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1 Flooding, Drought and Water Consumption

1.1 Summary

Flooding, drought and water consumption are important matters to consider in the planning process, especially taking into account Cornwall's changing climate and its impact on water quantities in the county. This paper examines each of these matters and identifies the main issues for the Core Strategy as:

Issue FDWC1 – Consider ways to deal with flood risk

Issue FDWC2 – Consider ways to control surface water runoff

Issue FDWC3 – Consider ways to minimise water consumption and maximise water recycling in new development

1.2 Purpose

This is one in a series of papers dealing with a specific theme. Each can be read in isolation or together with other papers to gain a wider understanding of issues facing Cornwall. This paper sets out the evidence base and the policy context for flooding, drought and water consumption and describes how the issues that need to be addressed in relation to flooding, drought and water consumption could be taken forward in the Core Strategy. The issues papers will form the first stage of the development of options for Core Strategy policy. Other issues papers available in this series include:

- *Housing*
- *Economy*
- *Tourism*
- *Retail & town centres*
- *Education & skills*
- *Social inclusion*
- *Crime & anti-social behaviour*
- *Sport recreation & open space*
- *Health*
- *Transport & accessibility*
- *Energy*
- *Climate change*
- *Soil, air & water quality*
- *Biodiversity & geodiversity*
- *Landscape & seascape*
- *Historic environment*
- *Design & efficient use of resources*
- *Agriculture & food*

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- *Coast & maritime*
- *Minerals*
- *Waste*

This series of papers is closely linked to the topics of the Sustainability Appraisal (SA) scoping report. The SA scoping report identifies the sustainability objectives, decision making criteria and indicators against which the LDF and other plans in Cornwall should be tested, to examine whether plans are sustainable. The SA scoping report also identifies key messages from national, regional and local plans for the Cornwall Local Development Framework (LDF), a baseline and sustainability issues for each topic. These Core Strategy issue papers largely build on the SA scoping report and start to examine in greater detail the messages from evidence and research, the opportunities and threats and planning issues that need to be considered in the Core Strategy (the SA scoping report can be found at <http://www.cornwall.gov.uk/default.aspx?page=17394>).

1.3 What is flooding, drought and water consumption?

Flooding is a natural process that can happen at any time in a wide variety of locations. Flooding can originate from a number of sources: from rivers or other watercourses, the sea, groundwater, surface water (from rain), from sewers, or from a combination of these sources.

Whilst a flood is caused by too much water, drought is marked by too little water. A drought occurs usually when an area experiences a consistent deficiency in rainfall over an extended period of time.

Water consumption is the combined use of water resources by householders, service providers and industry, including farming.

