUDS Manual (2007)
- C698 : Site Handbook for the Construction of SUDS (2007)

It is expected that further national guidance on SUDS standards will be release next year.

Drainage for new developments

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and a consequent potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure. It should be borne in mind that several sections of the sewer network across the Newcastle area were designed to drain less development than exists today. Development has added flow over time and the network is known to be at capacity in many places.

Controlling surface water discharges from new development is a crucial consideration if flood risk to new and existing development is to be effectively managed. Planned development can also play a role in reducing the number of properties that are directly at risk from surface water flooding. The Planning System has a key role to play in settings standards for sustainable drainage from new developments and ensuring that developments are designed to take account of the risk from surface water flooding. Sustainable drainage plays an important part in reducing flows in the sewer network and in meeting environmental targets, alongside investment in maintenance and new capacity by Northumbrian Water, in consultation with key partners, including the Environment Agency.

Wherever possible, this should be achieved through the implementation of SUDS. Source control should be considered firstly. There may be opportunities to deliver SUDS through integrated solutions for collections of strategic sites. The future ownership and maintenance of SUDS systems should be discussed at the planning application stage with the relevant sections of the LPA (including Highways and Drainage), Northumbrian Water and the Environment Agency.

The developer should liaise closely with the local authority drainage engineer, the Environment Agency and Northumbrian Water to determine appropriate discharge rates. The developer should prove that surface water discharges from the site will not have an adverse impact on flood risk elsewhere, with reference to investment planning by Northumbrian Water that may increase the capacity of the sewer network in the area.

The Council have made clear its approach to surface water management. All proposals for development must consider how surface water will be effectively controlled, and also propose SUDS techniques to fully attenuate surface water generated on the development site. The aim of this approach is to prevent any increase in surface water discharge to receiving watercourses or drainage infrastructure and prevent any increase in flood risk as a result of development.

The planning system has a key role to play in settings standards for SUDS from new developments and ensuring that developments are designed to take account of the risk from surface water flooding. Sustainable drainage and the use of SUDS is supported by the policy direction in Future Water²⁰, Making Space for Water²¹, the Pitt Review²² and the Flood and Water Management Act²³ that provides for more sustainable management of the water cycle, working in partnership across different agencies and new responsibilities for local flood risk management. In particular, the Flood and Water Management Act requires developers where practical, to include sustainable drainage in new developments to reduce flood risk and improve water quality. It includes '*a requirement on developers to demonstrate that they have met national standards for the application of SUDS techniques before they can connect any residual surface water drainage to a public sewer (amending section 106 of the Water Industry Act 1991).*' As part of their new responsibility for local flood risk management, local authorities will be responsible for approving SUDS for new developments and adopting and maintaining them.

²⁰ Defra (2008) *Future Water*

²¹ Defra, Department for Transport, HM Treasury and Office of the Deputy Prime Minister (2005) *Making Space for water: Taking forward a new Government strategy for flood and coastal erosion risk management in England; First Government response to the autumn 2004 Making space for water consultation exercise*

²² The Pitt Review (2008) *Learning lessons from the 2007 floods*

²³ Defra (2010) *Flood and Water Management Act* © Crown Copyright

Recognising the above, drainage from new developments should incorporate storage, with residual discharge of surface water to the following networks in order of preference:

- Infiltration drainage (e.g. soakaways).
- Discharge to a watercourse
- Discharge to a public sewer

The choice of system will be determined by local ground conditions (including groundwater levels). Whilst infiltration SUDS may be the most suitable for new development, developers must consider the risk of contamination to underlying aquifers

Local flood risk management will be an important responsibility for local authorities in the future, which includes managing the risk of flooding from surface water, groundwater and ordinary watercourses. Many of the localised flooding problems can be related to local watercourses that have been culverted as past development has taken place. The condition and standard of protection of these watercourses are unknown but they can be a significant source of flood risk. Flooding in the urban environment is difficult to separate into distinct sources and in reality surface water flooding will be from a combination of overland flows, sewers and highways gullies backing up and surcharging at manholes, local watercourses overtopping, culverts surcharging and potentially high groundwater levels. This is one reason why it is important for one body (the local authority) to take the lead in local FRM delivery.

