Local Flood Risk Management Strategy
Strategic Environmental Assessment (SEA)

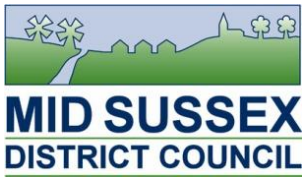
LOCAL FLOOD RISK

This document has been prepared so that West Sussex County Council meets its duties to manage local flood risk and deliver the requirements of the Flood and Water Management Act 2010

west sussex county council

West Sussex Lead Local Flood Authority

PARTNERS OF THE WEST SUSSEX LOCAL FLOOD RISK MANAGEMENT STRATEGY



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Introduction

West Sussex County Council as Lead Local Flood Authority has a duty to develop a Local Flood Risk Management Strategy to manage flood risk in the County. The Strategy has been developed from January 2013 and will be published in October 2013. Alongside the Strategy, this Strategic Environmental Assessment (SEA) is being undertaken to ensure that significant environmental effects arising from the Strategy are identified, assessed and mitigated.

This report represents the scoping document of the SEA and it is being prepared alongside the development of the Strategy. The scoping report sets the context and objectives of the environmental report, and sets the baseline information from which future environmental performance can be monitored.

The Strategic Environmental Assessment (SEA)

The European Directive 2001/42/ED (The 'SEA Directive') was adopted in 2001 and transposed into English legislation by the Environment Assessment of Plans and Programmes Regulations in 2004. The purpose of the SEA Directive is to increase the level of protection for the environment. It integrates environmental considerations into the preparation and adoption of plans and programmes with the view of promoting sustainable development.

The Directive requires a strategic assessment to be carried out for all plans and programmes which are 'subject to preparation and/or adoption by an authority at national level, regional or local level.' The West Sussex Local Flood Risk Management Strategy therefore qualifies and requires this assessment.

The SEA seeks to identify and evaluate the likely environmental impacts that a plan or policy may have but in the early stages of development and prior to the adoption and implementation of the plan or programme, allowing time for alternative measures to be identifies and assessed.

The SEA Regulations identify environmental receptors that must be initially considered for all SEAs. These include:

- Population and human health
- Biodiversity, flora and fauna;

- Soil;
- Water;
- Air;
- Climatic factors;
- Material assets;
- Cultural, architectural and archaeological heritage
- Landscape; and the
- Inter-relationship between the above factors

This list serves as a starting point from which the local and relevant issues have been scoped in or out of the SEA, depending on whether or not they are considered likely to be affected by the Strategy.

The detailed issues of each project within the strategy are more appropriately considered during project level Environmental Impact Assessments (EIA) undertaken for specific schemes. If environmental opportunities or constraints of built solutions are broadly identifiable they will be highlighted in the SEA in order to avoid adverse effects and facilitate positive environmental opportunities at an early stage of planning.

The Habitat Regulations Assessment

The HRA is a requirement under the European Union Council Directive 92/43/EEC 'the Habitats Directive' on the Conservation of Natural Habitats and Wild Fauna and Flora, the EU Birds Directive 2009/147/EC on the Conservation of Wild Birds, and the transposed UK Regulations.

There are several areas with international designations include four Special Protection Areas (SPAs), seven Special Areas for Conservation (SACs) and three Ramsar sites. The majority of these sites are located within Chichester and Pagham Harbours and the Arun Valley. The Strategy has the potential to impact on these sites. Where this is the case a Habitat Regulations Assessment (HRA) is required. These additional assessments will be carried out alongside the Strategy.

The Study Area

The study area considered in this report is the area within the administrative boundary of West Sussex. West Sussex has a two tier local authority structure made up of the county council acting as the Lead Local Flood Authority (LLFA) and Adur, Arun, Chichester, Horsham, and Mid Sussex District Councils, and Crawley and Worthing Borough Councils. There 159 Parish and Town Councils.

West Sussex covers an area of 2030km². Just over 800,000 people live in West Sussex, nearly 90% of which live in twenty four towns and villages of over 4,000 population. Urban areas cover just over 12% of the land area.

There is a strong defined settlement pattern of medium sized and larger towns, villages and coastal settlements. Most development is on the coast and the eastern fringes leaving the centre almost wholly rural. More than half the county is within nationally designated Areas of Outstanding Natural Beauty. Woodlands and forests account for about 13% of the land area. Most of the farmland is arable or improved grassland and the best of agricultural land is on the coastal plain.

The main transport corridors are the South Coast Rail and A27/A259 roads corridor and the Crawley/ Brighton rail and A23 road corridor. Secondary corridors and the Arun Valley rail corridor and the A24 road corridor, which link the north east of the county with the coast.

Flooding in the Study Area

Surface water flooding occurs when there is excessive rainfall and when the water table is high. In combination with wet conditions, surface water flooding of the built environment can be caused when the drainage network blocks, or when sewer capacity is exceeded. Places at risk of surface water flooding within the county are the urban areas of Southwick, Shoreham, Worthing, Crawley, Horsham, Bognor Regis, Bosham, the Manhood Peninsula, Pulborough, Burgess Hill and Haywards Health.

Due to the chalk geology running across West Sussex, the lower slopes of the South Downs are the area's most susceptible to groundwater flooding. This is water escaping directly from the ground either due to a high water table or natural pressure. This can affect the areas in the upper reaches of the River Lavant (Singleton, East Dean and Charlton), Bosham Stream (Woodend, Funtington), River Ems (Walderton, Stoughton), and, North Lancing and Durrington.

The River Arun and the River Adur flow southwards through the county and drain 600mm – 1000mm of rainfall per year into the English Channel at Littlehampton and Shoreham. The River Ouse drains a large part of the High Weald in the east of the County, and drains into East Sussex where the river flows through Lewes and into the Channel near Seaford. River flooding can impact a number of West Sussex towns including Arundel, Bognor Regis Bognor Regis (including Bersted, Felpham, Middleton and Elmer), Chichester, Littlehampton, Shoreham, Haywards Heath, Horsham and Crawley.

The coastline in West Sussex stretches from West Wittering to Southwick. High water caused by the tide, waves and storm surges can cause flooding to occur at

Shoreham, Worthing, Littlehampton, Bognor Regis. Areas at particular flood risk are the harbours and estuary areas (Shoreham, Littlehampton, Chichester, Pagham).

Consultation

The SEA process requires that three statutory bodies be consulted. These are Natural England, The Environment Agency and English Heritage. The consultation will take place over Summer 2013 (17th June – 9th September).

Background

West Sussex Local Flood Risk Management Strategy

The Local Flood Risk Management Strategy sets out how West Sussex County Council will operate its flood risk responsibilities that are a statutory requirement of the Flood and Water Management Act 2010. As part of this fundamental change in flood risk management responsibility, West Sussex County Council have become a Lead Local Flood Authority (LLFA) and are required to plan in a local strategy how to carry out this new role.

Objectives of the Strategy

Our four objectives will be linked to all the flood risk project work undertaken by West Sussex County Council.