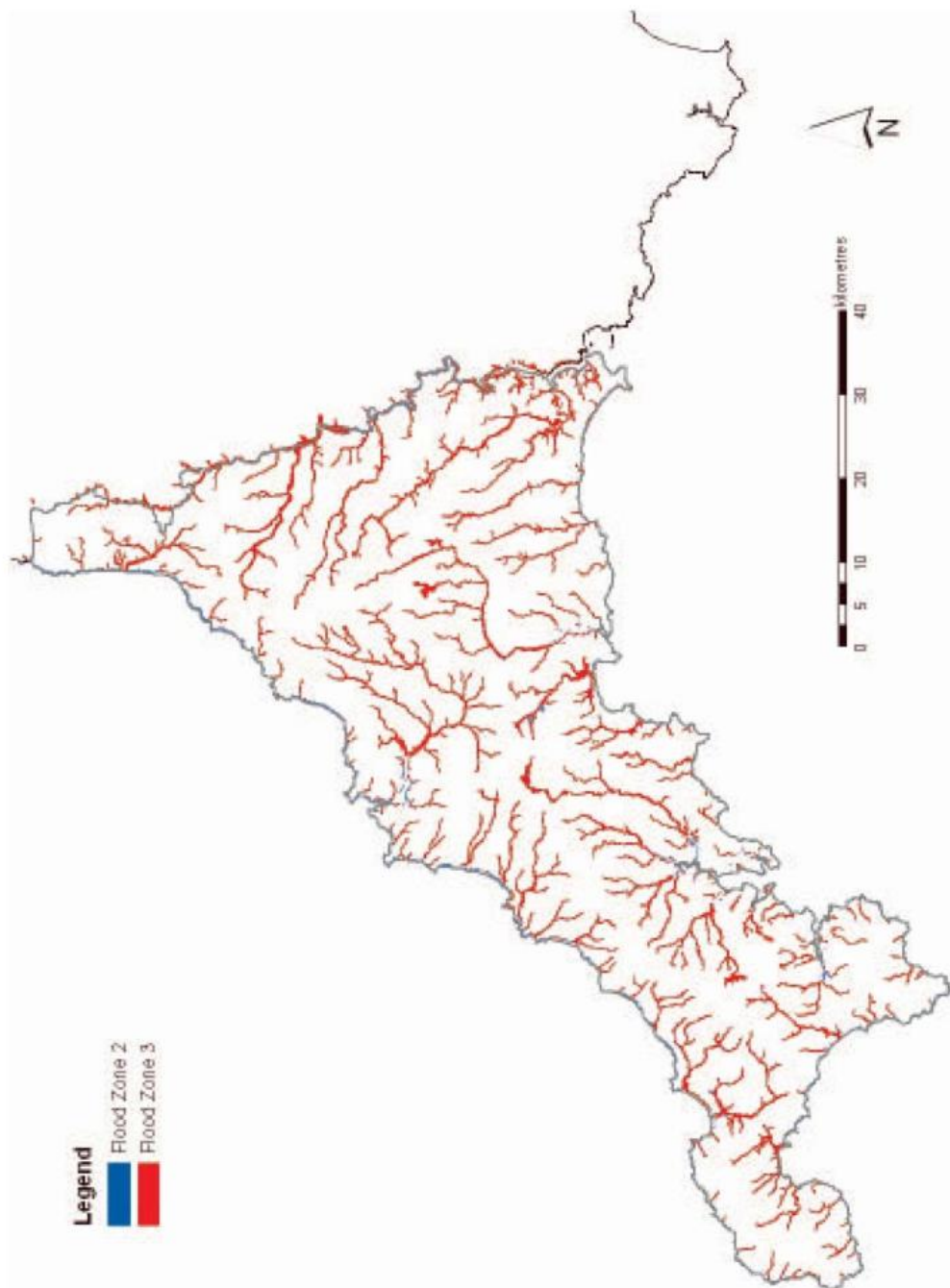
Whilst all topics are interlinked, this Flooding, Drought and Water Consumption paper has particularly strong links to the papers dealing with Water Quality, Biodiversity and Coast.

1.4 Flooding, drought and water consumption 'portrait' of Cornwall

Many of the existing settlements in Cornwall are built beside rivers and coastal areas, some of which will be the focus for growth. Approximately 10,000 properties are at risk of flooding and of these nearly 4,000 residential and 1,500 commercial properties have a significant risk of flooding. Cornwall is characterised by relatively short steep river valleys where floods are often short-lived and intense, caused by relatively short periods of intense rainfall. Cornwall has a long coastline including a number of significant estuaries. Tidal flooding occurs characteristically during high spring tides, combined with low atmospheric pressure, and strong wind that surges seawater into the Cornish estuaries and other low-lying land.

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Areas of medium and high flood risk in Cornwall are identified on the map below (respectively Flood Zones 2 and 3).



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Critical Drainage Areas have been identified by the Environment Agency in areas where surface water drainage issues are critical and where surface water run-off rates should be restricted to reduce flood risk. The Critical Drainage Areas in Cornwall are identified on the Cornwall Council website at the following location: <http://www.cornwall.gov.uk/Default.aspx?page=23707>

Overall Cornwall has a relatively high annual rainfall, but has experienced periods of drought, for instance during the summers of 1976, 1984, 1989 and 1995. Water consumption in Cornwall fluctuates significantly, concurring with the fluctuating visitor numbers to the County. Especially in summer, when the total population of the county can double, water consumption is at peak levels. Where this has coincided with a drought, water supplies have been stressed and, as a result, hosepipe bans have been imposed. Water supply is managed by the regulated water utility company South West Water.