Suitability of Sites for Infiltration/SUDs

The potential suitability of sites identified in this SFRA, in terms of infiltration/SUDs, has been categorised as being at high, medium or low suitability. This designation is based on typical soil types/maps and no detailed site assessment or ground investigation has been undertaken as part of the SFRA.

The suitability of ground conditions including, for example, seasonal groundwater levels and soil permeability will need to be determined prior to development.

Sites confirmed to be of low suitability will need to include sustainable solutions that do not depend on infiltration. As indicated in Annex F of PPS25, several SUDs storage alternatives may be suitable for sites where permeability is poor, and infiltration is not deemed appropriate. There include:

- Source control measures including rainwater recycling and drainage
- Filter strips and swales, which are vegetated features that hold and drain water downhill mimicking natural drainage patterns
- Basins and ponds to hold excess water after rain and allow controlled discharge that avoids flooding.

Critical Drainage Areas

Certain locations are particularly sensitive to an increase in the rate and volume of surface water runoff from new development. There are generally known local flooding problems associated with these areas. These areas have been defined as Critical Drainage Areas (CDAs) in the SFRA. Specific drainage requirements are required in these areas to help reduce local flood risk. The SFRA has designated CDAs as high flood risk areas.

These are areas with complex surface water flooding problems that would benefit from a drainage strategy, which is most effectively done in a Surface Water Management Plan.

The CDAs provided in the SFRA should be refined over time as more detailed information on flood risk and local flood management assets, including sewer catchments, becomes available.

In these areas, a detailed FRA is required regardless of which Flood Zone that applies for all developments over 0.5 hectares. This should demonstrate that new development is not at risk from flooding from existing drainage systems or potential overland flow routes. It should also demonstrate that the development will not adversely affect existing flooding conditions by

the use of appropriate mitigation measures. The FRA should define and address the constraints that will govern the design of the drainage system and layout of the development site.

The Environment Agency Standing Advice allows developers to screen online for the level of flood risk assessment that is appropriate for a development with regard to the PPS25 Flood Zones. This highlights the need for a FRA in Flood Zones 2 and 3 and in Flood Zone 1 where there are critical drainage problems. The Standing Advice notes that for developments in Flood Zone 1 FRA Guidance Note 1²⁴ should be followed:

'In areas where the Local Planning Authority has identified drainage problems through a Strategic Flood Risk Assessment or Surface Water Management Plan and they have indicated that a formal flood risk assessment is required'. FRA Guidance Note 1 requires FRAs to provide 'Proposals for surface water management that aims to not increase, and where practicable reduce the rate of runoff from the site as a result of the development (in accordance with sustainable drainage principles, and the Local Planning Authority's published SFRA).'

Proposals for development in Critical Drainage Areas as defined by this SFRA should follow the guidance and standards as set out below for developments that are within any flood zone.

Development should seek to reduce existing local flooding problems and not add to them. The following guidance should be followed:

- Development should deliver Greenfield runoff on Greenfield sites up to a 1% equivalent storm event, considering climate change
- Development should aim for a minimum reduction in surface water runoff rates of 50% for Brownfield sites, with an aim of reducing runoff to Greenfield rates up to a 1% equivalent storm event, considering climate change
- Development should be designed so that there is no flooding to the development in a 3.33% year event and so that there is no property flooding in a 1% (plus climate change) event

Over time, it is envisaged that local authorities will commission drainage strategies (see below) to determine in more detail and establish the evidence base for set reductions in surface water runoff from development sites. With regard to this, the developer should liaise closely with the Environment Agency, Northumbrian Water and LPA as soon as possible to determine an appropriate reduction in runoff rate and volume with reference to discharge limits as laid down by any completed SWMP or drainage strategy for that area.