1. Understand the areas that flood
2. Manage the flood risk in West Sussex
3. Enable people, communities, business and public bodies to work together more effectively
4. Put communities at the heart of what we do and help West Sussex residents during flood events, and recover as quickly as possible after incidents

The objectives represent what the Local Strategy will do for West Sussex County Council. The most important function from a planning perspective is to understand the areas in the county that flood, and outline the approach to manage the risks. In terms of taking action, the most important function of the Strategy is to facilitate people, consultants, engineers and organisations in working together effectively, and, above all, put incident management and flood recovery at the heart of our work.

Strategy Environment Assessment Process and Methodology

SEA Screening

The West Sussex Local Flood Risk Management Strategy is a Local Authority plan. The projects supported within the plan are likely to have an effect on the environment and therefore an SEA is required.

SEA Guidance

This assessment has been carried out to the guidance set out in the 'Practical Guide to the Strategic Environmental Assessment Directive (OPDM 2005).

Stages of the SEA

The SEA process has five stages.

SEA Stage	Purpose	Tasks
Stage A	Setting the context and objectives, establishing the baseline and deciding on the scope	A1 Identifying other relevant plans A2 Collecting baseline information A3 Identifying environmental problems A4 Developing SEA Objectives A5 Consulting on the SEA scope
Stage B	Developing and refining alternatives and assessing their effects	B1 Testing the plan objectives against SEA Objectives B2 Developing strategic objectives B3 Predict the effects of the plan or programme, including alternatives B4 Evaluate the effects of the draft plan

		or programme including alternatives B5 Considering ways of mitigating adverse effects. B6 Proposing measures to monitor the environmental effects of plan implementation
Stage C	Preparing the environmental report	C1 Preparing the Environmental Report
Stage D	Consulting on the draft plan or programme and the environmental report	D1 Consulting on the draft plan D2 Assessment of significant changes D3 Decision making and providing information
Stage E	Monitoring the significant effects of implementing the plan or programme	E1 Developing aims and methods for monitoring E2 Responding to adverse effects

The scoping report represents Stage A of the process (A1-4) and covers each of the following tasks.

A1

- **Identify other relevant policies, plans and programmes, and environmental protection objections**

The relationship between various plans and polices may influence the Local Strategy. The relationships are analysed to assess whether any external social environmental or economical objectives should be reflected in the SEA process, and whether the cumulative effect of the Strategy together with other plans may lead to detrimental effects.

A2

• Collecting Baseline Information

The baseline data for West Sussex SEA includes existing environmental and sustainable information from a range of sources which is both quantitative and qualitative. The information provides the basis for assessing the potential mitigation effects of the Local Strategy options and will aid development of appropriate mitigation measures, together with future monitoring data.

A3

• Identify environmental issues and problems

The identification of significant key issues allows opportunities and constraints for the implementation of the Local Strategy to be recognised at an early stage. The purpose of this is to improve its objectives and options.

A4

• Developing the strategic environmental assessment objectives and framework

The SEA framework is a key component of the SEA process as it provides a way to predict, describe and analyse the environmental effects that are likely to arise from the implementation of the plan. The projects in the work plan are to be appraised individually against SEA objectives to allow the environmental, economic and social effects to be identified.

A1 Relevant Plans, Policies and Programmes

The Strategy must acknowledge and take into account the relationship with other plans, strategies, programmes and policies. This requirement covers all levels, from International, to National, to Regional and County. Constraints and conflicts of interest can be addressed in this process, which can ultimately affect whether projects are supported by the Strategy.

The key plans are outlined in the table below. Information that forms the environmental baseline is drawn from these documents.

International Plans and Programmes
• EU Floods Directive • EU Water Framework Directive 2000/60/EC • EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora 92/43/EEC 1992 • EC Directive 2009/147/EC on the Conservation of Wild Birds 2009
National Plans and Programmes
• The Flood and Water Management Act 2010 • Flood Risk Regulations 2009 • The National Flood and Coastal Erosion Risk Management Strategy for England 2011 • Land Drainage Act 1991 • Making Space for Water 2005 • National Planning policy Framework 2012 • Office for National Statistics – Census 2011
Regional Plans and Programmes
• The South East River Basin Management Plan 2009 • Arun Catchment Flood Management Plan 2008 • Adur Catchment Flood Management Plan 2008 • Ouse Catchment Flood Management Plan 2008 • The Thames Catchment Flood Management Plan • Beachy Head to Selsey Bill Shoreline Management Plan • North Solent (Selsey Bill to Hurst Spit) Shoreline Management Plan • West Sussex Preliminary Flood Risk Assessment (PFRA) 2011

Local Plans and Programmes
• West Sussex Structure Plan 2001-2016 • West Sussex Transport Plan 2001-2026 • West Sussex Public Health Plan 2012-2017 • West Sussex Waste Local Plan 2012 • West Sussex Multi-Agency Flood Plan • Time for Action – A Strategy for a Sustainable West Sussex • West Sussex Strategic Flood Risk Assessment • Worthing Surface Water Management Plan • Elmer Sands Surface Water Management Plan • The Lidsey Catchment Surface Water Management Plan • Arun to Pagham Strategy • Arun to Adur Strategy • Pagham to East Head Strategy • Emsworth to East Head Strategy • Shoreham to Brighton Marina Strategy • Lower Tidal Arun Strategy • Lower Tidal Adur Strategy • Pagham Harbour Strategy

Summary of the Review

The key themes from the review of plans and strategies can be summarises as:

- A reduction in the level of flood risk to the communities of West Sussex
- A reduction in the economic impact of flooding
- A reduction in the environmental impact of flooding
- Improved flood resilience and emergency response
- Ensure protected sites (International, National and local) are enhanced and not damaged
- An improvement in public health
- An improvement in economic prosperity
- Sustainable consumption and use of resources
- Promote safe and sustainable development

