Mid and North Northumberland
Northumberland National Park
Strategic Flood Risk Assessment (SFRA)

June 2008 (Final)
EXECUTIVE SUMMARY

Introduction

1. The Northumberland National Park is situated in the north-east of England, encompassing a proportion of the district areas of Berwick-upon-Tweed, Alnwick, and Tynedale. **This study encompasses only the northern portion of the National Park, including those areas that fall within the Borough of Berwick upon Tweed and the District of Alnwick.** This area of the park is characterised by the upland catchment areas of the Rivers Coquet, Till and Breamish.

2. The northern section of the Northumberland National Park covers an area of approximately 53,000 hectares. Based on address point data¹, approximately 130 properties are potentially at risk of flooding in a 0.1% (1 in 1000 year) flood event, with most of these properties sparsely located throughout the Park.

3. Throughout the northern section of the National Park, the risk of flooding from rivers is generally low. Notwithstanding this however, the geology and topography of the Park means that there is a relatively high susceptibility to rapid surface water runoff, resulting in flash flooding. Whilst only a relatively few properties have been affected by these incidents historically, the damage and disruption caused by flash flooding can be considerable. It is important therefore that future planning decisions are taken with due consideration to the potential risks associated with this form of flood risk.

Why carry out a Strategic Flood Risk Assessment (SFRA)?

4. Flooding can result not only in costly damage to property, but can also pose a risk to life and livelihood. It is essential that development is planned and designed carefully, steering it away from areas that are most at risk from flooding, and ensuring that it does not exacerbate existing known flooding problems.

5. Planning Policy Statement (PPS) 25: Development and Flood Risk has been developed to underpin decisions relating to future development within areas that are subject to flood risk. In simple terms, PPS25 requires local planning authorities to review the variation in flood risk across their area, and to steer vulnerable development towards areas of lowest risk. The Strategic Flood Risk Assessment (SFRA) is the first step in this process, and it provides the building blocks upon which spatial planning (i.e. the allocation of land for future development) and development control decisions will be made.

6. It is important to highlight at this early stage that, given the landscape designation of the National Park, and the small and remote population, the National Park Authority is not required to allocate sites for strategic growth within the Park’s main settlements, as the vast majority of development will be to meet local needs. The Authority is responsible for preparing a Local Development Framework and for making development control decisions. Within the National Park therefore, it is essential that the Authority has a clear understanding of the source and severity of flood risk within the Park, and a robust appreciation of the mitigation measures required to reduce damage and disruption due to flooding.

7. It is immediately apparent that the risk to property and infrastructure (and consequently people) within the National Park is largely associated with rapid surface water runoff, rather than flooding from rivers. The Northumberland National Park northern SFRA has been developed accordingly.

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¹ Sourced from the Environment Agency National Property Dataset (2006)

June 2008 (Final)
Outcomes of the Northumberland National Park SFRA

8. The northern part of the Northumberland National Park encompasses the uppermost catchment reaches of the Northumberland's key rivers. The river valleys are steep and well defined, and not surprisingly the risk of flooding from rivers is very low. In accordance with PPS25, zones of ‘high’, ‘medium’ and ‘low’ fluvial (river) flooding have been defined, and these are presented in Figure 1. It is immediately evident that a very large proportion of the Park falls within Zone 1 Low Probability.

9. Whilst indeed there is little risk of fluvial flooding, it is essential to highlight that the steep topography and low permeability soils result in a relatively high susceptibility to flash flooding. Intense rainfall is common place within the hilly terrain, and there are numerous reported incidents of localised flooding to roads and villages within the Park following storm events. It is imperative that the SFRA captures this potential risk, in effect sub-delineating Zone 1 Low Probability into areas of low, medium and high likelihood of surface water flooding. This is presented in Figures 2 and 3.

10. In summary therefore, the spatial variation in flood risk across the northern section of the National Park has been delineated (and should be managed) in the following manner:

**Zone 3a High Probability**

11. Areas subject to flooding in the 1% (100 year) design event design event have been delineated as Zone 3a High Probability. In accordance with PPS25\(^2\), ‘more vulnerable’ development (including residential) should be avoided in these areas. Only if clear planning arguments can be put forward, *that outweigh flood risk on sustainability grounds*, should development of this type be permitted. All development within Zone 3a High Probability should be designed in such a way as to mitigate the potential risks associated with river flooding (refer Section 6.4).

12. It is highlighted that, within rural areas of the National Park it is important to protect ‘natural’ floodplain areas from future development. This will provide future protection not only for the development itself, but also for the communities along the river system that rely on existing floodplain storage to prevent rising water levels.

**Zone 2 Medium Probability**

13. Areas subject to flooding in events exceeding the 1% (100 year) design event, and up to (and including) the 0.1% (1000 year) event have been delineated as Zone 2 Medium Probability. In accordance with PPS25\(^3\), ‘highly vulnerable’ development (including permanent caravan parks) should be avoided in these areas. Only if clear planning arguments can be put forward, *that outweigh flood risk on sustainability grounds*, should development of this type be permitted. All development within Zone 2 Medium Probability should be designed in such a way as to mitigate the potential risks associated with river flooding (refer Section 6.4).

**Zone 1 Low Probability**

14. The risk of flooding from rivers within these areas is less than 1 in 1000, and PPS25 places no restrictions placed upon land use within Zone 1 Low Probability. With due consideration to the potential risk of surface water flooding within the National Park however, a sub-delineation of Zone 1 has been undertaken:

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\(^2\) PPS25 Appendix D, Table D2
\(^3\) PPS25 Appendix D, Table D2

June 2008 (Final)
High Risk of Flash Flooding

These areas are situated at the base of steep sloping hills within the Park, where there is a rapid change in gradient. During periods of heavy rainfall, water will run off the hills towards the river valleys. Due to the flattening ground slope, the overland flow will tend to accumulate and increase in depth, resulting in relatively fast flowing (and at times deep) surface water. These areas are considered most vulnerable to flash flooding and/or ponding, potentially resulting in property damage and disruption.

Medium Risk of Flash Flooding

These areas are situated (typically) immediately up-slope of the ‘high risk of flash flooding areas. In simple terms, these areas are typically steeper. They are therefore likely to experience shallow and rapid sheet flow that will pass through very quickly without resulting in damage and/or disruption.

Low Risk of Flash Flooding

These are areas situated typically at the top of the hills (and/or at the steepest gradients) where ponding and/or overland sheet flow is likely to be very shallow, passing very quickly following a rainfall event. The risk of damage to property and/or disruption (e.g. through the closure of roads) is expected to be low within these areas.

The Way Forward

15. River flooding does not pose a major risk to the northern section of the Northumberland National Park. Notwithstanding this however, there is a considerable risk posed to property and infrastructure (roads and bridges) from ‘flash flooding’ during intense storm events. It is envisaged that this risk will increase with time as a result of climate change. It is essential that therefore the National Park Authority understand the potential risks, how these vary across the Park, and how they can assist property owners within their jurisdiction to protect themselves (through the development control process).

16. The National Park Authority is not required to allocate sites for future strategic growth of the Park’s main settlements, as the vast majority of development will be to meet local needs. The intent of PPS25 however, seeking a proactive approach nationwide to the reduction of flood risk, is no less relevant. It is imperative that the National Park Authority has clear local planning policy in place that assists local landowners (and prospective developers) to protect themselves against the risks posed by flooding, from all sources.

17. The northern Northumberland National Park SFRA has been developed building heavily upon existing knowledge with respect to flood risk within the National Park. The knowledge of flood risk within the National Park will change over time (with modelling and/or observed flooding, and this may alter predicted zones of risk within the Park in future years. National planning policy guidance, and the understanding of potential climate change impacts, is also expected to change with time. It is imperative therefore that the SFRA is adopted as a ‘living’ document and is reviewed regularly.
Table of Contents