Wherever possible, this should be achieved through the implementation of SUDS. Source control should be considered firstly. There may be opportunities to deliver SUDS through integrated solutions for collections of strategic sites. The future ownership and maintenance of SUDS systems should be discussed at the planning application stage with the relevant sections of the LPA (including Highways and Drainage), Northumbrian Water and the Environment Agency. This approach should be taken unless the developer can demonstrate that this is not feasible and that there will be no adverse impact caused by the development elsewhere.

²⁴ Environment Agency. Flood Risk Assessment (FRA) Guidance Note 1, Development Greater Than 1 Hectare (ha) in Flood Zone 1 (and Critical Drainage areas less than 1ha) Can be accessed online at <http://www.environment-agency.gov.uk/static/documents/Research/FRAGuidanceNote1.pdf>

H . Flood Risk Mitigation

Introduction

Throughout the risk-based sequential approach, opportunities should be taken to minimise flood risk at every stage of the planning process. Mitigation measures should be seen as a last resort to address flood risk issues.

Mitigation measures must be designed to provide an appropriate level of protection to a site for the lifetime of the development. At many sites it may be technically feasible to mitigate or manage flood risk. However, the potential impacts of mitigation measures on flood risk to the surrounding community must be considered. Where the depth of flooding is substantial, these mitigation measures may result in practical constraints to development with significant financial implications.

The minimum acceptable standard of protection against flooding for new property within flood risk areas is the 1% AEP flood event for fluvial flooding, including allowance for climate change over the lifetime of the development.

Strategic Approach

Mitigation measures should be considered on a strategic basis to avoid a piecemeal approach and partnership is advocated between the LPA and EA. Measures should also be integrated with wider EA flood risk management works and strategies such as the CFMP.

Outline flood risk mitigation strategies should consider the wider, cumulative impacts of mitigation. This requires master-planning an area from a flood-risk perspective.

In summary, taking a strategic approach to flood risk management involves consideration of:

- Avoidance of development in flood risk areas;
- Implementing a sequential approach to site layout, substituting higher vulnerability development in lower flood risk areas;
- Considering flooding from all sources;
- Wherever possible, using open land or green infrastructure to reduce risk, (e.g. by providing compensatory flood storage);
- Adopting mitigation measures that contribute to the wider community objectives for flood risk management in risk areas, (developers should aim to reduce risk to the wider community);
- The design and use of SUDs; and,
- Preparing emergency flood plans.

EU Floods Directive

The “EU Floods Directive” aims to reduce and manage the risk floods pose to human health, the environment, cultural heritage and economic activity. Member States have two years in which to transpose its provisions into domestic legislation and the first requirements of the Directive begin at the end of 2011. By this date, an evidence base for flood risk should be developed to map the risk and then produce plans to manage it. Preliminary Flood Risk Assessments (PFRAs) for all sources of flooding need to be prepared showing the impact of historic flooding and the potential impact of a repeat event. Following this, areas of potentially Significant Flood Risk (SFR) need to be defined. In addition, and by the end of 2013, flood hazard and flood risk maps for the SFR areas are required and should be co-ordinated with, and possibly integrated into, the reviews of River Basin Districts under the Water Framework Directive (WFD). Finally, by the end of 2015, Flood Risk Management Plans (FRMPs) must be established, which aim to reduce the potential adverse consequences of flooding and/or reduce its likelihood.

The Government proposes to use existing flood risk planning outputs of RFRA and SFRA to deliver the requirements of PFRAs. It is also proposed that local authorities extend their Level 2 SFRA to look at the impact of flooding on the environment and cultural heritage when determining SFR areas. In addition, it is proposed that SWMPs will be FRMPs under the Directive, and will also be a tool more generally for local flood risk management. This integrated approach will underpin the planning system and guide the location of future development to avoid and minimise flood risk, whilst also meeting the requirements of the Floods Directive. Local authorities, through their land use planning activities, have a key role to play.