1.5 What is the role of the Core Strategy?

The Core Strategy can provide planning policies that help deliver enhancement and protect environmental standards for the benefit of local communities. In developing these policies, the Core Strategy needs to take into account all other relevant plans, strategies, policies and programmes as well as involve key stakeholders and the community.

In the context of flooding, drought and water consumption:

- A key requirement of the Core Strategy is that it should be based on an understanding and appreciation of the risk of flooding across the local area. Such information can then inform the location of development.
- If a significant amount of development is to be located on the edge of existing settlements the Core Strategy can provide a strategic approach to managing surface water runoff and require that surface water runoff is taken into account in the location of development.
- The Core Strategy can explore how best to minimise water consumption and maximise the water recycling associated with new development.

1.6 Relevant policy context

When preparing the Core Strategy, the Council does not start with a blank sheet of paper. There is a whole series of planning policies at national and regional level which have to be followed and the Core Strategy needs to be prepared within the framework set by national and European legislation and national planning guidance. This section focuses on the most relevant published legislation, plans & strategies and draws out their key messages for the Core Strategy. The key directives, acts, plans and strategies identified and used are:

International / European

- Surface Water Abstraction Directive (75/440/EEC)
- Habitats Directive (92/43/EEC)
- The Water Framework Directive (2000/60/EC)

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- The Groundwater Directive (2006/118/EC)
- The Floods Directive (2007/60/EC)

National

- PPS25 Development and Flood Risk (DCLG, 2010)
- Consultation paper on a new Planning Policy Statement: Planning for a Natural and Healthy Environment (DCLG, 2010)
- PPG 20 Coastal Planning (DoE, 1992)
- Making space for water – Developing a new Government Strategy for flood and coastal erosion management in England. Consultation document (DEFRA 2004)
- The Pitt Review, and associated reports (DEFRA 2008).
- Future Water - The Government's Water Strategy for England (DEFRA 2008)
- Towards a New National Flood Emergency Framework (DEFRA pending).
- Water for life and livelihoods – A framework for river basin planning in England and Wales (Environment Agency 2006)
- Code for Sustainable Homes/BREEAM
- The Conservation (Natural Habitats, &c.) Regulations (1994), implement the EU Habitats directive.
- The Water Environment (Water Framework Directive) (England and Wales) Regulations (2003)
- The Water Act (2003)
- Floods and Water Management Act (2010)

Regional

- South West Regional Flood Risk Appraisal (SWRDA, 2007)
- South West River Basin Management Plan (consultation draft), (Environment Agency 2009)
- Drought Plan for South West Region (EA, 2007)
- South West Water Drought Plan (SWW, 2007)
- Managing Water Abstraction (EA, 2002)
- Managing Water Abstraction interim update (EA, 2008)
- SWW draft Water Resources Plan (SWW, 2008)

Local

- Strategic Flood Risk Assessment (Cornwall Council, 2009)
- Catchment Flood Management Plans: Tamar, East Cornwall, West Cornwall (EA, 2009).
- Shoreline Management Plans (Rame Head to Lizard Point, Lizard Point to Lands End, Lands End to Hartland Point) (Environment Agency, 2010)
- Cornwall Multi-Agency Flood Warning and Response Plan (Cornwall County Council, 2007).
- Catchment Abstraction Management Strategies (North Cornwall, Seaton, Looe & Fowey, West Cornwall, Fal & St Austell Streams, Tamar)
- Local Estuary Management Plans
- River Catchment Plans – Caerhays, Camel & Allen, Cober & Loe Pool, East & West Looe, Fal & Tresillian, Fowey & Lerryn, Gannel, Inny, Lynher & Tidley, Neet & Strat, Menalhyl, Mevagissey, Ottery, Seaton, St Austell Stream.