1 Introduction ....................................................................................................................... 1
  1.1 Overview .................................................................................................................. 1
  2 SFRA Approach .............................................................................................................. 2
  3 Policy Framework ........................................................................................................... 5
    3.1 Introduction ............................................................................................................. 5
    3.2 National Policy ....................................................................................................... 5
      3.2.1 Planning Policy Statement 25: Development and Flood Risk ....................... 5
      3.2.2 Consultation Planning Policy Statement: Planning and Climate Change ...... 6
    3.3 Regional Planning Policy ....................................................................................... 6
      3.3.1 North East Regional Spatial Strategy (RSS) ..................................................... 6
    3.4 Local Planning Policy ........................................................................................... 7
  4 Data Collection ............................................................................................................... 9
    4.1 Overview .................................................................................................................. 9
    4.2 Environment Agency Flood Zone Maps ................................................................ 9
    4.3 Historical Flooding Incidents .............................................................................. 9
    4.4 Flood Defences ..................................................................................................... 10
    4.5 Consultation ......................................................................................................... 10
    4.6 Topography and Geology ..................................................................................... 11
  5 Flood Risk in the Northumberland National Park ......................................................... 13
    5.1 Overview ................................................................................................................ 13
    5.2 Fluvial Flooding - Delineation of the PPS25 Flood Zones .................................... 13
      5.2.1 Delineation of Zone 3b Functional Floodplain ............................................. 14
      5.2.2 Delineation of Zone 3a High Probability ..................................................... 14
      5.2.3 Delineation of Zone 2 Medium Probability ................................................. 14
      5.2.4 Delineation of Zone 1 Low Probability ....................................................... 14
    5.3 Surface Water (Flash) Flood Risk ....................................................................... 15
    5.4 Local Drainage Issues ......................................................................................... 15
    5.5 Groundwater Flooding ....................................................................................... 16
    5.6 Climate Change ................................................................................................... 16
    5.7 Residual Risk of Flooding .................................................................................... 17
  6 Sustainable Management of Flood Risk ........................................................................ 19
    6.1 Overview ................................................................................................................ 19
    6.2 Responsibility for Flood Risk Management ........................................................... 19
    6.3 Strategic Flood Risk Management - The Environment Agency ........................... 20
      6.3.1 Overview ....................................................................................................... 20
      6.3.2 Catchment Flood Management Plans (CFMP) – North East Region ........... 20
    6.4 Planning & Development Control – Northumberland National Park ............... 21
      6.4.1 Planning Solutions to Flood Risk Management ......................................... 21
      6.4.2 Development Control Recommendations (Design Measures) .................. 24
    6.5 Detailed Flood Risk Assessment (FRA) – The Developer ...................................... 25
      6.5.1 Scope of the Detailed Flood Risk Assessment ............................................. 25
      6.5.2 Raised Floor Levels & Basements (Freeboard) .......................................... 26
      6.5.3 Sustainable Drainage Systems (SUDS) ....................................................... 26
    6.6 Local Community Actions to Reduce Flood Damage ......................................... 28
      6.6.1 Flood Proofing ............................................................................................ 29
    6.7 Emergency Planning ............................................................................................ 29
    6.8 Insurance ............................................................................................................... 30
  7 Conclusion & Recommendations ...................................................................................... 32
# Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AEP</strong></td>
<td>Annual Exceedance Probability e.g. 1% AEP is equivalent to 1% probability of occurring in any one year (or, on average, once in every 100 years)</td>
</tr>
<tr>
<td><strong>Core Strategy</strong></td>
<td>The Development Plan Document within the Authority’s Local Development Framework, which sets the long-term vision and objectives for the area. It contains a set of strategic policies that are required to deliver the vision including the broad approach to development.</td>
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<tr>
<td><strong>DCLG</strong></td>
<td>Department of Community and Local Government</td>
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<td><strong>Defra</strong></td>
<td>Department of Environment, Food and Rural Affairs</td>
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<tr>
<td><strong>Development</strong></td>
<td>The carrying out of building, engineering, mining or other operations, in, on, over or under land, or the making of any material change in the use of a building or other land.</td>
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<tr>
<td><strong>Development Plan Document (DPD)</strong></td>
<td>A spatial planning document within the Authority’s Local Development Framework, which set out policies for development and the use of land. Together with the Regional Spatial Strategy, they form the development plan for the area. They are subject to independent examination.</td>
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<tr>
<td><strong>EA</strong></td>
<td>Environment Agency</td>
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<tr>
<td><strong>Flood Zone Map</strong></td>
<td>Nationally consistent delineation of ‘high’ and ‘medium’ flood risk, published on a quarterly basis by the Environment Agency</td>
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<td><strong>Formal Flood Defence</strong></td>
<td>A structure built and maintained specifically for flood defence purposes</td>
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<td><strong>Zone 3b Functional Floodplain</strong></td>
<td>PPS25 Flood Zone, defined as areas at risk of flooding in the 5% AEP (1 in 20 chance) design event, and that can store or convey flood water during such an event</td>
</tr>
<tr>
<td><strong>Habitable Room</strong></td>
<td>A room used as living accommodation within a dwelling but excludes bathrooms, toilets, halls, landings or rooms that are only capable of being used for storage. All other rooms, such as kitchens, living rooms, bedrooms, utility rooms and studies are counted.</td>
</tr>
<tr>
<td><strong>Zone 3a High Probability</strong></td>
<td>PPS25 Flood Zone, defined as areas at risk of flooding in the 1% AEP (1 in 100) design event</td>
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<tr>
<td><strong>Informal Flood Defence</strong></td>
<td>A structure that provides a flood defence function, however has not been built and/or maintained for this purpose (e.g. boundary wall)</td>
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<tr>
<td><strong>Local Development Framework (LDF)</strong></td>
<td>Consists of a number of documents which together form the spatial strategy for development and the use of land</td>
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<tr>
<td><strong>Zone 1 Low Probability</strong></td>
<td>PPS25 Flood Zone, defined as areas outside of Zone 2 Medium Probability</td>
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<tr>
<td><strong>Zone 2 Medium Probability</strong></td>
<td>PPS25 Flood Zone, defined as areas at risk of flooding in events that are greater than the 1% AEP (1 in 100), and less than the 0.1% AEP (1 in 1000) design event</td>
</tr>
<tr>
<td><strong>Planning Policy Guidance (PPG)</strong></td>
<td>A series of notes issued by the Government, setting out policy guidance on different aspects of planning. They will be replaced by Planning Policy Statements.</td>
</tr>
<tr>
<td><strong>Planning Policy Statement (PPS)</strong></td>
<td>A series of statements issues by the Government, setting out policy guidance on different aspects of planning. They replace Planning Policy Guidance Notes</td>
</tr>
<tr>
<td><strong>Previously Developed (Brownfield) Land</strong></td>
<td>Land which is or was occupied by a building (excluding those used for agriculture and forestry). It also includes land within the curtilage of the building, for example, a house and its garden would be considered to be previously developed land.</td>
</tr>
<tr>
<td><strong>Residual Risk</strong></td>
<td>A measure of the outstanding flood risks and uncertainties that have not been explicitly quantified and/or accounted for as part of the review process</td>
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<tr>
<td><strong>SEA</strong></td>
<td>Strategic Environmental Assessment</td>
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<td><strong>SUDS</strong></td>
<td>Sustainable Drainage System</td>
</tr>
<tr>
<td><strong>Supplementary Planning Document (SPD)</strong></td>
<td>Provides supplementary guidance to policies and proposals contained within Development Plan Documents. They do not form part of the development plan, nor are they subject to independent examination.</td>
</tr>
<tr>
<td><strong>Sustainability Appraisal (SA)</strong></td>
<td>Appraisal of plans, strategies and proposals to test them against broad sustainability objectives.</td>
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<tr>
<td><strong>Sustainable Development</strong></td>
<td>Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (The World Commission on Environment and Development, 1987).</td>
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1 Introduction

1.1 Overview

18. The Northumberland National Park is situated in the north-east of England, encompassing a proportion of the district areas of Berwick-upon-Tweed, Alnwick, and Tynedale. This study encompasses only the northern portion of the National Park, including those areas that fall within the Borough of Berwick upon Tweed and the District of Alnwick. This area of the park is characterised by the upland catchment areas of the Rivers Coquet, Till and Breamish.

19. The northern section of the Northumberland National Park covers an area of approximately 53,000 hectares. Based on address point data, approximately 130 properties are potentially at risk of flooding in a 0.1% (1 in 1000 year) flood event, with most of these properties sparsely located throughout the Park.

20. Throughout the northern section of the National Park, the risk of flooding from rivers is generally low. Notwithstanding this however, the geology and topography of the Park means that there is a relatively high susceptibility to rapid surface water runoff, resulting in flash flooding. Whilst only a relatively few properties have been affected by these incidents historically, the damage and disruption caused by flash flooding can be considerable. It is important therefore that future planning decisions are taken with due consideration to the potential risks associated with this form of flood risk.

21. Planning Policy Statement (PPS) 25: Development and Flood Risk requires that local planning authorities prepare a Strategic Flood Risk Assessment (SFRA) in consultation with the Environment Agency. The primary purpose of the SFRA is to determine the variation in flood risk across the National Park. Robust information on flood risk is essential to inform and support the National Park Authority’s revised flooding policies in its emerging Local Development Framework (LDF).

22. Jacobs was commissioned to develop the Mid and North Northumberland Strategic Flood Risk Assessment (SFRA) in June 2007, incorporating the Alnwick, Castle Morpeth and Berwick-upon-Tweed Councils, and including the northern section of the Northumberland National Park (overlapping the western areas of the District of Alnwick and the Borough of Berwick-upon-Tweed).

23. Given the protected designation of the National Park, the National Park Authority is not required to allocate sites for strategic growth within the Park’s main settlements, as the vast majority of development will be to meet local needs. The Authority is responsible for preparing a Local Development Framework and for making development control decisions. Within the National Park therefore, it is essential that the Authority has a clear understanding of the source and severity of flood risk within the Park, and a robust appreciation of the mitigation measures required to reduce damage and disruption due to flooding. The Northumberland National Park SFRA has been developed accordingly to inform the development of the emerging Core Strategy.

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* Sourced from the Environment Agency National Property Dataset (2006)
2 SFRA Approach

24. The primary objective of the northern Northumberland National Park SFRA is to inform the development of emerging flooding policies within the emerging Local Development Framework (LDF).

25. The Government provides no specific methodology for the SFRA process. Therefore, to meet these broader objectives, the SFRA has been developed in a pragmatic manner in close consultation with both the National Park Authority and the Environment Agency.

26. Due to the rural nature of the northern part of the National Park, only a small amount of knowledge exists with respect to flood risk. The Northumberland National Park SFRA has therefore not only built upon this existing knowledge, but has also carried out some additional investigations to further develop and fortify this knowledge. The overall data collection has been used to underpin the delineation of the northern section of the Park into zones of ‘high’, ‘medium’ and ‘low’ probability of flooding, both fluvial and surface water related, in accordance with PPS25.

27. The northern part of the Northumberland National Park primarily covers the upland catchment areas of the Rivers Coquet, Till and Breamish, and therefore future development within these areas could potentially influence the risk of flooding posed to neighbouring areas if not carefully managed. It is imperative that the National Park Authority clearly understands the core issues that flood risk raises within these neighbouring Boroughs, and adapt their decision making accordingly. The National Park Authority therefore must be aware of the impact that careless planning may have, not only locally, but also upon the adjoining Boroughs.

28. A number of authorities across Northumberland are beginning to carry out similar strategic flood risk investigations. These will help provide the evidence base for the Core Strategies and Site Specific development allocations that will form part of the Local Development Frameworks that all local planning authorities must now produce. Whilst the delivery teams and programmes underpinning these studies vary from one district to the next, all are being developed in close liaison with the Environment Agency. Consistency in the adopted approach and decision making with respect to the effective management of flood risk throughout the sub region is imperative. Regular discussions with the Environment Agency have been carried out throughout the SFRA process to this end, seeking clarity and consistency where needed.
3 Policy Framework

3.1 Introduction

29. This section provides a brief overview of the strategy and policy context relevant to flood risk in the Northumberland National Park. The success of the SFRA is heavily dependent upon the National Park Authority’s ability to implement the recommendations put forward for future sustainable flood risk management within the Park through the planning process.

30. A framework of national and regional policy directive are in place, providing guidance and direction to local planning authorities. Ultimately however, it is the responsibility of the National Park Authority to establish robust policies that will ensure future sustainability with respect to flood risk.

3.2 National Policy

3.2.1 Planning Policy Statement 25: Development and Flood Risk

31. Planning Policy Statement 25 (PPS25) was published in December 2006 and sets out the planning objectives for flood risk management. It states that all forms of flooding and their impacts are material planning considerations, which gives much weight to the issue of flooding. The aim of PPS25 is to ensure that flood risk is taken into account at all stages of the planning process in order to prevent inappropriate development in ‘at risk’ areas.

32. The key objectives for planning are appraising, managing and reducing flood risk. To appraise the risk it is stated that flood risk areas need to be identified, and that the level of risk needs to be identified. To facilitate this, PPS25 indicates that Regional Flood Risk Appraisals and Strategic Flood Risk Assessments should be prepared.

33. To manage the risk, Local Planning Authorities (LPAs) need to develop policies which “avoid flood risk to people and property where possible, and manage any residual risk, taking account of the impacts of climate change”. LPAs should also only permit development in flood risk areas if there are no feasible alternatives located in areas of lower flood risk.

34. To reduce the risk, PPS25 indicates that land needed for current or future flood management should be safeguarded; new development should have an appropriate location, layout and design and incorporate sustainable drainage systems (SUDS); and new development should be seen as an opportunity to reduce the causes and impacts of flooding by measures such as provision of flood storage, use of SUDS, and re-creating the functional flood plain.

35. A partnership approach is stressed in PPS25 to ensure that LPAs work with partners such as the Environment Agency. The Environment Agency can provide both information and advice relating to flood risk, and should always be consulted when preparing policy or making decisions which will have an impact on flood risk.

36. The future impacts of climate change are highlighted in PPS25, as climate change will lead to increased flood risk in many places in the years ahead. When developing planning policy, LPAs need to consider if it is necessary to encourage the relocation of existing development to locations at less of a risk from flooding in order to prevent future impacts of flooding.

37. PPS25 also gives specific advice for determining planning applications, which needs to be considered when developing policy. LPAs should ensure that flood risk assessments (FRAs) are submitted with planning applications where this is appropriate; they should apply the sequential approach (defined in the PPS) which ensures that lower risk areas are considered preferable to higher risk areas; priority should be given to the use of SUDS; and new

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development should be designed to be resilient to flooding as appropriate.

38. The Practice Guide Companion to PPS25 was released in draft form for consultation by Communities and Local Government in February 2007, providing additional guidance on the principles set out in PPS25.

3.2.2 Consultation Planning Policy Statement: Planning and Climate Change

39. The proposed planning policy statement for climate change was published in December 2007. This document will supplement the existing PPS1: Delivering Sustainable Development. The document highlights the issue of climate change, and sets out ways planning should prepare for its effects, which includes managing flood risk. Little detail is given about flooding in this document as PPS25 already does this.