A2 Baseline Information

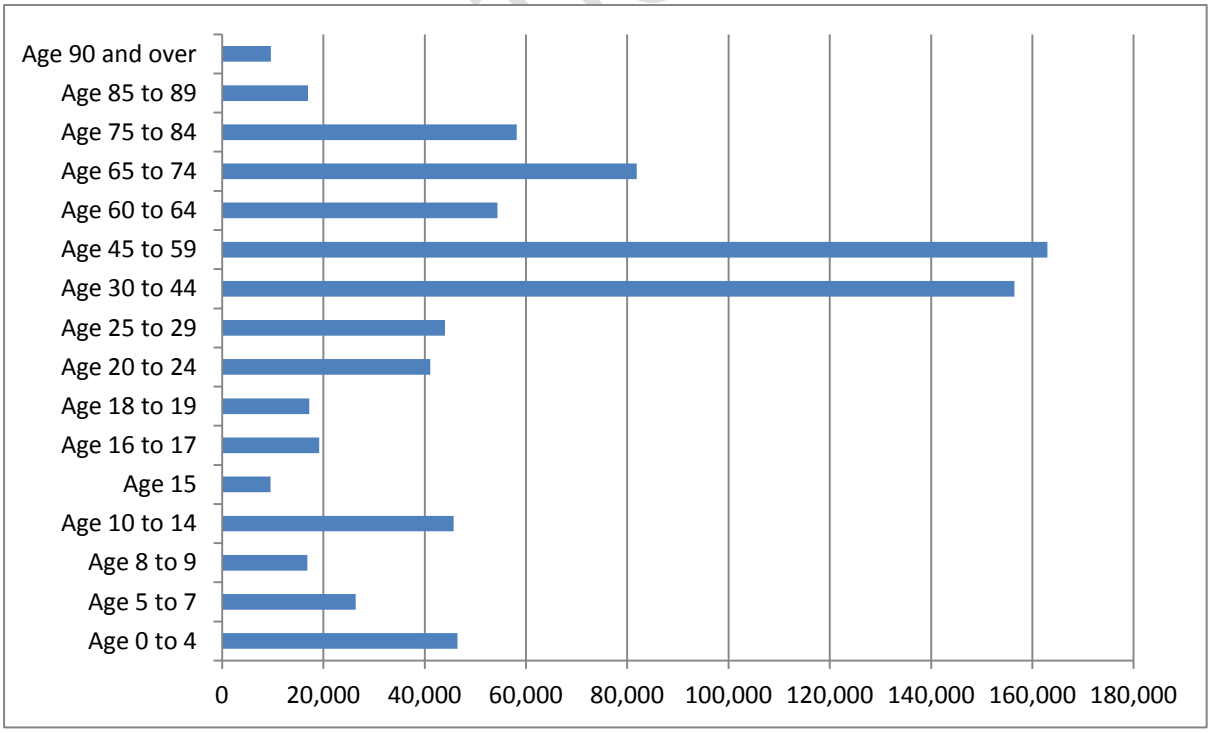
The data collected to form the environmental baseline of West Sussex has been derived from a number of referenced secondary sources. No new investigations or surveys have been undertaken as part of this work. Baseline information is presented for the county, including the administrative boundaries of all seven Districts and Boroughs.

Population and Health

Population

The number of births, the number of deaths and migration in and out of the area each control the population of an area.

Figure 1: Population



Between 1991 and 2001 the population of West Sussex increased by 7%, to 753,612. The population increased a further 7% over the next 10 years to 2011, reaching approximately 806,900. Change in the population size of the districts within West Sussex varies greatly, although each has experienced population growth over the period. Worthing had by far the smallest rate of growth, with an increase of only 1%. Horsham's population grew by over 10%, while Crawley had the largest population growth with an increase of 14%.

Age Structure

Figure 2: Age Structure

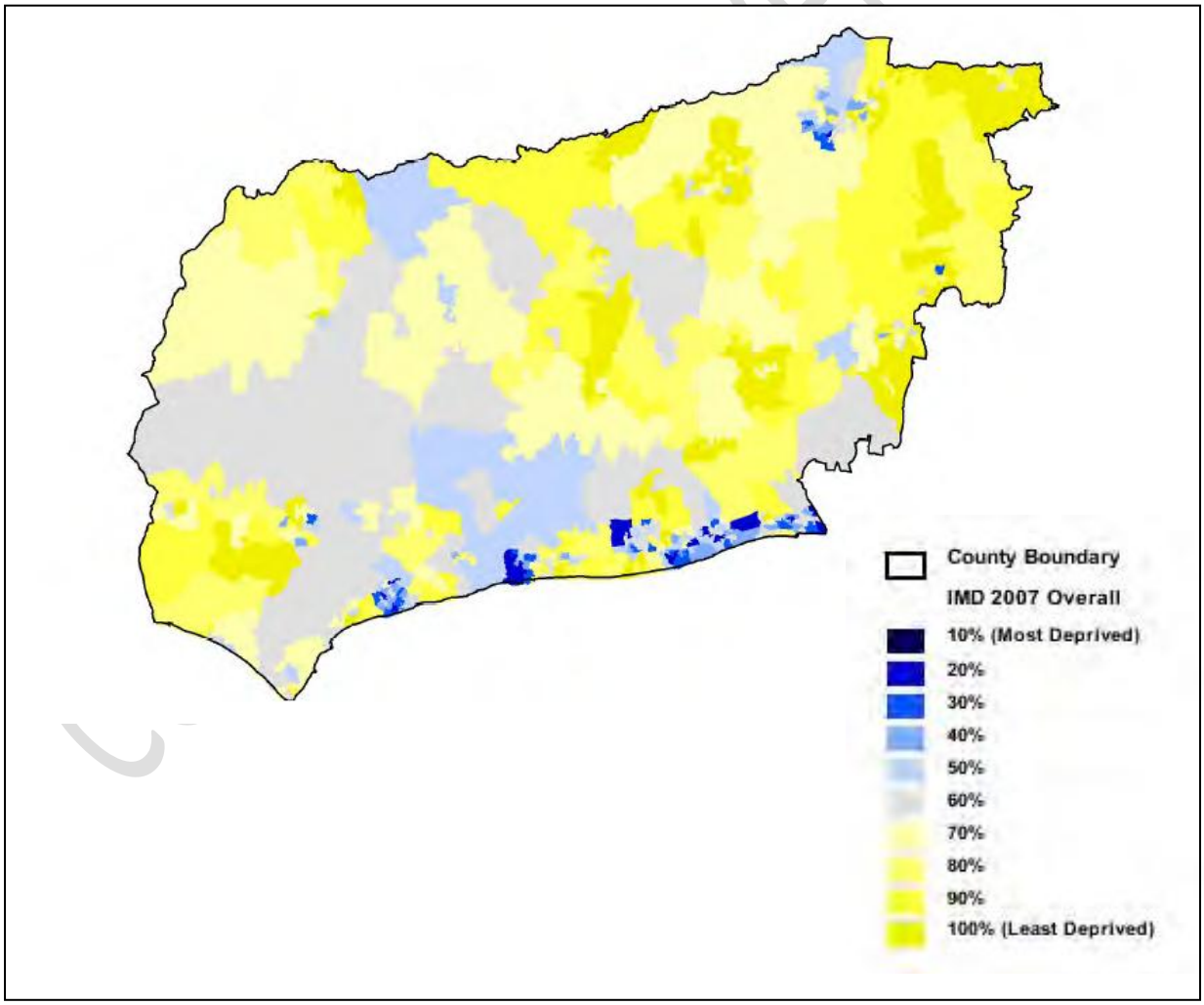
Age Range	West Sussex Population	UK Population
Age 0 to 4	**46,486**	**3,318,449**
Age 5 to 7	**26,373**	**1,827,610**
Age 8 to 9	**16,806**	**1,145,022**
Age 10 to 14	**45,733**	**3,080,929**
Age 15	**9,557**	**650,826**
Age 16 to 17	**19,181**	**1,314,124**
Age 18 to 19	**17,229**	**1,375,315**
Age 20 to 24	**41,088**	**3,595,321**
Age 25 to 29	**44,020**	**3,650,881**
Age 30 to 44	**156,491**	**10,944,271**
Age 45 to 59	**163,008**	**10,276,902**
Age 60 to 64	**54,345**	**3,172,277**
Age 65 to 74	**81,862**	**4,552,283**
Age 75 to 84	**58,142**	**2,928,118**
Age 85 to 89	**16,931**	**776,311**
Age 90 and over	**9,640**	**403,817**
TOTALS	**806,892**	**53,012,456**

Overall, West Sussex has an older population than the national average. Within West Sussex 20% of people are aged 65 and over (compared to 16% for England and Wales). Crawley is the only area within West Sussex with proportion of 65s and over (15%) below the average. In England and Wales, 64% of the population are aged 16-64 years, compared to 61% for West Sussex.