The Flood Risk Regulations transpose the EU Floods Directive into UK law and were introduced on 10 December 2009. These confirm the lead local flood authority role and require specific tasks to be undertaken by these authorities this year, with completion of Preliminary Flood Risk Assessments and identification of Flood Risk Areas due by June 2011.

Reducing Flood Risk through Site Layout and Design

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development.

The PPS25 Practice Guide states that a sequential, risk-based approach should be applied to try to locate more vulnerable land use to higher ground, while more flood-compatible development (e.g. vehicular parking, recreational space) can be located in higher risk areas.

Waterside areas, or areas along known flow routes, can be used for recreation, amenity and environmental purposes, allowing the preservation of flow routes and flood storage, whilst at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should ensure safe access to higher ground from these areas, and avoid the creation of isolated islands as water levels rise.

The EA will have to consent any works within 5 metres of a main river. It is likely that the EA will require an unobstructed access and maintenance easement within these areas."

Modification of ground levels

Modifying ground levels to raise the land above the required flood level is an effective way of reducing flood risk to the site in question.

However, in most areas of fluvial flood risk, conveyance or flood storage may be reduced by raising land within the floodplain, adversely impacting on flood risk downstream. Compensatory flood storage must be provided, in general, on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain. In general it should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated).

Where the site is entirely within the floodplain it is not possible to provide onsite compensatory storage.

The need for compensatory storage must be discussed at the earliest stage of planning as this will be a major constraint as this requirement may have significant implications for the yields achieved for individual sites.

Local flood storage

Where development reduces the volume of floodplain storage it will be necessary to provide compensatory storage locally. This could be an environmental wetland area, designated washland (designed to flood) or a flood basin. This can also be considered within urban design if areas are designated to flood in a flood event (e.g. ground floor of a development with residential on first floor).

On a strategic catchment-wide scale, appropriately located flood storage basins and washlands can not only provide a reduction in flood risk, but can also enhance and contribute to wetland restoration and habitat creation as well as potentially increasing the recreational value of many river corridors. For upstream flood storage schemes to maximise benefits downstream, they need to be located in suitable areas of the catchment. Locating flood storage basins too high in the catchment could mean that a large proportion of a flood event is still able to travel downstream from other areas in the catchment.

The need for compensatory storage must be discussed at the earliest stage of planning as this will be a major constraint as this requirement may have significant implications for the yields achieved for individual sites due to the associated land take this may require.

Raised defences

Construction of raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will remain. Compensatory storage must be provided where raised defences remove storage from the floodplain.

Temporary or demountable defences are not acceptable flood protection for a new development.

Developer Contributions to Flood defences

In some cases, it may be necessary for the developer to make a contribution to the improvement of flood defence provision that would benefit both the development and local community.

Building Design

Raising of floor levels within a development avoids damage to the interior, furnishings and electrics in times of flood. If it has been agreed with the EA that, in a particular instance, the raising of floor levels is acceptable, they should normally be raised to 600mm above the maximum water level during a 1% AEP event including allowance for climate change.

Making the ground floor of a building water-compatible (for example a garage), is an effective way of raising living space above flood levels.

Constructing a building on stilts is not considered an acceptable means of flood mitigation for new development. However it may be allowed in special circumstances if it replaces an existing solid building, as it can improve flood flow routes. In these cases attention should always be paid to safe access and egress and legal protection should be given to ensure the ground floor use is not changed.

Resistance and Resilience

The 2007 document 'Improving the Flood Performance of New Buildings' provides further details on possible resistance and resilience measures²⁵.

Temporary Barriers

Temporary barriers consist of moveable flood defences that can be fitted to doorways and windows. On a smaller scale it is likely that the EA will require an unobstructed access and maintenance easement within these areas, temporary snap-on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.

²⁵ Communities and Local Government (2007) Improving the Flood Performance of New Buildings – Flood Resilient Construction

Permanent barriers

Permanent barriers can include built-up doorsteps, rendered brick walls and toughened glass barriers.