3.3 Regional Planning Policy

3.3.1 North East Regional Spatial Strategy (RSS)

40. The RSS for the North East covers the period to 2021, and will replace the existing Regional Planning Guidance. The RSS provides the framework within which local policy is developed, and dictates the density (and, to some degree, the distribution) of future development within the region.

41. The submission draft of the Regional Spatial Strategy for the North East was submitted to Government in June 2005. From a flooding perspective, it is worth noting that this is prior to the release of draft PPS25 (December 2005) and therefore not surprisingly some amendments to regional policy relating to flood risk management are envisaged within the final RSS.

42. The RSS Examination in Public was held in April 2006, and the Panel Report (outlining recommended changes to the submission draft RSS) was delivered in July 2006. Consultation on the proposed changes to the draft RSS was subsequently carried out in May 2007, while another consultation was carried out in February 2008 (‘Further Proposed Changes’). The final RSS is currently anticipated to be published in 2008.

43. With respect to future sustainability within the region (from a flood risk perspective), the Panel Report strongly advocated the importance of adopting a sequential approach, in line with the (then) emerging PPS25 policy guidance. This advice has been embraced to a large degree by the recommended changes to the RSS by the Secretary of State, culminating in the inclusion of Policy 37 – Flood Risk.

Strategies, plans and programmes should adopt a strategic, integrated, sustainable and proactive approach to catchment management to reduce flood risk within the Region, managing the risk from:

a) tidal effects around estuaries and along the coast including the implications of the latest Government predictions for sea level rise;

b) fluvial flooding along river corridors and other significant watercourses resulting from catchments within and beyond the Region and other sources of flooding.

In developing Local Development Frameworks and considering planning proposals, a sequential risk-based approach to development and flooding should be adopted as set out in PPS25. This approach should be informed by Strategic Flood Risk Assessments prepared by planning authorities in liaison with the Environment Agency to inform the application of the Sequential Test and, if necessary, the Exception Test, in development allocations in their LDDs and consideration of planning proposals.

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44. This emerging regional policy will underpin the local planning policy approach adopted by Local Authorities within the North East region.

### 3.4 Local Planning Policy

45. During the summer of 2005 Northumberland National Park Authority consulted on Initial Issues for the Core Strategy. The outcome of this consultation contributed to the preparation of a Core Strategy Issues and Options document which was consulted on in June 2006. Comments from this consultation informed the Preferred Options Document which was consulted on in December 2006.

46. As a result of the comments received during this consultation, and the decision to combine the Core Strategy with the Development Control Policies Document it was decided to undertake a further round of Preferred Options consultation in November 2007. The Core Strategy will be submitted for independent examination in June 2008.

47. In summer 2006 the National Park Authority also consulted in Initial Issues for the Development Control Policies and Land Allocations Document, the outcome of which informed the preparation of an Issues and Options Document which was consulted on in December 2006. Consultation on the Preferred Options for the Land Allocations Document took place in November 2007.

#### Future Development within the National Park

48. PPS25 has been prepared to provide local planning authorities throughout England with clear guidance to support spatial planning decisions, relating largely to the allocation of land for housing and employment. Within the context of the National Park, some ‘interpretation’ of PPS25 is required to ensure that the SFRA (and the resulting planning recommendations) are sensible and applicable within the local context. The nature of future development pressures within the Park is outlined below:

- Conversion of existing buildings in the open countryside;
- New buildings in the open countryside (specifically for commercial, agricultural and/or tourism uses);
- Householder development (extensions);
- Affordable housing to meet local need (resulting in minor expansion to the settlement envelope);
- New development within identified sustainable settlements

#### Emerging Planning Policy (Flood Risk)

49. The Core Strategy and Development Policies Preferred Options was released for consultation in October 2007. This document sets out the proposed planning policy for the National Park. Specific reference is made to Policy 28, as set out below.

**Policy 28 Water and Flood Risk**

“All development within the National Park should make the most efficient use of water and enhance the sustainable use of the water environment. The National Park Authority will require that development is protected from flooding and that appropriate measures are implemented to mitigate flood risk in line with National Planning Policy.”

The aquatic environments of the National Park are significant. The European Water Framework Directive, which came into force in December 2000 sets demanding ecological objectives to protect aquatic ecosystems and groundwater, and promote sustainable water use. In addition, the Environment Agency is introducing Catchment Flood Management Plans which will produce flood risk management policies.

As a result of the topography of the National Park flooding is not a common occurrence. However, as the climate continues to change the National Park is not immune to future incidences of flooding. Clear guidance is set out nationally in Planning Policy Statement 25 – Development and Flood Risk, which seeks to avoid inappropriate development in areas
at risk from flooding and to direct development away from areas at highest risk. The Core Strategy will be informed by a Strategic Flood Risk Assessment (SFRA), which will provide the information needed to apply the sequential approach to determine the suitability of land for development. This process aims to steer new development to areas at the lowest probability of flooding. However until the SFRA is complete, the Settlement Strategy set out in the Core Strategy has been informed by the Environment Agency Flood Map which illustrates Flood Zones 1, 2, and 3.

50. This policy makes specific reference to PPS25 (and the National Park SFRA), providing the essential ‘hooks’ into national planning policy relating to flood risk management. In due course, it is suggested that consideration is given to the establishment of a dedicated Supplementary Planning Document that provides clear guidance to developers re the design measures outlined in Section 6.4 of this document. Many of the design recommendations provided offer not only a sustainable means of mitigating the risk of flooding, but other possible sustainability benefits including (for example) a reduction in water consumption. An integrated approach is therefore recommended.
4 Data Collection

4.1 Overview

51. A reasonable amount of knowledge exists with respect to flood risk within the northern section of the Northumberland National Park, including information relating to observed incidents of flooding (from various sources), the Environment Agency Flood Zone Maps (December 2007) and topographic (IFSAR) and geological data across the National Park. This data has been sourced from various stakeholders, such as the National Park Authority, the Environment Agency, Northumbrian Water, Parish Councils and the Forestry Commission, forming the core dataset that has informed the SFRA process.

52. Further investigations have been carried out to support (and improve) this information, which included an investigation on the hydrological processes throughout the area, and in particular their relation to the topography of the northern section of the National Park to develop a clear understanding of the expected significant risk of flash flooding.

53. The application of the above data in the delineation of zones of ‘high’, ‘medium’ and ‘low’ probability of flooding, and the formulation of planning and development control recommendations, is explained in Section 5 below. An overview of the core datasets, including their source and their applicability to the SFRA process, is outlined below.

4.2 Environment Agency Flood Zone Maps

54. The Environment Agency’s Flood Map shows the natural floodplain, ignoring the presence of defences, and therefore areas potentially at risk of flooding from rivers or the sea. The Flood Map shows the area that is susceptible to a 1 in 100 (1% annual exceedance probability (AEP)) chance of flooding from rivers, and a 1 in 200 (0.5% AEP) chance of tidal flooding5, in any one year. It also indicates the area that has a 1 in 1000 (0.1% AEP) chance of flooding from rivers and/or the sea in any given year. This is also known as the Extreme Flood Outline.

55. The Flood Map outlines have been produced from a combination of a national generalised computer model, more detailed local modelling (if available), and some historic flood event outlines. The Environment Agency’s Flood Map provides a consistent picture of flood risk for England and Wales.

56. The Environment Agency’s knowledge of the floodplain is continuously being improved by a variety of studies, detailed models, data from river flow and level monitoring stations, and actual flooding information. They have an ongoing programme of improvement, and updates are made on a quarterly basis.

4.3 Historical Flooding Incidents

57. Discussions have been held with the National Park Authority, Parish Councils and the Forestry Commission to identify those areas within the northern section of the National Park that are known to have been exposed to flooding in recent years. These have been highlighted in the adjoining flood risk map (refer Figure 1). The map also provide brief explanations on the cause (and affected area) of each incident. It is important to recognise that the incidents listed are events in which properties have been affected not only by flooding from rivers and local watercourses, but also from localised incidents including (for example) rapid overland runoff, the blockage of gullies and culverts, and/or failure of the underground sewer system.

58. Not much historical data related to flooding is available for the northern part of the

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5 The Northumberland National Park is not influenced in any way by tidal flooding, and therefore in this instance, the Environment Agency Flood Zone Map provides purely an indication of the possible risk of fluvial (river) flooding.
Northumberland National Park, which is quite likely due to the remote rural nature of the area, which usually results in many flooding events (affecting no properties) going undetected. However, some incidents have been recorded in the past, most notably in the Kidland Forest, Holystone, Hesleyhurst and Alwinton. These were primarily flash flooding incidents caused by rapid surface water runoff from hills and steep sided valleys. Not many properties were affected by these incidents, but some have caused severe damage to the road infrastructure and bridges, sometimes isolating properties.

59. Furthermore, heavy rainfall has caused local sewer networks to flood, due it would seem to an inability of the system to drain into the local river as result of high water levels (e.g. Hepple Parish). Again, only some isolated properties seem affected by such incidents.

60. Within the northern section of the National Park, it is evident that many properties affected by flooding are situated outside of the delineated high probability flood zones as defined by the Environment Agency. This is an important reminder that the risk of flooding must always be carefully considered when planning and designing future development, irrespective of the site’s proximity to a local river or watercourse. Planning decisions must consider all forms of potential flooding to the site. They must also be made with due consideration to the potential impact that future development may have upon known existing flooding problems if not carefully managed.

4.4 Flood Defences

61. Flood defences are typically raised structures that alter natural flow patterns and prevent floodwater from entering property in times of flooding. They are generally categorised as either ‘formal’ or ‘informal’ defences. A ‘formal’ flood defence is a structure that was built specifically for the purpose of flood defence, and is maintained by its respective owner, which could be the Environment Agency, Local Authority, or an individual. An ‘informal’ flood defence is a structure that has not been specifically built to retain floodwater, and is not maintained for this specific purpose, but may afford some protection against flooding. These can include boundary walls, industrial buildings, railway embankments and road embankments situated immediately adjacent to rivers.

62. Few formal raised flood defences exist within the northern section of the National Park, although some have been identified in consultation with the Environment Agency. These defences are located mainly near the boundary of the Park, within Westnewton and near Holystone. Although these raised defences may be formally maintained, it is important to recognise that the risk of flooding can never be fully removed, especially through the construction of a raised flood defence. There will always be a residual risk of flooding, due to (for example) an extreme event overtopping the flood defence, changing climatic conditions reducing the effectiveness of the structure, a structural failure of the constructed flood defence system, or flooding behind the defences due to local runoff or groundwater. Where future development of any kind is proposed within a defended area, it is incumbent on both the National Park Authority and landowners to ensure that the level and integrity of defence provided can be assured for the lifetime of the development⁸.

63. Following consultations with the Parish Councils, it was highlighted that some informal raised flood defences have been built within the National Park, most notably within Alwinton. Here, the response to a flooding incident (a severe rainfall event caused a tree to be washed away, subsequently blocking a local road bridge and causing significant flooding) incorporated the dredging of the watercourse (Hosedon Burn) and the construction of raised embankments from the dredged material.

4.5 Consultation

64. Consultation has formed a key part of the data collation phase for the northern Northumberland National Park SFRA. The following key stakeholders have been comprehensively consulted to

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⁸ For planning purposes, the Environment Agency stipulates that the “lifetime of development” is 60 years for commercial property, and 100 years for residential property.
inform the current investigation:

**Northumberland National Park Authority**

Consulted to identify areas that are known to have flooding historically, and to clarify the role of the National Park Authority, and the pressures placed upon the Park by future development.