Index of multiple deprivation

There is a common theme across many West Sussex policies and strategies that there is a need to achieve economic development. The way to address deprivation is to address the barriers to growth by enabling greater access to well paid and satisfying employment. The current areas of deprivation within West Sussex County are illustrated in Figure 3.

Figure 3: Deprivation



Flood risk management can play a role in addressing economic growth. Particular attention, through the weighting of funding for projects and schemes, will be given to deprived areas. Existing areas that already benefit from a flood risk management qualify.

Employment

The breakdown of employment by industry is similar in West Sussex to that of England and Wales as a whole. The public sector includes administration and defence, education and health and social work. This sector makes up the largest group in West Sussex, comprising 22% of all employed individuals. Finance and real estate make up 20% of employment, manufacturing and construction 19%, wholesale and retail trade is also a significant industry at 16%.

Within Crawley, transport comprises 21% of employment, compared to 10% across West Sussex. This is mainly due to employment created by Gatwick Airport. The airport impacts upon transport employment in Mid Sussex and Horsham, and the slightly higher proportion of people employed in hotels and catering in Crawley.

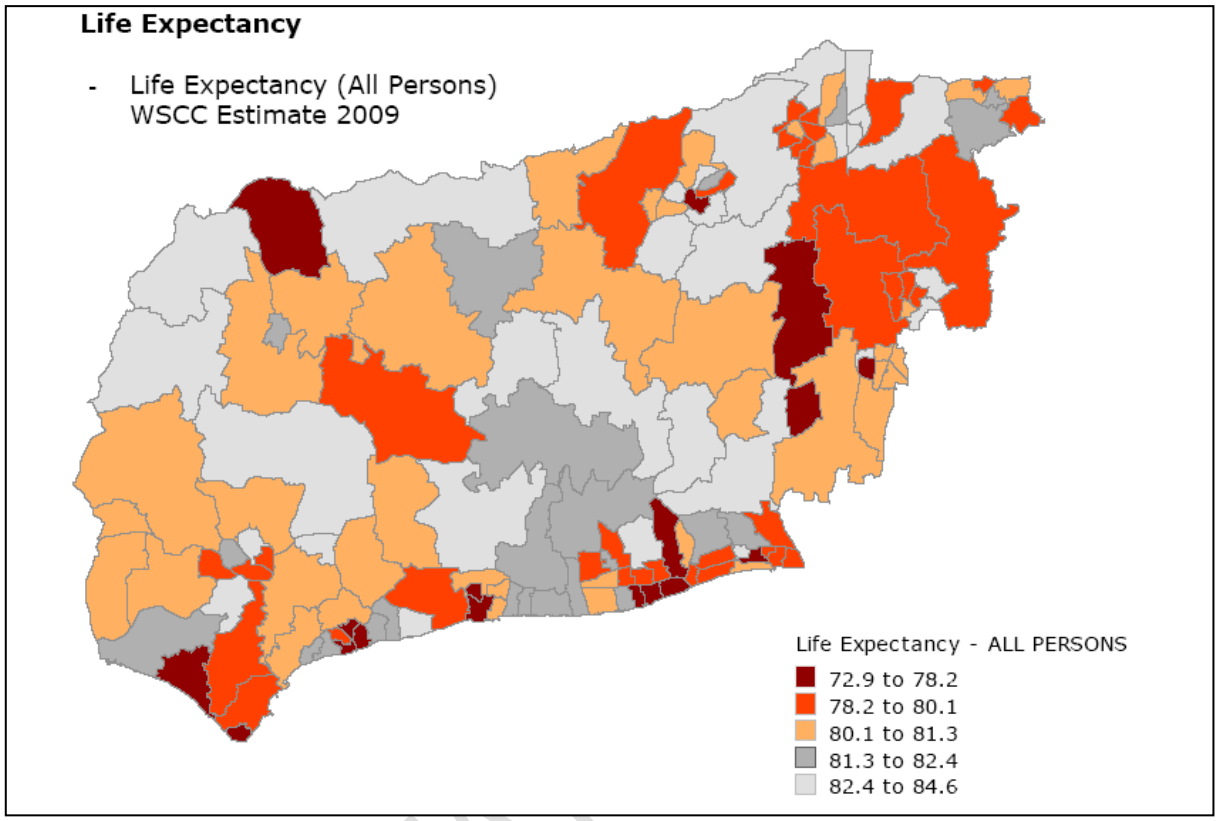
Health

The documents reviewed emphasise the need to improve quality of and access to health care, sports and recreation facilities. Well designed places and buildings foster well being and enable a better quality of life. The health benefits from air quality improvement and active lifestyles are recognised.

The Strategy will have a high regard for human health. Sustainable drainage techniques use water creatively within new developments can significantly improve the environment. Flood risk management techniques can also be used to improve water quality. Flood risk assets can be used to minimise sewer flooding during flood events, helping to better manage flood water.

Figure 4 maps the current life expectancy of residents within West Sussex.

Figure 4: Life expectancy



Effect of the LFRMS | Population and Human Health

The purpose of the Strategy is to manage flood risk and reduce the impact on the county's population. The negative impacts of this are likely to be small or zero.

By reducing the risk of flooding to communities the likelihood of loss of earnings or financial loss from damaged property and possessions would be reduced. This would also reflect favourably on flood insurance. By communicating the flood risk to people, any associated stress or worry or uncertainly around the risk can have beneficial and positive effects on a community.

Flood risk management can cause some changes to natural land features meaning reduced access to some stretches of river or coastal line. These impacts are mitigated at design stage, but are in some cases deemed necessary to provide protection to the wider population.

By communicating the risks of flooding, messages need to be clear so that the existing risk, that has always been there, is highlighted. This may be perceived negatively or positively by local communities.

There is a relationship between population, human health and flood risk management and so this theme has been scoped in to the SEA assessment.

Biodiversity, Flora and Fauna

The key messages from the documents reviewed signify the importance of the need to conserve, restore and enhance biodiversity in the County. Connectivity between habitats and space is needed to allow species to migrate between areas and adapt to climate change. The value of biodiversity should be recognised and promoted.

Biodiversity within West Sussex needs to remain a key factor influencing the location and nature of new development, including the function of new flood risk management assets. The EU Habitats Directive and the EU Birds Directive will continue to promote policy and progress in conservation and improvements to habitats.

The Strategy recognises the Habitat Regulation Assessment Directives 79/409/EEC and 92/43/EEC as well as nationally recognised designations such as Sites of Special Scientific Interest (SSSI). The development of the Strategy should be within the environmental limits of the area, however there maybe instances when there is the potential to increase biodiversity through habitat corridors. It is common for these corridors to be trans boundary, an important consideration for the Council and its neighbouring authorities.