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1.7 Relevant evidence and research

Climate Change in Cornwall: Meteorological Implications – Geographical analysis of the UKCIP02 dataset (Cornwall County Council, 2008).

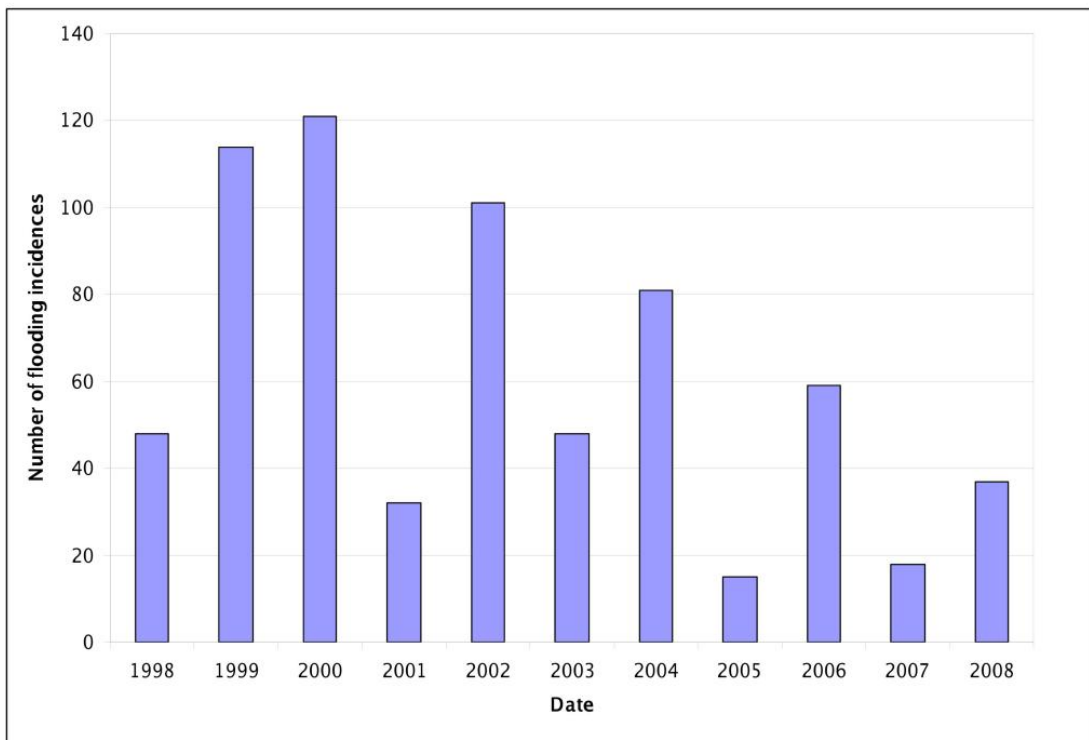
Climate Change in Cornwall: Meteorological Implications – Geographical analysis of the Meteorological Office gridded datasets for comparison with future scenarios (Cornwall County Council, 2008).

Climate Change in Cornwall: Sea Level Rise Implications – Geographical analysis of future high tides (Cornwall County Council, 2008).

Shifting Shores. Living with a changing coastline. (National Trust 2005).

There are over 2000 instances of flooding in Cornwall since the turn of the 20th Century that are recorded on the Environment Agency's flood reconnaissance database, though this list is far from exhaustive. Over the 10 years from 1998 to 2007, more than 600 individual incidences were recorded though the number of flood events in any one year may be quite variable, (Figure 1). Around 30-35% of these incidents resulted in fluvial flooding, 30-35% were related to surface water runoff with 1-2% attributed to sewer problems, 15% were tidal and coastal and for about 20% of incidents the type of flooding was not ascertained.

Number of recorded instances of flooding in Cornwall since 1998



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Of the 3550 km² land area that makes up Cornwall, 155 km² (4.4%) is at risk of flooding in Flood Zones 2 and 3, of which 138 km² (3.9%) is at serious risk in Flood Zone 3. Therefore more than 95% of the land area is in flood zone 1, with a low probability (< 0.1 % annual probability) of fluvial or tidal flooding.