**Parish Councils**

Parish Councils were approached to enhance the knowledge of flooding incidents throughout the National Park, in particular regarding incidents resulting from rapid surface water runoff.

**Environment Agency**

The Environment Agency has been consulted to source specific flood risk information to inform the development of the SFRA. In addition, the Environment Agency is a statutory consultee under PPS25 and therefore must be satisfied with the findings and recommendations for sustainable flood risk management into the future. For this reason, the Environment Agency has been consulted during the development of the SFRA to discuss potential flood risk mitigation measures and planning recommendations.

**Northumbrian Water**

Northumbrian Water is responsible for the management of urban drainage (surface water) and sewerage within the National Park. Northumbrian Water was consulted to discuss the risk of localised flooding associated with the existing drainage/sewer system. Unfortunately the feedback provided was very general in nature, providing simply an overview of risk locations within the Park through assigning colour-coded risk categories to various (key) settlements. It is not possible therefore to pinpoint known and/or emerging capacity problems within the system.

It is highlighted however that issues associated with failures of the underground drainage/sewer systems are often relatively localised, particularly given the very limited urban density of the villages and hamlets within the National Park jurisdiction. Notwithstanding this however, a small number of sewer related problems have been highlighted by the data collection process, and it is essential to ensure that future development (of any kind) does not exacerbate known existing problems. Planning decisions should be made with due consideration to potential drainage and sewer capacity problems (to be advised by Northumbrian Water as part of the statutory consultation process), and conditions should be placed upon future development to ensure that these capacity issues are rectified before development is permitted to proceed.

### 4.6 Topography and Geology

65. The Environment Agency Flood Zone Map provides an approximation of the areas within the National Park that may be at risk of flooding from rivers. This is discussed further in Section 5.2 below. Given the steep topography and rural nature of the Park however, it is clear that the risk of flooding from rivers and streams is relatively low. This is reinforced by relatively few incidents of observed river flooding, and the narrow extents of the predicted flood risk zones, constrained by the steep river valleys.

66. The risk of rapid runoff following intense rainfall, resulting in localised flooding, is particularly high however. Many of the flooding incidents reported throughout the Park are of this nature, and it is essential therefore that an assessment of the potential risk of ‘flash flooding’ is carried out as part of the SFRA.
67. This propensity to ‘flash flooding’ is clearly directly related to the hydrological response of the upland areas of the Park, and this in turn is a direct function of the Park topography and geology. Within the context of the northern Northumberland National Park SFRA therefore, the ‘slope’ and ‘soils’ are critical elements of the risk assessment process.

68. The geology within the northern section of the National Park mainly consists of resistant volcanic andesite and basalt with extensive areas of peatland. The latter, in combination with the steep topography, generally results in a very rapid response to heavy rainfall, contributing to large volumes of surface water runoff throughout the National Park. A detailed assessment of potential surface water (flash) flood risk has been carried out on the basis of the Park geology and topography. This is discussed further in Section 5.3.
5 Flood Risk in the Northumberland National Park

5.1 Overview

69. The northern part of the Northumberland National Park mainly covers the upland areas of the Rivers Coquet, Till and Breamish, characterised by primarily minor watercourses with very narrow and well defined floodplains. A very small number of properties are therefore currently at risk from flooding from rivers within the National Park. It is important to note however that, due to the rural nature of the National Park, some river flooding might go undetected, e.g. along extensive grassland and/or forested areas.

70. The topography and geology of the National Park lends for a significant risk of surface water runoff and subsequent flash flooding resulting from localised intense rainfall, which is therefore regarded as being a much greater issue for the area than flooding from rivers. Historically, this has caused many problems throughout the Park, affecting not only properties but also essential road infrastructure and bridges (sometimes blocking off isolated properties). An example of such an event is evident in Alwinton, where road bridges were severely damaged due to flash floods in the 1970s. With changing climate patterns, it is expected that localised storm cells resulting in particularly intense rainfall will become increasingly common. It is therefore vitally important that planning decisions recognise the potential risk that ‘flash flooding’ poses to property, guiding development accordingly so that future sustainability can be assured.

71. The overloading of the sewer system due to inflows exceeding the underground system capacity (i.e. resulting in surcharging) is a recognised problem in some isolated areas, although these are usually also connected to high water levels in nearby watercourses. Note that surface water networks are typically designed to cater for events up to a 1 in 30 year, and surface water flooding will therefore occur during a more intense storm.

5.2 Fluvial Flooding - Delineation of the PPS25 Flood Zones

72. It is emphasised that the risk of an event (in this instance a flood event) is a function of both the probability that the flood will occur, and the consequence to the community as a direct result of the flood. PPS25 endeavours to assess the likelihood (or probability) of river flooding, categorising the northern section of the National Park into zones of low, medium and high probability. It then provides recommendations to assist the Authority to manage the consequence of flooding in a sustainable manner, guiding planning decisions in an endeavour to reduce the vulnerability of populations that may be at risk.

73. In accordance with PPS25 therefore, the northern section of the Northumberland National Park has been delineated into the flood zones summarised below, providing a measure of the potential risk of river flooding.

- **Zone 3b The Functional Floodplain**
  Areas of the region susceptible to flooding within which “water has to flow or be stored in times of flood” (PPS25).

- **Zone 3a High Probability**
  Land assessed as having a 1 in 100 or greater annual probability of fluvial flooding in any year (i.e. 1% AEP), and 1 in 200 or greater annual probability of tidal flooding (i.e. 0.5% AEP).

- **Zone 2 Medium Probability**
  Land assessed as having between a 1 in 100 (i.e. 1% AEP) and 1 in 1000 (i.e. 0.1% AEP) annual probability of river flooding in any year.
Zone 1 Low Probability
Land assessed as having a less than 1 in 1000 annual probability of river flooding in any year (i.e. 0.1% AEP).

74. The delineation of the PPS25 flood zones is discussed below, and presented in the adjoining Flood Risk Map (refer Figure 1).

5.2.1 Delineation of Zone 3b Functional Floodplain

75. Zone 3b Functional Floodplain is defined as those areas in which “water has to flow or be stored in times of flood”. The definition of functional floodplain remains somewhat open to subjective interpretation, however PPS25 states that “SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).”

76. For the purposes of the Northumberland National Park SFRA, the functional floodplain has not been specifically delineated as it is estimated that the 1 in 20 year (5%) design event predominantly stays in bank due to the steep sided river valleys.

5.2.2 Delineation of Zone 3a High Probability

77. Zone 3a High Probability is defined as those areas of the Northumberland National Park that are situated below (or within) the 1% AEP (100 year) fluvial flood extent.

78. For planning purposes, the Environment Agency has issued a series of Flood Zone Maps (FZM) as depicted on the Environment Agency’s website (www.environment-agency.gov.uk). Within the National Park the Environment Agency’s Flood Zone Maps have been adopted to underpin the SFRA process.

79. Detailed topography has been used to carry out a ‘sensibility check’ of the flood zone maps. This check has simply sought to ensure that the predicted floodplain extents are sensible in light of surrounding ground levels. No alterations have been made to the maps in this instance.

Planning Response within Rural Areas of the Borough
Within rural areas, it is important to protect ‘natural’ floodplain areas from future development. This will provide future protection not only for the development itself, but also for the communities along the river system that rely on existing floodplain storage to prevent rising water levels.

5.2.3 Delineation of Zone 2 Medium Probability

80. Zone 2 Medium Probability is defined as those areas of the National Park that are situated between the 0.1% AEP (1 in 1000 year) and the 1% AEP (1 in 100 year) fluvial flood extents. In this instance, Zone 2 Medium Probability is defined in accordance with the Environment Agency Flood Zone Map.

5.2.4 Delineation of Zone 1 Low Probability

81. Zone 1 Low Probability is defined as those areas of the National Park that are situated above (or outside of) the 0.1% AEP (1000 year) flood extent. For SFRA purposes, this incorporates all land that is outside of the shaded Zone 2 and Zone 3 flood risk areas (as defined above).
5.3 Surface Water (Flash) Flood Risk

82. The PPS25 flood zones, as defined in strict accordance with the current guidance, focuses very heavily upon the risk of fluvial flooding. It is widely recognised however that, within the National Park, the primary risk to property and infrastructure is from ‘flash flooding’. In simple terms, this is flooding that occurs as a result of rapid runoff from steep sided valleys following heavy rainfall.

83.

84. As outlined in Section 4 above, the risk of flash flooding is very much a function of the Park’s geology and topography. The underlying soils determine how much rainfall can fall, and be stored, on the ground before water begins to travel as sheetflow overland. Once the capacity of the soils to capture and store water has been exceeded, the topography will then determine in what direct, how fast and how deep the overland runoff will flow. Adopting this simple model as a means of appraising the potential risk of flash flooding, the Park has been delineated into zones of ‘high’, ‘medium’ and ‘low’ surface water flood risk (refer Figures 2 and 3).

85. The detailed methodology adopted for the delineation of risk is provided in Appendix A. Put simply however, given that the geology of the Park is relatively uniform throughout the study area, it was determined that the potential risk of flash flooding is (for planning purposes) largely a function of the slope of the land upslope and downslope of a particular location. That is to say:

- Expansive areas of flat ground will typically not be at a high risk of flash flooding;
- Areas of particularly steep ground may be at risk to a small degree, however surface water will pass through very quickly at shallow depth;
- In contrast however, areas situated at the base of a steep slope are most likely to be vulnerable to the impacts of flash flooding. Water will cascade quickly off the steep sided valley, and due to the flattening topography will tend to deepen, resulting in relatively deep fast flow.

86. A GIS based model of the Park was developed therefore, based upon the IfSAR topography provided by the Environment Agency, analysing the change in slope as one moves downhill. Areas in which the change in slope is less than or equal to zero (i.e. steepening ground, flat ground, and/or very steep slopes) have been designated as at “low” risk of flash flooding. Areas in which the change of slope is relatively marginal are considered “medium” risk. Finally areas in which the change in slope is marked, indicating the ground is becoming shallower, have been designated as at “high” risk of flash flooding. This is depicted in Figures 2 and 3.

87. The characteristic topography of the Park is such that the maximum change in slope is typically at the foot of valleys, and therefore at first glance the ‘surface water flood risk’ map appears to differ relatively little from the PPS25 flood zone map. There are some very important distinguishing features however. The risk of flash flooding, whilst often adjacent to the river (by virtue of the topography), will typically be highest within the surrounding foothills. The PPS25 fluvial flood zones will therefore not adequately capture the potential risk to slightly elevated properties and/or infrastructure that may be at risk from rapid surface water runoff.

5.4 Local Drainage Issues

88. As discussed in Section 4.6, consultation has been carried out with the Environment Agency, the Northumberland National Park Authority, Northumbrian Water and Parish Councils to identify known incidents of flooding. Many of those identified are as a result of surface water flooding as discussed above. A small proportion however are related to localised drainage issues. These drainage problems may be attributed to inundation due to poor maintenance, associated with (for example) culvert and/or gully blockages, and sewer flooding exacerbated by elevated river levels. Issues of this nature are often relatively localised, affecting generally a small number of properties.
89. Even though the northern part of the Northumberland National Park predominantly has a rural nature, within the villages and hamlets it is inevitable that localised flooding problems arising from under capacity drainage and/or sewer systems will occur, particularly given the mounting pressure placed upon systems as a result of climate change.