Figure 5 highlights the current environmental designations within the County that will be taken into consideration in the Strategy. Figure 6 shows the boundary of the newly established South Downs National Park, which will also need to be considered.

Areas of International, National and Local Importance

The high quality of the environment is one of West Sussex's greatest assets. It is widely recognised that, in meeting development requirements, the quality of the environment is not compromised and that opportunities are taken to make improvements, with proposals seeking to preserve and enhance natural resources –

including air, soil and water. The Local Strategy seeks to preserve and enhance the quality of the environment.

Significant areas of West Sussex have been formally recognised for their nature conservation importance. International designations include four Special Protection Areas (SPAs), seven Special Areas for Conservation (SACs) and three Ramsar sites, the majority of which are located within Chichester and Pagham Harbours and the Arun Valley.

Site	Designation	Reason	Description
Arun Valley	SPA	Over winter the area regularly supports Cygnus columbianus bewickii. In the non-breeding season the area regularly supports Waterfowl including Cygnus columbianus bewickii.	Sympathetic management of lowland wet grassland /grazing marsh is essential to achieving favourable conservation status of the Arun Valley SPA.
Pagham Harbour	SPA	During the breeding season the area regularly supports Sterna albifrons (Eastern Atlantic - breeding). Over winter the area regularly supports Philomachus pugnax (Western Africa - wintering)	Pagham Harbour comprises an extensive central area of salt marsh and tidal mudflats, with surrounding habitats including lagoons, shingle, open water, reed swamp and wet permanent grassland. Land drainage for agriculture and pollution from inadequate treatment of sewage discharges can affect the site.
Chichester and Langstone Harbours	SPA	Over Winter and Summer the area regularly supports: Branta bernicla bernicla, Tadorna tadorna, Anas penelope, Anas crecca, Anas acuta, Anas clypeata, Mergus serrator, Charadrius hiaticula, Pluvialis squatarola, Calidris alba, Calidris	The SPA comprises two large, sheltered estuarine basins on the central south coast of England. Chichester is surrounded mainly by high grade farmland. The site is subjected to significant recreational pressures, especially during summer months. Effluent discharges and agricultural run-off can lead to localised eutrophication problems. Inundation from sewers and

		alpina alpina, Limosa lapponica, Numenius arquata, Tringa totanus, Arenaria interpres	groundwater can also affect eutrophication levels in Chichester Harbour.
Wealden Heaths	SPA	During the breeding season the area regularly supports: Caprimulgus europaeus, Lullula arborea, Sylvia undata, Sylvia undata	The site is a mix of scrub land, broad-leaved deciduous woodland, and coniferous woodland. The SPA is very dependent upon grazing and other traditional management practices. The potential threat to the breeding success of the birds comes from military use of the land, and from leisure activities.
Solent Maritime	SAC	Vertigo moulinsiana, Lutra lutra, Phoca vitulina	Features important to the site are: sandbanks which are slightly covered by sea water all the time, mudflats and sandflats not covered by seawater at low tide, coastal lagoons, perennial vegetation of stony banks, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")
Ebernoe Common	SAC	Broad-leaved deciduous woodland (95%) Mixed woodland (5%) The woods are important for a number of bat species, in particular 1323 Bechstein's bat Myotis bechsteinii and 1308 barbastelle Barbastella barbastellus	Ebernoe Common has an extensive block of beech Fagus sylvatica high forest and former wood-pasture over dense holly Ilex aquifolium, and has a very rich epiphytic lichen flora, including Agonimia octospora and Catillaria atropurpurea. It represents Atlantic acidophilous beech forests in the south-eastern part of the habitat's UK range. The beech woodland is associated with other woodland types, open glades and pools, which contribute to a high overall diversity.
Duncton to Bignor Escarp-	SAC	Heath. Scrub. Maquis and garrigue.	Asperulo-Fagetum beech forests occur here on steep scarp slopes and on more gently-

ment		Phygrana (10%) Dry grassland. Steppes (5%) Broad-leaved deciduous woodland (80%). Mixed woodland (5%)	sloping hillsides in mosaic with ash Fraxinus excelsior woodland, scrub and grassland. Much of the beech woodland is high forest but with some old pollards. Rare plants present include the white helleborine Cephalanthera damasonium, yellow bird's nest Monotropa hypopitys and green hellebore Helleborus viridis. The woods also have a rich mollusc fauna.
Kingley Vale	SAC	Heath. Scrub. Maquis and garrigue. Phygrana (25%) Dry grassland. Steppes (30%) Coniferous woodland (30%) Mixed woodland (15%)	Kingley Vale is one of the sites representing yew Taxus baccata woods on chalk, in the central southern part of its UK range. It has been selected primarily because of its size, as it is the largest area of yew woodland in Britain. It also shows excellent conservation of the full range of habitat structure and function.
Pevensey levels	SAC	Mesophile grassland (97.5%). Anisus vorticulus.	Pevensey Levels is a large and expansive grazing marsh that supports Anisus vorticulus in both a wide spatial distribution and in good population density classes.
Singleton and Cocking Tunnels	SAC	The woods are important for a number of bat species, in particular 1323 Bechstein's bat Myotis bechsteinii and 1308 barbastelle Barbastella barbastellus	Singleton and Cocking Tunnels on the former Midhurst railway line and support the South East's most important hibernating site for Barbastelle and Bechsteins bats. Singleton Tunnel is grilled at both ends and so secure from human disturbance. In the long-term the tunnels may start to deteriorate (collapse) but this is not anticipated for many years.
The Mens	SAC	1308 Barbastelle Barbastella barbastellus	The Mens is an extensive area of mature beech Fagus sylvatica woodland rich in lichens, bryophytes, fungi and saproxylic invertebrates, and is one of the largest tracts of Atlantic acidophilous beech forests in the south-eastern part of the

			habitat's UK range. It is developing a near-natural high forest structure, in response to only limited silvicultural intervention over the 20th century, combined with the effects of natural events such as the 1987 great storm.
Pagham Harbour	Ramsar	The area supports internationally important numbers of wintering pintail and nationally important numbers of dark-bellied brent goose, grey plover and black-tailed godwit.	Pagham Harbour comprises an extensive central area of saltmarsh and tidal mudflats with surrounding habitats including lagoons, shingle, open water, reed swamp and wet permanent grassland. The intertidal mudflats are rich in invertebrate and algae, and provide important feeding areas for birds.
Chichester and Langstone harbours	Ramsar	The site is of particular significance for over-wintering wildfowl and waders and also a wide range of coastal and transitional habitats supporting important plant and animal communities.	Chichester and Langstone Harbours are large, sheltered estuarine basins comprising extensive mud and sand flats exposed at low tide.
The Arun Valley	Ramsar	The area is of outstanding ornithological importance notably for wintering wildfowl and breeding waders.	The Arun Valley consists of three component Sites of Special Scientific Interest. Together these sites comprise an area of wet meadows on the floodplain of the River Arun between Pulborough and Amberley. The neutral wet grassland which is subject to winter, and occasional summer, flooding, is dissected by a network of ditches, several of which support rich aquatic flora and invertebrate fauna.