Within these flood zones it is estimated that over 10,000 properties in Cornwall are at risk of flooding and of these nearly 4,000 residential and nearly 1,500 commercial properties have a significant risk of flooding.

Tidal and coastal flooding is an area of concern for coastal communities in Cornwall. The sea level records for Newlyn show an increase of 161mm between 1916 and 2006 with the mean wave height between 1962 and 2008 increasing from 1.8m to 2.3m.

The county has also experienced increased major summer flooding incidences. Climate change will probably increase the likelihood of Cornwall experiencing more extreme weather events, thus exacerbating inland and coastal flooding with resultant knock on impacts on water treatment, supply and quality.

The majority of usable water supplied in the county comes from surface water sources though groundwater is also abstracted from wells for some private supplies in isolated rural areas, or for farm irrigation.

Present climate change models indicate that by the 2050s, winters in the south west will be 5% - 20% wetter and summers will be 10% - 40% drier.

South West Water supplies approximately 1.6 million people across Devon, Cornwall and parts of Somerset and Dorset. This increases by over half a million during the summer period. It operates three Water Resource Zones ⁽¹⁾: Colliford, Roadford and Wimbleball, each with a large strategic reservoir. Each Water Resource Zone is divided into a number of smaller strategic supply areas. The main Water Resource Zone for Cornwall is based around Colliford Reservoir.

The Colliford Water Resource Zone contains the following main reservoirs:

- Colliford Reservoir
- Argal & College Reservoirs
- Crowdy Reservoir
- Drift Reservoir
- Siblyback Reservoir
- Stithians Reservoir
- Park Lake

The above reservoirs, together with six river 'intakes', form the Colliford strategic supply system. When necessary these sources are supplemented by a small bulk transfer from the Roadford system. The Upper Tamar Reservoir, within the Roadford Water Resource Zone, is an important source for parts of North Devon and North Cornwall (the Bude area).

1 Planning for water resources is based on Water Resource Zones, which are defined as the largest possible zone in which all water resources can be shared

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South West Water's Water Resources Plan (January 2009) covers the period up to 2034/35. The plan appraises a range of supply/demand projections and considers the likely effects of climate change on both the availability of water and water demand. Population projections in the plan use 'best' estimates. The data for the Colliford Strategic Supply Area (SSA) underpin SWW's planning and are given below:

Colliford SSA – resident population projections (000's)

Table 1.1

2007	2011	2016	2021	2026	2031	2036
511.6	522.2	536.6	556.9	577.9	598.9	619.9

Colliford SSA – new household projections (000's)

Table 1.2

2007-11	2011-16	2016-21	2021-26	2026-31	2031-36
5.5	10.5	15.5	16.7	16.7	16.7

The Company's plan shows that South West Water will maintain a surplus of supply over demand at these levels of development as a result of both demand management measures (water meters, water efficiency measures & new tariffs) and further investment in water supply infrastructure and relatively small water resource schemes.

Average water consumption per household for the South West area is 350 litres per day. In the next few years water consumption levels are forecast to decrease owing to demand management (water metering etc). Code level 3 sets a per capita consumption design target of 105 litres per person per day. Code level 3 standards for water efficiency can be achieved at a cost of between £189- £284 extra per home ⁽²⁾. Average households in the south west would expect to save between £36 and £62 per year on water bills in a new code level 3 compliant home compared to a new average metered home.

River flow is important for water supply, wildlife, visual amenity and recreation. In Cornwall, flows are generally good but water abstraction can affect the flow, which in turn can affect the security of public water supply, water quality and habitats. Environmental monitoring is routinely undertaken in Cornwall to identify a base against which current trends can be compared.

1.8 Emerging Evidence and Policy

The gathering of evidence is an iterative process and must be continued throughout the preparation of the Core Strategy. Additional evidence should be considered right up to the 'submission' stage in the process. Listed below are the known emerging relevant guidance & studies, which will be taken into account if available before the submission of the Core Strategy:

² Assessing the cost of compliance with the code for sustainable homes. Environment Agency. September 2006

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The Surface Water Management Plan (SWMP) for Camborne, Pool, Illogan and Redruth is complete. Work is progressing towards a SWMP for Bodmin at present and a partial SWMP has been drafted for Truro.