90. Input has been sought from Northumbrian Water to pinpoint known and/or perceived problem areas, however the information provided is very general. Reliance has therefore been placed upon problems that are known to have occurred in the past. It is important to recognise however that this is not a true depiction of ‘risk’ (i.e. susceptibility to flooding in the future), and often problems will occur during a storm event quite unexpectedly in areas not known to have been flooded in the past.

91. Once again however, it should be noted that issues of this nature are generally localised, and can often be addressed as part of the design process. It is essential to ensure that future development (of any kind) does not exacerbate existing flooding problems. Strict planning conditions should be placed upon developers to ensure that best practice measures are implemented to mitigate any potential increase in loading upon existing drainage system(s).

92. The Environment Agency strongly advocates the use of Sustainable Drainage Systems (SUDS). A wide variety of SUDS techniques are available (refer Section 6.6.3), potentially providing both water quality and water quantity improvement benefits on a site by site basis throughout the National Park. Collectively, the effective application of SUDS as part of all future development will assist in reducing the risk of flooding to the Park.

5.5 Groundwater Flooding

93. The risk of groundwater flooding is typically highly variable and heavily dependent upon local conditions at any particular time, nevertheless the risk of groundwater flooding in this instance is considered to be low. Throughout the northern section of the National Park, no significant groundwater flooding has been recorded in the past and, given the geology of the Park, it is anticipated that this will not become an issue in the future. Some extensive peatland throughout the Cheviot Hills does suggest a risk of perched water tables, although the rural nature of this area indicates that only very isolated properties could become affected.

94. Notwithstanding this, in accordance with PPS25, future development will require an appropriate Flood Risk Assessment (FRA) at the planning application stage, commensurate with the level of flood risk posed to the site. The FRA should incorporate a site based assessment of the potential risk of groundwater flooding to the site, confirming (or otherwise) the absence of this source of flood risk.

5.6 Climate Change

95. A considerable amount of research is being carried out worldwide in an endeavour to quantify the impacts that climate change is likely to have on flooding in future years. Climate change is perceived to represent an increasing risk to low lying areas of England, and it is anticipated that the frequency and severity of flooding will change measurably within our lifetime. PPS25 (Appendix B) states that a 10% increase in the 1% AEP (100 year) river flow can be expected within the next 20 years, increasing to 20% within the next 50 to 100 years. Whilst this is unlikely to measurably increase the predicted risk of fluvial flooding to property within the Park, this increase in flow corresponds to a 20% to 30% increase in predicted rainfall intensity to 2057 and 2107 respectively. This will certainly have a direct impact upon the potential risk of flash flooding.

96. It is essential that developers consider the possible change in flood risk over the lifetime of the development as a result of climate change. The likely increase in flow and/or tide level over the lifetime of the development should be assessed proportionally to the guidance provided by the EA as outlined above.
Climate Change Impacts upon River Flooding

97. When considering the potential impact that climate change may have upon the PPS25 flood zones (i.e. river flooding), in the absence of a definitive flood outline, in simple terms the anticipated extent of the 1% AEP (100 year) flood affected area in 2106 can be approximated by the current 0.1% AEP (1000 year) flood outline, i.e. Zone 2 Medium Probability. Due to the steep sided topography, this indicates virtually no increase in the number of properties at risk of flooding.

98. In conclusion therefore, adopting the pragmatic comparison between Zone 3a and Zone 2 above, and with due consideration to the relatively well defined topography of the area, it is clear that climate change will not markedly increase the extent of river flooding. For this reason, very few areas that are currently situated outside of Zone 3 High Probability will be at risk of flooding in future years. This is an important conclusion from a spatial planning perspective. Notwithstanding this however, those properties (and areas) that are currently at risk of flooding may be susceptible to more frequent, more severe flooding in future years. It is essential therefore that the development control process (influencing the design of future development within the National Park) carefully mitigates against the potential impact that climate change may have upon the risk of river flooding to the property.

99. For this reason, all of the development control recommendations set out in Section 6.4 below require all floor levels, access routes, drainage systems and flood mitigation measures to be designed with an allowance for climate change. This provides a robust and sustainable approach to the potential impacts that climate change may have upon the National Park over the next 100 years, ensuring that future development is considered in light of the possible increases in flood risk over time.

Climate Change Impacts upon Flash Flooding

100. It is re-emphasised that the potential impacts of climate change will affect not only the risk of flooding posed to property as a result of river flooding, but it will also potentially increase the frequency and intensity of localised storms over the National Park. This may exacerbate flash flooding problems.

101. The risk of flash flooding is very much dictated by the topography, as explained in Section 5.3 above. For this reason, the delineation of the ‘high’, ‘medium’ and ‘low’ flash flooding risk zones provided in Figures 2 and 3 will not alter as a result of climate change. The severity (and frequency) of flash flooding to those areas that are currently at risk will worsen however. It is essential therefore that the site based detailed Flood Risk Assessment (i.e. prepared by the developer at the planning application stage as outlined in Section 6) takes careful consideration of climate change, ensuring that the adopted design mitigates the potential risks as much as possible.

Climate Change Impacts upon Localised Flooding

102. It is also important to recognise that an increase in the frequency and intensity of heavy rainfall will also impact upon the local drainage system, potentially increasing the number of localised drainage problems reported within the Park. Once again, it is important that the site based Flood Risk Assessment considers the potential impact of climate change upon the local sewers and drains at the design stage, and where possible measures are incorporated into the design to avoid any possible future exacerbation of localised problems.

5.7 Residual Risk of Flooding

103. It is essential that the risk of flooding is minimised over the lifetime of a development in all instances. It is important to recognise however that flood risk can never be fully mitigated, and there will always be a residual risk of flooding, associated with (for example) localised blockages that may occur during an event, general uncertainties in flood prediction, and/or the failure of a raised flood defence.

104. The SFRA process has carried out a review of flood risk within the northern part of the Northumberland National Park in accordance with PPS25, identifying areas that fall within Zone 3a High Probability (i.e. at risk from river flooding). The SFRA has also endeavoured to provide
105. The adopted river flooding zones underpinning the northern Northumberland National Park SFRA are solely based upon the outcomes of the national generalised computer model from the Environment Agency. The degree of uncertainty associated with the outcomes of this model should therefore be accounted for within future development. The Environment Agency (North East Region) usually adopts a 600mm allowance, increasing design floor levels within flood affected areas to account for the uncertainty in the predicted flood level.

106. It is incumbent on developers to carry out a detailed Flood Risk Assessment as part of the design process. A review of uncertainty should always be undertaken as an integral outcome of this more detailed investigation.
6 Sustainable Management of Flood Risk

6.1 Overview

107. An ability to demonstrate ‘sustainability’ is a primary government objective for future development within the UK. The definition of 'sustainability' encompasses a number of important issues ranging broadly from the environment (i.e. minimising the impact upon the natural environment) to energy consumption (i.e. seeking alternative sources of energy to avoid the depletion of natural resources). Of particular importance however is sustainable development within flood affected areas.

108. Recent history has shown the devastating impacts that flooding can have on lives, homes and businesses. A considerable number of people live and work within areas that are susceptible to flooding, and ideally development should be moved away from these areas over time. It is recognised however that this is often not a practicable solution. For this reason, careful consideration must be taken of the measures that can be put into place to minimise the risk to property and life posed by flooding. These should address the flood risk not only in the short term, but throughout the lifetime of the proposed development. This is a requirement of PPS25.

109. The primary purpose of the SFRA is to inform decision making as part of the planning and development control process, taking due consideration of the scale and nature of flood risk affecting the National Park. Responsibility for flood risk management resides with all tiers of government, and indeed individual landowners, as outlined below.

6.2 Responsibility for Flood Risk Management

110. There is no statutory requirement for the Government to protect property against the risk of flooding. Notwithstanding this however, the Government recognise the importance of safeguarding the wider community, and in doing so the economic and social well being of the nation. An overview of key responsibilities with respect to flood risk management is provided below.

111. The Regional Assembly should consider flood risk when reviewing strategic planning decisions including (for example) the provision of future housing and transport infrastructure.

112. The Environment Agency has a statutory responsibility for flood management and defence in England. It assists the planning and development control process through the provision of information and advice regarding flood risk and flooding related issues.

113. The Local Planning Authority is responsible for carrying out a Strategic Flood Risk Assessment. The SFRA should consider the risk of flooding throughout the Local Authority Area and should inform the allocation of land for future development, development control policies and sustainability appraisals. Local Planning Authorities have a responsibility to consult with the Environment Agency when making planning decisions.

114. Landowners & Developers have the primary responsibility for protecting their land against the risk of flooding. They are also responsible for managing the drainage of their land such that they do not adversely impact upon adjoining properties.

115. The Environment Agency has developed a guide entitled “Living on the Edge” that provides specific advice regarding the rights and responsibilities of property owners, the Environment Agency and other bodies. The guide is targeted at owners of land situated alongside rivers or other watercourses, and is a useful reference point outlining who is responsible for flood defence, and what this means in practical terms. It also discusses how stakeholders can work collaboratively to protect and enhance the natural environment of our rivers and streams. This guide can be found on the Environment Agency’s website at www.environment-agency.gov.uk.

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* Referred to also as 'landowners' within PPS25
6.3 Strategic Flood Risk Management - The Environment Agency

6.3.1 Overview

116. With the progressive development of urban areas along river corridors, particularly during the industrial era, a reactive approach to flood risk management evolved. As flooding occurred, walls or embankments were built to prevent inundation to developing areas. Needless to say, construction of such walls should be carefully assessed so that it does not result in the redistribution of floodwater, inadvertently increasing the risk of flooding elsewhere.

117. The Environment Agency (EA) in more recent years has taken a strategic approach to flood risk management. The assessment and management of flood risk is carried out on a ‘whole of catchment’ basis. This enables the Environment Agency to review the impact that proposed defence works at a particular location may have upon flooding at other locations throughout the catchment.

118. A number of flood risk management strategies are underway within the region, encompassing the large river systems that influence flood risk within the northern part of the Northumberland National Park. A brief overview of these investigations is provided below.

6.3.2 Catchment Flood Management Plans (CFMP) – North East Region

119. “One of the Environment Agency’s main goals is to reduce flood risk from rivers and the sea to people, property and the natural environment by supporting and implementing government policies.

120. Flooding is a natural process – we can never stop it happening altogether. So tackling flooding is more than just defending against floods. It means understanding the complex causes of flooding and taking co-ordinated action on every front in partnership with others to reduce flood risk by:

- Understanding current and future flood risk;
- Planning for the likely impacts of climate change;
- Preventing inappropriate development in flood risk areas;
- Delivering more sustainable measures to reduce flood risk;
- Exploring the wider opportunities to reduce the sources of flood risk, including changes in land use and land management practices and the use of sustainable drainage systems.

121. Catchment Flood Management Plans (CFMPs) are a planning tool through which the Agency aims to work in partnership with other key decision-makers within a river catchment to explore and define long term sustainable policies for flood risk management. CFMPs are a learning process to support an integrated approach to land use planning and management, and also River Basin Management Plans under the Water Framework Directive.\(^{10}\)

122. A set of CFMPs are being developed for Northumberland, of which the Northeast Northumberland CFMP and the Till and Breamish CFMP are the most relevant to the northern portion of the Northumberland National Park (of relevance within this SFRA).