In additional to international designations, the county has a network of nature conservation designations, including 82 Sites of Special Scientific Interest (SSSI) and two National Nature Reserves (NNRs) at Kingley Vale and Ebernoe Common. There are three Areas of Outstanding Natural Beauty (AONB); Chichester Harbour, the Sussex Downs, and High Weald. The South Downs is also a designated National Park. There are also a range of more local designations, including 266 Sites of Nature Conservation Importance (SNCI) and 23 Local Nature Reserves, and a number of Regionally Important Geological/Geomorphological Sites (RIGS) which are the most important sites for geology and geomorphology outside of SSSIs. There may be other sites or areas of equal importance that have either not been identified or designated.

Surface water and freshwater marsh are important habitats in the County. There are two reservoirs at Ardingly and Weir Wood and former gravel workings around Chichester, as well as a few areas of inland water. However, West Sussex has a wealth of small downland dewponds, village ponds and other pools in woodland and on farmland. Along with rivers and streams, these habitats are at increasing risk, mainly from agriculture and drainage works, but also from development. Groundwater and aquifers may also be vulnerable.

The coast is a local and national resource and is important for nature conservation, but is an area under threat from coastal processes and to some extent from development. The coastline is naturally sinking and therefore vulnerable to the impacts of climate change and tidal flooding from rising sea levels.

All proposals for waste development should take account of the existing environment of West Sussex and the policies set out in the Development Plan in order to minimise environmental impacts. Where appropriate, development should seek to enhance the biodiversity of the county by enhancing existing habitats, as well as providing new ones. Every effort should be made to avoid impacts on sites with statutory designations and protect the wider environment in terms of air, water and soil and this should be reflected in the design of the Strategies proposals.

Figure 5: International and Nationally important sites

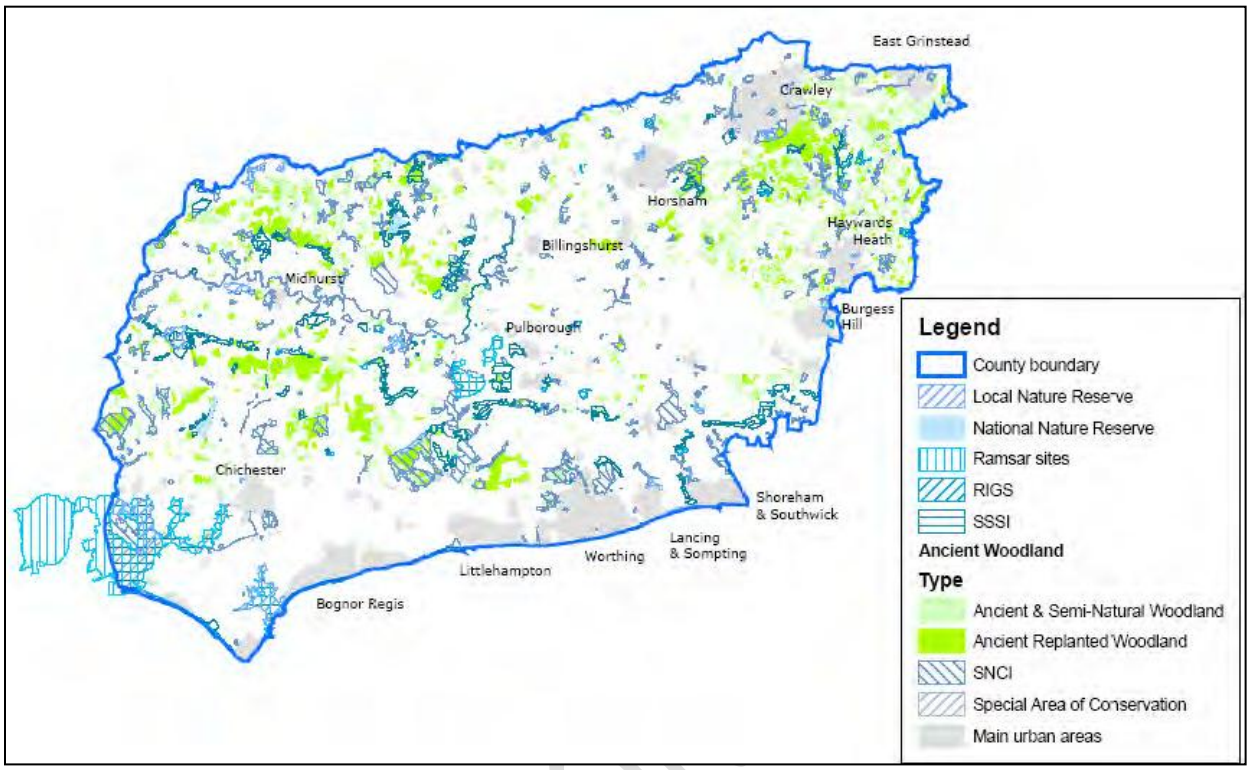


Figure 6: The South Downs National Park

Habitat can be very sensitive to changes in water levels and water quality. The Strategy needs to ensure that protected sites are maintained to the same level, and improved where possible. This will involve each project being carefully designed with environmental sites in mind.

Coastal projects, such as the Medmerry Realignment Scheme, change the nature of some areas. Care must always be taken when reducing flood risk not to negatively impact on the coastal environment through coastal squeeze.

The Strategy supports environmental sustainability and the biodiversity opportunities that new projects will bring. Implementation may come through the planning process when building new homes, when retro fitting improved drainage to urban areas, or when designing a new flood alleviation scheme. New habitat can be produced as a secondary benefit for the community and wider benefit to the county.

There is a relationship between biodiversity, flora and forna, and flood risk management so this theme has been scoped in to the SEA assessment.