Wet-proofing

This involves designing interiors to reduce damage caused by flooding by, for example:

- Installing electrical circuitry at a higher level with power cables being carried down from the ceiling rather than up from the floor
- Using water-resistant materials for floors, walls and fixtures

Resilience measures will be specific to the nature of the flood risk, and as such will be informed and determined by the FRA.

Making Development Safe

Safe Access and Egress

The developer must ensure that safe access and egress can be provided to an appropriate level for the type of development.

As part of the FRA, the developer should review the acceptability of the proposed access with the EA.

For the purpose of the SFRA it is considered appropriate to provide low hazard access and egress routes associated with new housing developments. Environment Agency guidance suggests that all development should have a dry access and egress in the 1% AEP event.

Making Space for Water

Opportunities for River Restoration and Enhancement

All new development close to rivers should consider the opportunity to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwaters, de-silting, in-channel habitat enhancement and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

Opportunities for Floodplain Restoration

It is an objective of PPS25 to safeguard land from development that may be required for current or future flood management. In areas of high flood risk there may be a strong case for allowing previously developed sites to return to functional floodplain in urban areas where they can convey and store flood water reducing the risk of flooding to development.

Buffer Strips

Developers should set back development from the landward toe of fluvial defences (or top of bank where defences do not exist) and this distance should be agreed with the EA. This provides a buffer strip to 'make space for water', and ensure access to defences is maintained.

Recommendations for Surface Water Management

It is understood that Newcastle City Council are currently progressing a SWMP.

Newcastle City Council and the Environment Agency should work closely with Northumbrian Water, using the outputs from the SFRA as a starting point, to identify the potential locations of and priorities for SWMPs. They should identify particular hotspots where surface water solutions can be identified or more detailed modelling is needed. A Drainage Strategy should

be undertaken as part of or alongside this for key development areas to identify locations suitable for SUDS and how flood risk can be managed and reduced downstream.

The Council, as the lead for local flood risk management, should co-ordinate any future surface water management work. The recent Defra Surface Water Management Plan Guidance (2010) supports the use of SFRA in providing the evidence base for where SWMPs are required.

Surface water management needs to take a holistic approach, taking into account all the sources of local flood risk, including from sewers, overland flow, culverted and open watercourses and groundwater. A suite of options are available for surface water management including source control, such as the implementation of SUDs, increasing the capacity of sewers or watercourses, storing excess water and managing exceedance flows through urban design and "Green Infrastructure". SWMPs should provide the opportunity to undertake detailed sewer modelling and pool together the knowledge and understanding from different organisations to help assess options to reduce surface water flood risk to new and existing development.

Options to reduce flood risk in one location should not increase risk upstream or downstream. SWMP areas may cross one or more local authority area and different local authorities, the Environment Agency and Northumbrian Water can be brought together in a SWMP partnership to develop sustainable options to manage surface water flood risk.

There is the potential for groups of development sites coming forward to share a central and integrated solution for managing surface water runoff. This is best investigated further through a SWMP or a Drainage Strategy, which may or may not be undertaken at the same time as a SWMP. Such solutions can provide great benefits besides water management, including providing recreational facilities, improving biodiversity and making communities a better place to live. Where there are several sites that would share a communal facility, such sites may be funded through developer Section 106 or Community Infrastructure Levy payments. Drainage Strategies can be particularly useful for considering, recommending the implementation of, and long term management arrangements for, SUDS and setting appropriate runoff rates from new development.



Offices at

Atherstone
Doncaster
Edinburgh
Haywards Heath
Limerick
Newcastle upon Tyne
Newport
Northallerton
Saltaire
Skipton
Tadcaster
Wallingford
Warrington

Registered Office
South Barn
Broughton Hall
SKIPTON
North Yorkshire
BD23 3AE

t: +44(0)1756 799919
e: info@jbaconsulting.co.uk

Jeremy Benn Associates Ltd
Registered in England
3246693



Visit our website
www.jbaconsulting.co.uk