123. The CFMPs are currently still in their scoping stages at the time of writing, and are expected to be completed during mid 2008. Some key messages regarding urban development have emerged as part of the earlier Scoping Phase however. These messages include some key objectives for the National Park, including:

\(^{10}\)Catchment Flood Management Plans – Volume 1 (Guidance), Version 1.0, July 2004
“Promote and support land use practices that reduce flood risk”
“Actively seek to keep the flood risk of commercial and residential property as low as possible”

124. To meet these objectives, some specific indicators and targets have been defined, which include;

Indicators;
- Minimal damages to property and infrastructure through flooding
- Removal of inappropriate development from high risk areas

Targets;
- 100% of our sustained objections to inappropriate developments are upheld
- All new developments incorporate flood-resilient measures by 2011
- More homes benefit from reduced flood risk – 85,000 by April 2008 in England
- Flood Warning coverage of 80%

125. These succinctly reinforce the over-arching objectives of PPS25. The planning policy is seeking to advocate flood avoidance in the first instance, steering development away from areas that are most at risk. Where other planning constraints are taken in balance (through the Sustainability Appraisal) and it is the decision of the Local Authority to permit development within a flood affected area, measures must be taken through the design process to mitigate the potential risk that flooding may pose to both property and life. It is highlighted that this is irrespective of the source of the flooding. These underlying principles have been used to develop the specific planning recommendations provided for the National Park below.

6.4 Planning & Development Control – Northumberland National Park

6.4.1 Planning Solutions to Flood Risk Management

126. PPS25 has been developed to offer guidance to Local Planning Authorities, ensuring that flood risk represents an integral consideration when considering the future sustainability of both existing and emerging communities.

127. The Northumberland National Park is a unique area that is protected against large scale urban development. The Northumberland National Park Authority is responsible for ensuring that future development within the Park is carried out in a sustainable manner. Whilst, given the unique character of the National Park, this does not involve the specific allocation of sites for housing and/or employment (i.e. planning for population growth), the existing Park community is no less susceptible to the potential risks associated with flooding than their neighbours in adjacent Boroughs. When existing landowners improve and/or extend their property, it is imperative that they consider the potential risks posed to them by flooding (from all sources).

128. For this reason, it is important that the National Park Authority are aware of the potential risks posed by flooding throughout the Park, and have robust planning policies in place that will enable them to mitigate these risks through the development control process. Furthermore it is recognised that there is a need to meet possible future demands for local housing within the existing villages and hamlets of the Park. It will be necessary for the National Park Authority to demonstrate adherence to the principles of PPS25 – specifically the application of the Sequential and Exception Tests – when taking these planning decisions.

129. For this reason, a series of specific spatial planning and development control recommendations have been developed, building upon the findings of the SFRA flood risk assessment. These are provided below, and should be read in conjunction with adjoining Figures 1, 2 and 3, depicting the spatial variation in fluvial and surface water flood risk across the northern section of the National Park.
The Sequential Test

130. The ideal solution to effective and sustainable flood risk management is a planning led one, i.e. steer urban development away from areas that are susceptible to flooding. PPS25 advocates a sequential approach that will guide the planning decision making process (i.e. the allocation of sites). In simple terms, this requires planners to seek to allocate sites for future development within areas of lowest flood risk in the initial instance. Only if it can be demonstrated that there are no suitable sites within these areas should alternative sites (i.e. within areas that may potentially be at risk of flooding) be contemplated. Within the context of the National Park, this sequential approach should be adopted to drive the provision of sites for local housing. This sequential approach is referred to as The Sequential Test, and is summarised in Figure 3.1 of the PPS25 Practice Companion Guide (A Living Draft, February 2007).

131. As indicated by the bottom right hand corner of the flow chart in Figure 3.1 of the Practice Guide, PPS25 stipulates permissible development types. This considers both the degree of flood risk posed to the site, and the likely vulnerability of the proposed development to damage (and indeed the risk to the lives of the site tenants) should a flood occur. Within those areas (albeit limited) that are affected to some degree by a risk of fluvial flooding, the National Park Authority should restrict development to the permissible land uses summarised in PPS25 Appendix D (Table D2).

132. Within the Northumberland National Park, the risk of flooding from rivers is relatively low. The potential risk of flash flooding, arising from the rapid runoff of rainfall from the surrounding steep topography, is relatively high however. Whilst the PPS25 flood zones (and specifically the delineation of Zone 3a High Probability) focus heavily upon fluvial flood risk, it is strongly recommended that the National Park Authority adopt a similar sequential approach to the risk of flash flooding. That is to say, where (for example) future housing may be required to meet the immediate needs of the local community, this should be steered in the initial instance towards those areas designated as at ‘low’ risk of flash flooding (refer Figures 2 and 3). Only where it can be shown that there are strong planning arguments that outweigh flood risk should areas of ‘medium’ risk (and subsequently ‘high’ risk) be considered.

The Exception Test

133. The risk of fluvial flooding within the northern section of the National Park is very limited. There is however a relatively sizeable proportion of the foothills that is at relatively high risk of flash flooding, and therefore equally susceptible to damage and disruption. It is strongly recommended that the principles of PPS25 are applied to these areas, seeking wherever possible the avoidance of flood risk (i.e. not permitting future development at these locations). It is recognised however that a large proportion of ‘development’ within the National Park is driven by community ‘need’, or existing landowners wishing to improve and/or extend their property.

134. In these instances, often the location of the proposed development will be dictated to a large degree by other (non flooding related) planning considerations. In all instances, a sequential approach should be taken in the initial instance. Where other pressing planning ‘needs’ warrant further consideration of areas that may be susceptible to a degree of risk from flooding however, the National Park Authority and potential future developers are required to work through the Exception Test (PPS25 Appendix D) where applicable. For the Exception Test to be passed:

- “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 DPD has reached the ‘submission’ stage, the benefits of the development should contribute to the Core Strategy’s Sustainability Appraisal;
- the development should be on developable, previously development land or if it is not on previously developed land, that there are no reasonable alternative sites on previously development land; and
The first two points set out in the Exception Test are planning considerations. A planning solution to removing flood risk must be sought at each specific location in the initial instance, seeking to relocate the proposed allocation to an area of lower flood risk (i.e. Zone 1 Low Probability or Zone 2 Medium Probability) wherever feasible.

- A FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and where possible, will reduce flood risk overall."

The management of flood risk throughout the National Park must be assured should development be permitted to proceed, addressing the third critical element of the Exception Test. The SFRA has provided specific recommendations that ultimately should be adopted as design features, with evidence provided of how they will be fulfilled prior to permission being granted for all future development. It is the responsibility of the prospective developer to build upon these recommendations as part of a detailed Flood Risk Assessment to ensure that the specific requirements of PPS25 can be met.

135. The SFRA has been developed in liaison with the National Park Authority and the Environment Agency to set out and inform the requirements of the Sequential Test (and, where necessary, the Exception Test) within the National Park. Given the planning framework (i.e. the absence of specific allocations) and the nature of future development within the National Park, it will be almost exclusively the responsibility of the developer to develop a detailed Flood Risk Assessment that can demonstrate that a sequential approach has been applied, and that the risk of flooding has been adequately addressed in accordance with PPS25. The requirements of the detailed FRA is outlined in Section 6.5 below.
### 6.4.2 Development Control Recommendations (Design Measures)

<table>
<thead>
<tr>
<th>Design Requirement</th>
<th>River Flooding (refer Figure 1)</th>
<th>Flash Flooding (refer Figure 2 and 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed Flood Risk Assessment (FRA) - refer Section 6.5.1</td>
<td></td>
<td>Required for all sites greater than 1ha in area. Recommend that all sites carry out an assessment of localised flood risks (including surface water (flash) flooding)</td>
</tr>
<tr>
<td>Zone 3a High Probability</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Zone 2 Medium Probability</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Zone 1 Low Probability</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>High Risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor Level - refer Section 6.5.2</td>
<td>To be situated a minimum of 300mm above the 1 in 100 year river flood level, including climate change</td>
<td>No minimum level stipulated by PPS25</td>
</tr>
<tr>
<td></td>
<td>No minimum level stipulated by PPS25</td>
<td>To be situated a minimum of 500mm above ground level</td>
</tr>
<tr>
<td>Site Access &amp; Egress</td>
<td>For residential property, dry access is to be provided in the 1 in 100 year river flood. For commercial property, access must be &quot;safe&quot; in accordance with Defra &quot;Flood Risk to People&quot; (FD2320 &amp; FD2321)</td>
<td>A secondary access route should be identified in case of damage to primary route as a result of flash flooding</td>
</tr>
<tr>
<td></td>
<td>No minimum level stipulated by PPS25</td>
<td></td>
</tr>
<tr>
<td>Basements - refer Section 6.5.1</td>
<td>No sleeping accommodation permitted at basement level. All basements must have an access point that is above the 1 in 100 year river flood level, including climate change</td>
<td>No sleeping accommodation permitted at basement level</td>
</tr>
<tr>
<td></td>
<td>No restrictions</td>
<td>No restrictions</td>
</tr>
<tr>
<td>Site Runoff - refer Section 6.5.3</td>
<td>SuDS are required to limit runoff from the site to no greater than the greenfield runoff rate</td>
<td>SuDS are required to limit runoff from the site to no greater than the greenfield runoff rate</td>
</tr>
<tr>
<td>Buffer Zone</td>
<td>Development is not permitted within 5m of ‘top of bank’</td>
<td>N/A</td>
</tr>
<tr>
<td>Other</td>
<td>Development must not increase flood levels within adjoining properties</td>
<td>N/A</td>
</tr>
</tbody>
</table>
6.5 Detailed Flood Risk Assessment (FRA) – The Developer

6.5.1 Scope of the Detailed Flood Risk Assessment

136. As highlighted in Section 2, the SFRA is a strategic document that provides an overview of flood risk (from all sources) throughout the area. It is imperative therefore that a site-based Flood Risk Assessment (FRA) is carried out by the developer for all proposed developments, interrogating in more detailed the flooding related issues of specific relevance to the site, and this should be submitted as an integral part of the planning application.

137. The FRA should be commensurate with the risk of flooding to the proposed development. For example, where the risk of flooding to the site is negligible (e.g. Zone 1 Low Probability and ‘Low’ Flash Flood Risk), there is little benefit to be gained in assessing the potential risk to life and/or property as a result of flooding. Rather, emphasis should be placed on ensuring that runoff from the site does not exacerbate flooding lower in the catchment. The particular requirements for FRAs within each delineated flood zone are outlined below.

138. Proposed Development within Zone 3a High Probability & ‘High’ Flash Flood Risk

All FRAs supporting proposed development within Zone 3a High Probability and/or within ‘High’ Flash Flood risk should include an assessment of the following:

- The vulnerability of the development to flooding from all sources, including surface water runoff, groundwater, sewer flooding as well as from river flooding. This will involve discussion with the National Park Authority, the Environment Agency and Northumbrian Water to confirm whether a localised risk of flooding exists at the proposed site.

- The vulnerability of the development to flooding over the lifetime of the development (including the potential impacts of climate change), i.e. maximum water levels, flow paths and flood extents within the property and surrounding area. The Environment Agency may have carried out detailed flood risk mapping (relating to river flooding) within localised areas that could be used to underpin this assessment. Where available, this will be provided at a cost to the developer. Where detailed modelling is not available, hydraulic modelling by suitably qualified engineers will be required to determine the risk of flooding to the site.

- The potential of the development to increase flood risk elsewhere through the addition of hard surfaces, the effect of the new development on surface water runoff, and the effect of the new development on depth and speed of flooding to adjacent and surrounding property. This will require a detailed assessment, to be carried out by a suitably qualified engineer.