Soil, geology and geomorphology

Soils

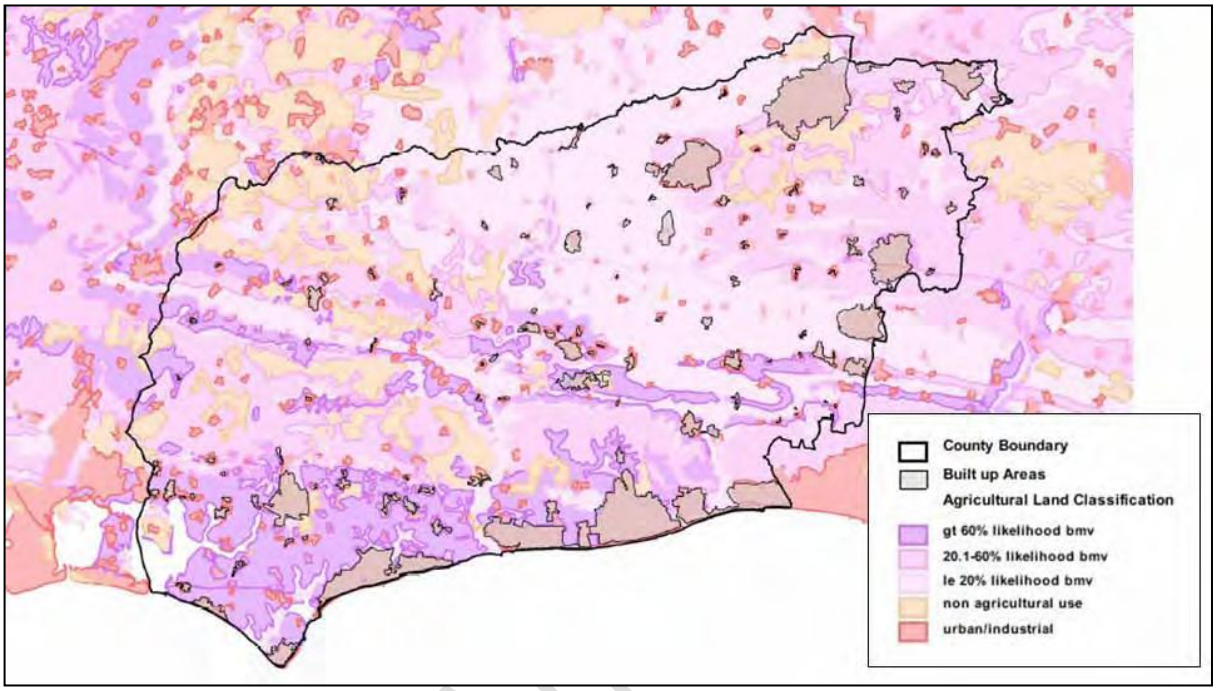
The overall aim of the Strategy with regard to soils is to promote sustainable land management, as well as supporting and promoting a diverse agricultural sector.

Soil is an important natural resource for food, farming, and biodiversity purposes. Soil quality and quantity are affected by land-use change, groundwater levels and susceptibility to flood risk, all of which the Strategy may influence.

Soil erosion is an increasing problem in England. It is becoming more common from inappropriate land management and agricultural practices. Floodwater can also remove soil from areas through flash flooding. Compaction, sealing, nutrient enrichment and pollution can also affect soils.

The Strategy should recognise the role of soil with regard to land structures, and aim to minimise soil compaction and erosion. The work resulting from the Strategy must aim to maintain or where possible enhance and protect the soils of West Sussex.

Figure 7: Soils



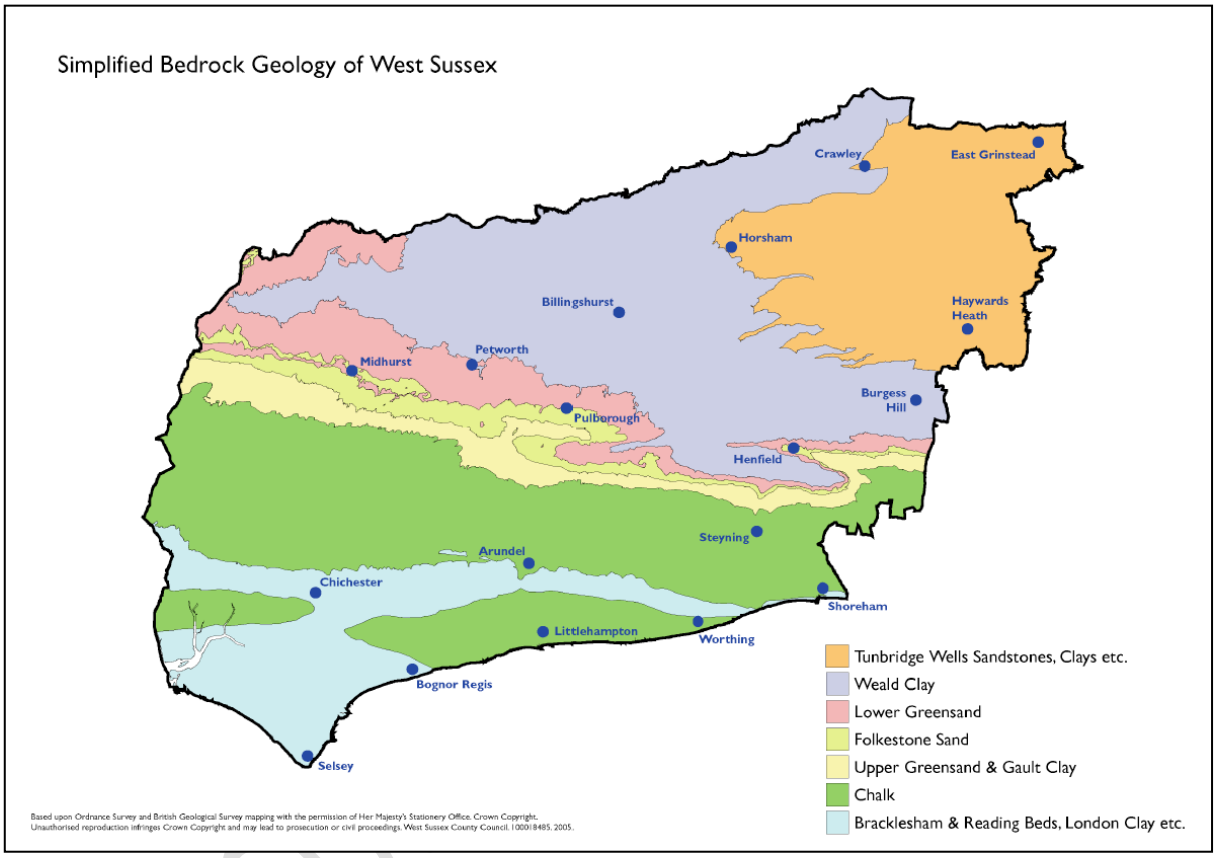
Geology

The geology of West Sussex is predominately Weald Clay in the north and Chalk and Clay in the South of the county. The geology typically runs in bands running east-west. Running across the south of the county, from Hampshire to chalk cliffs of Beachy Head lies the chalk ridge of the South Downs. The South Downs form the southern rim of the Wealden anticline, a large and eroded dome of rocks, largely of Cretaceous age (140-65 million years old) which has had a significant influence on the development of the diverse topography of the county. Small exposures of rocks of Jurassic age (195-140 million years old) occur on the main axis of the Weald anticline and rocks of Tertiary age (65-2 million years old) are exposed along the coast in West Sussex. During the Ice Ages no glaciers reached Sussex, but the county was under the influence of very cold tundra-like conditions at the edge of the ice sheets. Processes of erosion and deposition during this period have contributed significantly to the formation of the present landscape.

With the exception of the youngest part of the Chalk, West Sussex provides an almost complete sequence of Cretaceous rocks. They dip to the south with the consequence that increasingly younger rocks are exposed the further south you go.

From the summit of the Downs the hilly country observed on the northern side is occupied mainly by the Hastings Beds and the Weald Clay; at the foot of the escarpment lie the Gault and Upper Greensand, while between these formations and the Wealden rocks there is an elevated ridge of ground formed by the Lower Greensand.