The Environment Agency is currently working alongside Natural England in reviewing all existing water abstraction licences to ensure compliance with the Habitats Directive. The deadline for the completion of this review is 2010.

A review of the current Shoreline Management Plans for the South West has been drafted for Cornwall. A Shoreline Management Plan (SMP) is a large-scale assessment of the risks associated with coastal processes and aims to help reduce these risks to people and the built and natural environment. It sets policies for each stretch of coastline for managing the coastline and coastal defences. The draft Shoreline Management Plans covering Cornwall can be found on the Cornwall and Isles of Scilly Coastal Advisory Group website at the following location: <http://www.ciscag.org/draftsmpindex.html>

A River Basement Management Plan (RBMP) for the south west is currently being prepared by the Environment Agency, as part of a national programme of (RBMP) to implement the Water Framework Directive. It will set out the current chemical, biological and ecological status of water bodies in the South West river basin district and set objectives for individual catchments, to be met by 2015. The RBPM districts in Cornwall are: West Cornwall, East Cornwall and Tamar.

Catchment Flood Management Plans (CFMPs) covering Cornwall were completed in 2009 by the Environment Agency. They assess the risk and consequences of flooding per catchment area ⁽³⁾ and contain policies for long-term management of flood risk within these areas as well as actions to increase, decrease or maintain the current scale of flood risk in particular areas.

Appendix A gives further details on the county's key sites at risk of flooding. A summary of the policies proposed in the CFMP in the south west is shown below.

The United Kingdom Climate Impact Panel (UKCIP), which has reviewed the UK Climate Projections, was published in the early summer of 2009. Under low emissions scenarios the mean annual precipitation is projected to rise by 1% by the 2020s with a winter precipitation increasing by 6% and summer precipitation decreasing by 7%.

National Coastal Erosion Risk Mapping will be published by the Environment Agency in 2010.

1.9 Gaps in evidence

- None identified at present.

1.10 Key Messages from the Context and Evidence Review

A number of key messages and issues were drawn out from the evidence review. The table below identifies the messages deemed most relevant and the source documents.

3 Catchments are areas that drain into a particular river.

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Table 1.3

Message	Relevant Document(s)
Flood risk should be taken into account at all stages of the planning process, by appraising, managing and reducing risk.	PPS25
Avoid inappropriate development in areas at risk of flooding and direct development away from areas at highest risk.	PPS25, PPG20
All new development should be safe, not increase flood risk elsewhere and where possible reduce overall flood risk.	PPS25
In flood zones 1 and 2 developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through layout and form of development and appropriate sustainable drainage techniques.	PPS25
In the high risk flood zone, 3a, developers and local authorities should in addition seek opportunities to relocate existing development to land in zones at a lower probability of flooding, restore the functional floodplain and identify open space for flood storage.	PPS25, SFRA
In flood zone 3b (the functional flood plain) developers and local authorities should seek opportunities to relocate existing development to land in zones at a lower probability of flooding.	PPS25, SFRA
Green infrastructure can provide a wide range of environmental benefits (ecosystem services) in both rural and urban areas including flood water storage, sustainable drainage.	Draft Planning Policy Statement: Planning for a Natural and Healthy Environment
Flood risk is not a major limiting factor in Cornwall for the overall provision of growth.	SFRA1
The Core Strategy should support the preparation and outcomes of surface water management plans for a number of key settlements such as Bodmin, Camborne –Pool-Illogan-Redruth and Truro.	CFMP, SFRA1
A comprehensive council wide-policy on sustainable drainage systems (SUDS) should be considered, both for the LDF and for other relevant council activities.	SFRA