- A demonstration that residual risks of flooding (after existing and proposed flood management and mitigation measures are taken into account) are acceptable. Measures may include flood defences, flood resistant and resilient design, escape/evacuation, effective flood warning and emergency planning.

- Details of existing site levels, proposed site levels and proposed ground floor levels. All levels should be stated relevant to Ordnance Datum.

139. Proposed Development within Zone 2 Medium Probability and/or ‘Medium’ Flash Flood Risk

- For all sites within Zone 2 Medium Probability and/or ‘Medium’ Flash Flood Risk, a high level FRA should be prepared based upon readily available existing flooding information, sourced from the EA. It will be necessary to demonstrate that the residual risk of flooding to the property is effectively managed through, for example, the provision of raised floor levels and the provision of a planned evacuation route.

- It is reiterated that the risk of all sources of flooding, including sewer flooding, groundwater flooding, surface water flooding and river flooding must be considered. Sustainable urban drainage techniques must be employed to ensure no worsening to existing flooding problems elsewhere within the area.
140. **Proposed Development within Zone 1 Low Probability and/or ‘Low’ Flash Flood Risk**

Within all areas of the Park, the potential risk of flooding from all sources must be considered, and sustainable urban drainage techniques must be employed to ensure no worsening to existing flooding problems elsewhere within the area.

### 6.5.2 Raised Floor Levels & Basements (Freeboard)

141. The raising of floor levels above the 1% AEP (100 year) fluvial flood level will ensure that the damage to property is minimised. Given the anticipated increase in flood levels due to climate change, the adopted floor level should be raised above the 1% AEP (100 year) predicted fluvial flood level, assuming a 20% increase in flow over the next 100 years.

142. Wherever possible, floor levels should be situated a minimum of 600mm above the 1% AEP (100 year) plus climate change flood level, determined as an outcome of the site based FRA. A minimum of 600mm above the 1% AEP (100 year) fluvial flood level should be adopted if no climate change data is available. The height that the floor level is raised above flood level is referred to as the ‘freeboard’, and is determined as a measure of the residual risks.

143. The use of basements within flood affected areas should be discouraged. Where basement uses are permitted however, it is necessary to ensure that the basement access points are situated 600mm above the 1% AEP (100 year) flood level plus climate change. The basement must be of a waterproof construction to avoid seepage during flooding conditions. Habitable uses of basements within flood affected areas will not be permitted.

### 6.5.3 Sustainable Drainage Systems (SUDS)

144. **SUDS is a term used to describe the various approaches that can be used to manage surface water drainage in a way that mimics the natural environment.** The management of rainfall (surface water) is considered an essential element of reducing future flood risk to both the site and its surroundings. Indeed reducing the rate of discharge from urban sites to greenfield runoff rates is one of the most effective ways of reducing and managing flood risk within the National Park. The integration of sustainable drainage systems into a site design can also provide broader benefits, including an improvement in the quality of runoff discharged from the site, the capture and re-use of site runoff for irrigation and/or non potable uses, and the provision of greenspace areas offering recreation and/or aesthetic benefits.

145. SUDS may improve the sustainable management of water for a site by\(^\text{11}\):

- reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
- reducing volumes and the frequency of water flowing directly to watercourses or sewers from developed sites;
- reducing the rate of runoff from a site, thereby reducing the potential risk of flash flooding to properties downslope;
- capturing surface water runoff from upslope, and routing this through the site in a controlled manner;
- improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
- reducing potable water demand through rainwater harvesting;
- improving amenity through the provision of public open space and wildlife habitat;
- replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

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\(^{11}\) Interim Code of Practice for Sustainable Drainage Systems National SUDS Working Group, 2004
146. In catchment terms, any reduction in the amount of water that originates from any given site is likely to be small. But if applied across the catchment in a consistent way, the cumulative affect of a number of sites could be significant.

147. There are numerous different ways that SUDS can be incorporated into a development and the most commonly found components of a SUDS system are described in the following table. The appropriate application of a SUDS scheme to a specific development is heavily dependent upon the topography and geology of the site (and its surrounds). Careful consideration of the site characteristics must be assured to ensure the future sustainability of the adopted drainage system.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pervious surfaces</td>
<td>Surfaces that allow inflow of rainwater into the underlying construction or soil.</td>
</tr>
<tr>
<td>Green roofs</td>
<td>Vegetated roofs that reduce the volume and rate of runoff and remove pollution.</td>
</tr>
<tr>
<td>Filter drain</td>
<td>Linear drains consisting of trenches filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water; they may also permit infiltration.</td>
</tr>
<tr>
<td>Filter strips</td>
<td>Vegetated areas of gently sloping ground designed to drain water evenly off impermeable areas and to filter out silt and other particulates.</td>
</tr>
<tr>
<td>Swales</td>
<td>Shallow vegetated channels that conduct and retain water, and may also permit infiltration; the vegetation filters particulate matter.</td>
</tr>
<tr>
<td>Basins, Ponds and Wetlands</td>
<td>Areas that may be utilised for surface runoff storage.</td>
</tr>
<tr>
<td>Infiltration Devices</td>
<td>Sub-surface structures to promote the infiltration of surface water to ground. They can be trenches, basins or soakaways.</td>
</tr>
<tr>
<td>Bioretention areas</td>
<td>Vegetated areas designed to collect and treat water before discharge via a piped system or infiltration to the ground</td>
</tr>
</tbody>
</table>

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

- Interim Code of Practice for Sustainable Drainage Systems, National SUDS Working Group, 2004
- www.ciria.org.uk/SUDS/

149. Furthermore, the Environment Agency (Northeast Region) has issued best practice guidance for Sustainable Drainage Systems (October 2006), available from the Environment Agency development control teams. This provides a clear hierarchy for SUDS, reflecting the degree of sustainability offered by the SUDS application as captured in the table below.

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(12) Interim Code of Practice for Sustainable Drainage Systems National SUDS Working Group, 2004
### 6.6 Local Community Actions to Reduce Flood Damage

150. There will always be a residual risk of flooding, whether that be (for example) from an event that is more extreme than that considered, or whether as a result of a flood defence system that fails unexpectedly. Flood resistance and flood resilience may need to be incorporated into the design of buildings for this reason.

151. In all areas at risk of flooding, a basic level of flood resistance and resilience will be achieved by following good building practice and complying with the requirements of the Building Regulations 2000. The difference between ‘resilience’ and ‘resistance’ is explained below:

- **Flood resistance**, or ‘dry proofing’, where flood water is prevented from entering the building. For example using flood barriers across doorways and airbricks, or raising floor levels.
- **Flood resilience**, or ‘wet proofing’, accepts that flood water will enter the building and allows for this situation through careful internal design for example raising electrical sockets and fitting tiled floors. The finishes and services are such that the building can quickly be returned to use after the flood.

152. Examples of both flood-resistant and flood resilient design are given in Improving the Flood Performance of New Buildings (Flood Resilient Construction), CLG (2007).

153. It is evident that homes within the National Park are at risk of flooding. It is essential therefore to ensure a broad awareness with respect to flood risk, providing the community with the knowledge (and tools) that will enable them to help themselves should a flood event occur.

154. The following ‘community based measures’ are cost effective solutions that local communities may introduce to minimise the damage sustained to their own homes in the case of flooding. Further guidance is provided by the EA, Defra and CLG (refer the National Flood Forum (www.floodforum.gov.uk)).

155. It is recommended that the Authority seek to proactively raise awareness within the community with respect to flooding (and indeed ‘self help’ flood risk reduction opportunities) through, for example, the circulation of a targeted newsletter to affected residents to coincide with the release of the National Park SFRA.

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**Table: SUDS technique**

<table>
<thead>
<tr>
<th>Technique</th>
<th>Flood Reduction</th>
<th>Water Quality Improvement</th>
<th>Landscape &amp; Wildlife Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living roofs</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Basins and ponds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Constructed wetlands</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Balancing ponds</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- Detention basins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Retention ponds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filter strips and sanitary sewers</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Infiltration devices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Soakaways</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Infiltration trenches and basins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permeable surfaces and filter drains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Gravelled areas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Solid paving blocks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Porous paving</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tanked systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Over-sized pipes/tanks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Storms cells</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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13 Office of Deputy Prime Minister (ODPM) – now Communities & Local Government (CLG)
6.6.1 Flood Proofing

156. The ‘flood proofing’ of a property may take a variety of forms:

For new homes and/or during redevelopment

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

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

For existing homes

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

6.7 Emergency Planning

157. Emergency planning is a critical element of any sustainable flood risk management solution. Liaison with both the Environment Agency and emergency services is imperative.

158. The Local Planning Authority is designated as a Category 1 Responder under the Civil Contingencies Act 2004. As such, the Authority has defined responsibilities to assess risk, and respond appropriately in case of an emergency, including (for example) a major flooding event. The National Park Authority’s primary responsibilities are 35:

a. from time to time assess the risk of an emergency occurring;

b. from time to time assess the risk of an emergency making it necessary or expedient for the person or body to perform any of his or its functions;

c. maintain plans for the purpose of ensuring, so far as is reasonably practicable, that if an emergency occurs the person or body is able to continue to perform his or its functions;

d. maintain plans for the purpose of ensuring that if an emergency occurs or is likely to occur the person or body is able to perform his or its functions so far as necessary or desirable for the purpose of:

  i. preventing the emergency,
  ii. reducing, controlling or mitigating its effects, or
  iii. taking other action in connection with it

159. As water levels rise and/or damage to infrastructure begins to pose a risk to life and/or livelihood, it is the responsibility of the emergency services to coordinate the evacuation of residents. This evacuation will be supported and facilitated by the Local Planning Authorities. It is essential that a robust plan is in place that clearly sets out (as a minimum):

- roles and responsibilities;
- paths of communication;
- evacuation routes;
- community centres to house evacuated residents;

35 Civil Contingencies Act 2004
contingency plans in case of loss of power and/or communication.

160. Coordination with the emergency services and the Environment Agency is imperative to ensure the safety of residents in time of flood. Only few areas within the Northumberland National Park are at risk of river flooding. A number of areas however are at risk from localised ‘flash’ flooding, associated with storm cells that pass over the National Park resulting in high intensity, often relatively localised, rainfall. It is anticipated that events of this nature will occur more often as a result of possible climate change over the coming decades. Events of this nature are difficult to predict accurately, and the rapid runoff that follows will often result in flooding that cannot be sensibly forewarned.

161. It is recommended that the National Park Authority pass the findings of this strategic assessment of flood risk along to the Local Resilience Forum to enable the Emergency Response Plan to be reviewed in light of the findings and recommendations provided.

6.8 Insurance

162. Many residents and business owners perceive insurance to be a final safeguard should damages be sustained as a result of a natural disaster such as flooding. Considerable media interest followed the widespread flooding of 2000 when it became clear that the insurance industry were rigorously reviewing their approach to providing insurance protection to homes and businesses situated within flood affected areas. Not surprisingly, the recent widespread flooding of July 2007 has further exacerbated the discussion surrounding the future of insurance for householders and business owners situated within flood affected areas.

163. The following quotations are an extract from the Association of British Insurers (ABI) website, dated August 2007:

“The UK is unique in offering flood cover as a standard feature of household and most business policies. Unlike much of Europe and worldwide, cover is widely available to the UK’s 23.5 million householders.