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Consideration should be given to the safeguarding of land from development for future flood storage, flood defences and flood water conveyance.	SFRA
Consideration should be given in the formulation of LDF policy to 'flood-proofing' new development, through layout and design, and to the provision of safe access and egress to new development.	SFRA
The LDF should consider policies to ensure that safe access/egress remains for development during a flood event. If it is considered that flood free access is essential, then this should be a requirement set out in the LDD, informed by the SFRA.	SFRA

1.11 SWOT analysis

Table 1.4

Strengths	Weaknesses
<ul style="list-style-type: none"> • Relatively small proportion of the county is at medium/high risk of tidal or fluvial flooding • Relatively high rainfall • Relatively high control over tidal and fluvial flood risk 	<ul style="list-style-type: none"> • Existing urban areas, including key town centres, partially or wholly in areas at higher flood risk and the functional flood plain • Flood flow routes are located within existing urban areas • Highest water consumption at times of potentially least rain - reservoir capacity? • Lack of control over surface water drainage • Regeneration proposals do not generally seek to reduce surface water runoff
Opportunities	Threats
<ul style="list-style-type: none"> • Recreating functional flood plains through relocation of existing development in lower flood risk area • Regeneration/development of coastal settlements provides opportunities to pull development back out of the coastal flood plain • Surface water management plans to address surface water flooding as part of AAPs and Masterplans 	<ul style="list-style-type: none"> • Sea level rise • More extreme weather events • Climate change is set to increase the risk of flooding due to increased intensity and duration of rain events and combined fluvial and coastal flooding particularly during storm surges. • Surface water flooding poses the greatest flood risk to Cornwall in terms of frequency, impact and cost

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<ul style="list-style-type: none"> • Integration of surface water drainage within green infrastructure strategies • Plan for the reduction in overall surface water runoff for all new development including regeneration • Sustainable Drainage Systems can bring substantial biodiversity benefits • Water Cycle Strategies for growth areas to address capacity of waste water, water supply and water environment • Integrated approach between LDF and CFMPs and SMPs • Opportunities for safeguarding land for future flood storage • New developments create opportunities for reducing domestic and other water consumption • Developer contributions for reducing flood risk reduction 	<ul style="list-style-type: none"> • Rising temperatures will increase evaporation and reduce the county's surface waters • New development proposed for Cornwall - growth agenda • Desire to develop/regenerate waterside locations • Many key town centres in higher risk flood zones
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1.12 Climate Change Considerations

The main pressures from climate change on flooding, drought or water consumption are

- Changing weather patterns including hotter drier summers will decrease the supply of water and potentially increase demand
- Flooding (fluvial and tidal) due to extreme weather events and sea level rise
- Reduction in permeable surfaces from new development will increase risk of surface water flooding.
- Increase demand for access to clean bathing water resulting from hotter drier summers and greater demand for water-based recreation.
- Rising temperatures will increase the amount of evaporation, which will affect the county's surface waters

Climate change is further explored in a separate issues paper in this series, as well as in the Sustainability Appraisal Scoping Report (visit www.cornwall.gov.uk). The scoping report sets out a series of sustainability objectives against which the Core Strategy and other parts of the LDF will be assessed, to gauge how far they will promote sustainable development. The relevant objectives for flooding, drought and water consumption state:

- To reduce and manage the risk of flooding and reduce vulnerability to flooding, sea level rise and coastal erosion.
- To maintain and enhance water quality, reduce consumption and increase efficiency of water use.

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1.13 Main Spatial Planning Issues

Taking into account the key messages from the current evidence available, a number of spatial planning issues are listed below.

Issue FDWC 1

Consider ways to deal with flood risk

Issue FDWC 2

Consider ways to control surface water runoff

Issue FDWC 3

Consider ways to minimise water consumption and maximise water recycling in new development

These issues will work towards achieving the following long term objective for Cornwall as set out in the Sustainable Community Strategy - 'Future Cornwall':

- To make the most of our environment, reduce greenhouse gas emissions and invest in and promote sustainable use of natural resources

This paper summarises the evidence on flooding, drought and water consumption brought together to inform the Cornwall Core Strategy. However, it will be added to and kept up-to-date as other relevant evidence becomes available. In updating these papers all previous versions will be archived to ensure it is clear what evidence was available at each stage.

1.14 Appendix A

Table 1.5

Key Site	Main Source of Flood Risk	Property at risk**	Average Annual Damages ^{*/**}	People at risk**
Par/St. Blazey	River Par, St. Blazey Stream	688	£4,580,000	1253
Penzance	Longrock, Chyandour Streams	505	£860,000	1058
St Ives		366	£610,000	682
Wadebridge	Camel (Tidal)	357	£1,722,865	450

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Perranporth	Bolingey & Perrancoombe River	349	£520,000	667
Looe	Tidal	241	£1,362,653	232
St Austell	White & Sandy River	229	£330,000	486
Hayle	Angarrack River, Hayle River, and tide	222	£310,000	435
Truro	Rivers Kenwyn, Allen, and tide	218	£410,000	590
Helston	Cober	206	£350,000	407

Table 1.6

Bude	Neet/Tidal	196	£522,562	248
Polperro	Pol	176	£873,458	200
Redruth	Redruth Stream	166	£200,000	249
Lostwithiel	Fowey/Tidal	137	£208,830	200
Bodmin	Bodmin Town Leat	127	£307,662	200
Launceston	River Kensey & tributaries	106	£200,000	214
Penryn	Praze, College Streams	89	£570,000	148
Crowlas	Red River	81	£360,000	134
Boscastle	Valency/Jordon	75	£172,988	101
Stratton	Strat	56	£88,139	108
Tremar	Unnamed watercourse	52	£143,181	117
Newquay	Trenance	51	£37,774	63
Falmouth	Swanpool Stream	46	£120,000	103
Camborne	Red River	41	£340,000	85
Lanivet	Lanivet	41	£27,381	25
Camelford	Camel	26	£126,919	16

* Future (2100) average annual damages

** Approximate number of people and property within the 1% annual probability flood extent, ignoring defences

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1.15 Appendix B

Consultation to date:

The Issues papers were first published for stakeholder consultation in September 2009. The papers were amended to take into account consultee responses and were then circulated to Planning Policy Advisory Panel members in November 2009. They were also given to all members at a series of three area based consultation events in March 2010.

Revisions to Issues Papers:

In writing the draft Issues and Options report in March 2010 it was clear that it was necessary to revise the issues identified in some of the topic based issues papers. Some issues were requirements under other legislation or procedural matters, and therefore options could not be set against them (e.g. *The Core Strategy should work with other plans and programmes...*) Others were in fact options and needed to be set as options under an overarching issue (e.g. *The Core Strategy has a role in supporting the growth and sustainability of the micro and small business economy*). There was also some repetition between different topics and these issues could be amalgamated.

Criteria for Changes:

The issues have been rationalised against the following criteria:

- Is this a Spatial Planning Issue?
- Is the issue covered by other legislation?
- Can options be generated against each issue?
- Is this an issue and not an option?
- Is the issue rooted in evidence?
- Is there potential to amalgamate issues?

Issues in Consultation Version:

Issue FDWC1 – Planning decisions should be based on the assessment of all types of flood risk to the planning area, taking into account climate change

Issue FDWC2– Set out the mechanisms to ensure new development has sufficient water-supply infrastructure

Issue FDWC3– Encourage the design of new development to minimise water consumption and maximise water recycling

Issue FDWC4 – Consider the use of Water Cycle Strategies for growth areas to inform the capacity of water supply, waste water infrastructure and wider water environment

Issue FDWC5 – The Core Strategy should take account of and work in synergy with the objectives of the Shoreline Management Plan, Catchment Flood Management Plans and River Basin Management Plan

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Issue FDWC6 – Provide the context for incorporating sustainable drainage systems in new development and controlling surface water runoff from existing areas

Revised Issue:

Issue FDWC1 – Consider ways to deal with flood risk

Issue FDWC2 – Consider ways to control surface water runoff

Issue FDWC3 – Consider ways to minimise water consumption and maximise water recycling in new development