In the long term, this situation could worsen, unless we take action to reduce flood risk to people and property. Climate change will increase winter rainfall, the frequency of heavy rainfall, and sea levels and storm surge heights. With no change in Government policies or spending, climate change could increase the number of properties at risk of flooding to 3.5 million. Furthermore, continued pressure on land could mean even more new developments being situated in floodplains.

By spreading the risk across policy holders, insurance enables householders and businesses to minimize the financial cost of damage from flooding. In the modern competitive insurance market, premiums reflect the risks that customers face. This enables insurance to be offered at very competitive prices to customers living in low flood risk areas.

In 2003 ABI members agreed to extend their commitment to provide flood insurance to the vast majority of UK customers. The result of discussions between Government and insurers was a Statement of Principles, which aims to provide reassurance to the overwhelming majority of insurance customers living in the floodplain about the continued availability of insurance in future.

Individual property owners can do much to increase the resistance and resilience of their properties to flood damage - further information is available. ABI has issued a fact sheet for property owners on a range of measures that could be taken by a homeowner to improve the resilience of their property to flood damage.”

164. In summary, for the time being, residents and business owners can be assured that insurance will be available to assist in recovery following a flood event. It would appear fair to say however that the future availability of flood insurance within the UK will be heavily dependant
upon commitment from the government to reduce the risk of flooding over time, particularly
given the anticipated impacts of climate change. Investment is required in flood defence and
improving the capacity of sewage and drainage infrastructure, however it is also essential to
ensure that spatial planning decisions do not place property within areas at risk of flooding.
7 Conclusion & Recommendations

165. A number of properties within the northern part of the Northumberland National Park are at risk of flooding. The risk of flooding posed to properties within the Park arises from a number of sources including river flooding, localised runoff and sewer flooding, and most notably flash flooding.

166. Planning policy needs to be informed about the risk posed by flooding. A collation of potential sources of flood risk has been carried out in accordance with PPS25, developed in close consultation with both the National Park Authority and the Environment Agency. The northern part of the National Park has been broken down into zones of ‘high’, ‘medium’ and ‘low’ probability of flooding in accordance with PPS25, providing the basis for the application of the sequential approach (considering both fluvial and flash flooding).

167. Planning Policy is essential to ensure that the recommended planning solutions outlined in this SFRA can be imposed consistently throughout the planning cycle. This is essential to achieve future sustainability within the National Park with respect to flood risk management. It is recommended that consideration is given to the preparation of a supplementary planning document to build upon emerging National Park Authority policy, in light of the suggested development control recommendations presented by the Northumberland National Park SFRA (refer Section 6.4).

A Living Document

168. The SFRA has been developed building heavily upon existing knowledge with respect to flood risk within the National Park. A rolling programme of detailed flood risk mapping within the North East region is underway. This, in addition to observed flooding that may occur throughout a year, will improve the current knowledge of flood risk within the National Park and may marginally alter predicted flood extents within the Park. Furthermore, Communities and Local Government (CLG) are working to provide further detailed advice with respect to the application of PPS25, and future amendments to the PPS25 Practice Guide are anticipated. Given that this is the case, a periodic review of the Northumberland National Park SFRA is imperative.

169. It is recommended that the Northumberland National Park SFRA is reviewed on a regular basis. The following key questions should be addressed as part of the SFRA review process:

Question 1
Has any flooding been observed within the Park since the previous review? If so, the following information should be captured as an addendum to the SFRA:

- What was the mapped extent of the flooding?
- On what date did the flooding occur?
- What was the perceived cause of the flooding?
- If possible, what was the indicative statistical probability of the observed flooding event? (i.e. how often, on average, would an event of that magnitude be observed within the Park?)
- If the flooding was caused by overtopping of the riverbanks, are the observed flood extents situated outside of the current Zone 3a? If it is estimated that the frequency of flooding does not exceed, on average, once in every 100 years then the flooded areas (from the river) should be incorporated into Zone 3a to inform future planning decision making.

Question 2
Have any amendments to PPS25 or the Practice Companion Guide been released since the previous review? If so, the following key questions should be tested:

- Does the revision to the policy guidance alter the definition of the PPS25 Flood Zones presented within the SFRA?
Does the revision to the policy guidance alter the decision making process required to satisfy the Sequential Test?

Does the revision to the policy guidance alter the application of the Exception Test?

Does the revision to the policy guidance alter the categorisation of land use vulnerability, presented within Table D2 of PPS25 (December 2006)?

If the answer to any of these core questions is ‘yes’ then a review of the SFRA recommendations in light of the identified policy change should be carried out.

Question 3
Has the Environment Agency issued any amendments to their flood risk mapping and/or standing guidance since the previous policy review? If so:

- Has any further detailed flood risk mapping been completed within the Park, resulting in a change to the 20 year, 100 year or 1000 year flood outline? If yes, then the Zone 3b and Zone 3a flood outlines should be updated accordingly.
- Has the assessment of the impacts that climate change may have upon rainfall and/or river flows over time altered? If yes, then a review of the impacts that climate change may have upon the Park is required.
- Do the development control recommendations provided in Section 6.4 of the SFRA in any way contradict emerging EA advice with respect to (for example) the provision of emergency access, the setting of floor levels and the integration of sustainable drainage techniques? If yes, then a discussion with the EA is required to ensure an agreed suite of development control requirements are in place.

It is highlighted that the Environment Agency review the Flood Zone Map on a quarterly basis. If this has been revised within the Borough, the updated Flood Zones will be automatically forwarded to the Authority for their reference. It is recommended that only those areas that have been amended by the Environment Agency since the previous SFRA review are reflected in Zone 3 and Zone 2 of the SFRA flood maps. This ensures that the more rigorous analyses carried out as part of the SFRA process are not inadvertently lost by a simple global replacement of the SFRA flood maps with the Flood Zone Maps.

Question 4
Has the implementation of the SFRA within the spatial planning and/or development control functions of the Authority raised any particular issues or concerns that need to be reviewed as part of the SFRA process?
APPENDIX A

Northumberland National Park SFRA
Assessment of Surface Water (Flash) Flood Risk
Assessment of Surface Water (Flash) Flood Risk

Introduction

The northern section of the Northumberland National Park has many catchments with steep hill-slope gradients. Such areas display a rapid response to rainfall events and may experience flash flooding from both fluvial and surface runoff sources. The area is almost entirely rural so many occurrences are unreported. A review of the potential for overland flow occurrence during rainstorm events is therefore an important facet of flood risk assessment for the region.

This analysis covers an area of approximately 533 Km² containing several hundred named water courses. Consequentially the study area is too large to consider individual hill-slope analysis. Therefore a high level methodology for this assessment is required. Factors considered to contribute towards overland flow occurrence are:

- Bedrock and soil substrates – Specifically the permeability of the medium, which determines the propensity for rainfall infiltration. Infiltration excess surface flow is considered to increase in proportion to the permeability of the medium.
- Vegetation cover – This affects the severity of overland flow, from the interception and storage of raindrops as well as determining the roughness of terrain which directly controls the velocity of surface flow.
- Local Topography – This is an overarching factor in determination of overland flow occurrence. Surface slope is directly proportional to flow velocity. More importantly, changes from steep to shallow hill-slopes causes increased upwelling and surface transport.

A spatial index surface flow risk is required for infiltration excess and hillslope derived surface flow risk. GIS data layers for: Bedrock, Soil and Vegetation can each be categorised assigned a basic risk category. The union of these spatial datasets and the combining of each separate risk index in hierarchical matrices can determine the spatial distribution of infiltration excess risk factor.

Hill-slope angle and aspect can be calculated from a digital elevation model. Using these coverages runoff flow route can be determined. The change in slope angle from uphill to downhill grid cells can then be calculated and presented as spatial data. This measurement will provide a direct index of overland flow risk within the national park.

Data Availability

The data used for the investigations included the following:

- OS 1:50,000 scale
- OS 1:10,000 scale
- SAR (Synthetic Aperture Radar) Elevation Data. 5m Horizontal resolution
- British Geological Survey; Bedrock Classification, 1:625,000 scale
- British Geological Survey; Soil Classification, 1:625,000 scale

Methodology and Results

1. Calculation of overland flow risk due to substrate (infiltration excess runoff)

Figure 1a shows bedrock across the national park to be split by an east – west fault line. The north half of the park is characterised by hard impermeable basaltic material, and contains a discrete mountainous region of granitic rock types. The southern region is underlain by limestone series, this rock type may feature fissures and water permissivity is enhanced by macropore flow.
Figure 1a – Types of bedrock within the Northumberland National Park

Figure 1b – Soil types within the Northumberland National Park

The regions soils (figure 1b) are dominated by glacial till with waterlogged peat deposits where elevation and hillslope conditions are suitable. Small islands of undifferentiated riverine and glacial material are also seen.

- Bed rock and soil data layers were grouped into high medium and low risk categories

<table>
<thead>
<tr>
<th>Bedrock Type</th>
<th>Risk Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andasitic and Basaltic Lavas and Tuffs</td>
<td>H</td>
</tr>
<tr>
<td>Basal conglomerates</td>
<td>L</td>
</tr>
<tr>
<td>Basal Dolerite</td>
<td>H</td>
</tr>
<tr>
<td>Granite, Syenite, Granophite &amp; allied types</td>
<td>H</td>
</tr>
<tr>
<td>Porphyrite, Lamprophyte &amp; allied types</td>
<td>H</td>
</tr>
<tr>
<td>Carboniferous Limestone series</td>
<td>M</td>
</tr>
<tr>
<td>Wenlock</td>
<td>M</td>
</tr>
<tr>
<td>Alluvium</td>
<td>M</td>
</tr>
<tr>
<td>Glacial sands and gravels</td>
<td>L</td>
</tr>
<tr>
<td>Peat</td>
<td>H</td>
</tr>
<tr>
<td>River Terrace Deposits</td>
<td>L</td>
</tr>
<tr>
<td>Till</td>
<td>M</td>
</tr>
</tbody>
</table>

- Vegetation coverage was digitised from OS 1:50,000 raster datasets as Woodland and Non-woodland.

- Bedrock and soil datasets were merged using ESRI Arcview 9.2. the new polygon coverages was assigned a Subsurface risk factor using the following matrix:
The spatial distribution of this substrate risk index is shown in figure 2 below.

The substrate risk factor is based upon an un-vegetated surface, it is thought that forest coverage reduces overland flow from the interception and storage of raindrops as well as the roughness of terrain reducing flow velocities. The union of woodland coverage data with resulting in a new risk distribution (figure 3) based upon the following matrix:
2. Calculation of overland flow risk due to topography.

All spatial and 3d GIS analyses were performed using Mapinfo 9 with Vertical Mapper. To facilitate map calculations it was necessary to resample the SAR DEM grid to 50m resolution. Hillslope steepness and slope aspect grids were then produced from the 50m elevation grid. Each cell within the aspect grid was queried using Microsoft Excel expressions to determine the uphill cell out of the 8 neighbour cells. The difference between steepness of the uphill cell and the target cell was then calculated, also using Microsoft excel. The resulting slope change layer is shown in figure 4.
Negative slope change values (displayed in white) indicate an increase in steepness; these areas should not see any exacerbation of overland flow risk. Areas with high positive values for slope change represent reductions in steepness. According to classical hydrological theory, the reduction of flow velocity in such areas causes focal points for overland flow generation.

Results are also presented in terms of relative risk of overland flow (see figure 2 and 3 in Appendix B), in these figures slope change values have been assigned relative risk based on statistical distribution.
APPENDIX B

Northumberland National Park SFRA
Figures
APPENDIX C

Northumberland National Park SFRA
Level 2 Assessments