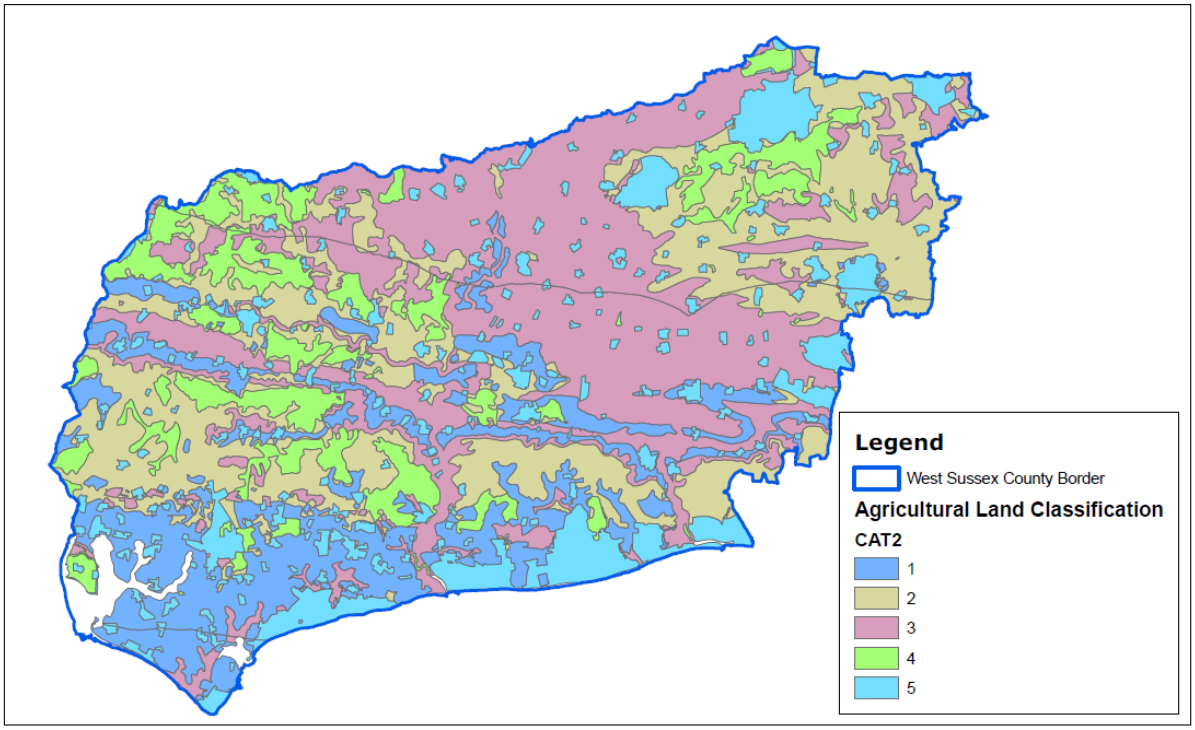
Figure 8: Geology



Agriculture

The majority of the land in West Sussex is classified as Grade 3, with small areas of higher and lower quality grades. The majority of the Grade 3 land is in the centre and east of the county. Small areas of Grade 2 overlie areas of Greensand and Gault geology and occur at the base of the southern slopes of the South Downs, and, in the north east of the county on the border with East Sussex. There is concentration of Grade 1 land on the Manhood Peninsula, with lines crossing the county north of the Downs. Grade 5 land exists mainly along the coastal strip.

Figure 9: Agricultural land classification



Topography

West Sussex has three main geographic sub-regions, each orientated approximately east to west. In the south-west of the county lies the fertile and densely-populated coastal plain. North of this lie the chalk hills of the South Downs, beyond which lies the well-wooded Sussex Weald.

The topography is dominated by the South Downs chalk escarpment, a ridge feature that crosses the county. Beyond this the land gently descends to the low lying coastal plain. The coastal strip between the South Downs and the sea is no more than 7 miles wide. The highest point in West Sussex, Blackdown, is 280 meters (919 ft) above sea level. Two river valleys cut through the South Downs ridge, the River Arun and the River Adur. North of the South Downs is the Low Weald where gradients are generally flat. The headwaters of the rivers originate from ground elevations of approximately 100 MOAD. The lower sections of both rivers have low gradients.

The Strategy aims to minimise the flood risk posed to the West Sussex population, property and infrastructure while maintaining or improving the natural environment. The work that the Strategy supports does have the potential to affect these natural characteristics. This SEA together with the individual Environmental Impact Assessments of each project will mitigate against any negative impact.

There is a relationship between soil, geomorphology and flood risk management, and so these themes have been scoped in to the SEA assessment. Geology is not linked and has been omitted.

Water and Water quality

Watercourses

The river system centres on the extensive catchments of the Arun and Adur. These drain the entire Low Weald and much of the rest of the County. These two tidal watercourses pass through most of West Sussex's major towns including Arundel, Bognor Regis Bognor Regis (including Bersted, Felpham, Middleton and Elmer), Chichester, Littlehampton, Shoreham, Haywards Heath, Horsham and Crawley. The River Ouse drains most of the High Weald in West Sussex, running to the sea via Lewes in East Sussex.

Draining into the two main watercourses and into the sea are a network of rifes, streams and smaller water courses (ordinary water courses). Together these channels make the river network across West Sussex.

Water supply

The majority (70 per cent) of our supply comes from groundwater, predominantly from the chalk aquifer which is widespread across the region. A further 23 per cent comes from rivers and the remaining seven per cent from surface water reservoirs owned by the company. The water we take from rivers and aquifers is regulated by the Environment Agency through a permit system to ensure there is enough water available for plants and wildlife. Because of the predominance of groundwater sources, rainfall during autumn and winter is critical to the availability of water resources across the region.

Water needs to be used more efficiently and demand needs to be lowered. This can be achieved by reducing leaks, incorporating efficiency measures into buildings and installing water meters. Our current water usage is 170 litres per person per day; our target is 130 litres per person per day by 2030.

The majority of West Sussex's public water supply comes from groundwater. The county is served by three water companies: Southern Water, Portsmouth Water, and South East Water. Southern Water supplies the largest area, mainly from chalk boreholes. Portsmouth Water also relies on chalk boreholes, and South East Water's main source for the area is their surface water abstraction at Barcombe.

In West Sussex, 10 per cent of water bodies (rivers and groundwater) are over abstracted, and 25 per cent have no water available. This means too much water is taken from our environment and we are working with planners and developers to make them aware that the county's natural resources have to be shared between people and the environment. By 2050, climate change could reduce the amount of water available in the environment by 15 per cent, and our current water usage is higher than ever. Water consumption needs to be reduced by more than 40 litres per person per day.

With more new homes planned for the South East (74,600 in West Sussex) the demand on our rivers and groundwater will grow. We want all designs for all new homes to include the highest standards of water efficiency. However, we recognise that two thirds of the dwellings that will be in use in the UK in 2050 already exist – so it is important that we all take steps to use water more efficiently.

In addition, we intend to work with the water companies to make best use of their existing resources and encourage them to adopt full metering. Only a third of houses in West Sussex currently have water meters, although Southern Water is planning to implement full metering by 2015. Other companies will follow their lead in the future.

Water quality

The quality of the water environment is fundamental to the environment as a whole, as well as social and economic wellbeing and quality of life. Our rivers provide a habitat for a diverse range of animal and plant species. However, only 12 per cent of water bodies in West Sussex are at good ecological status or potential.

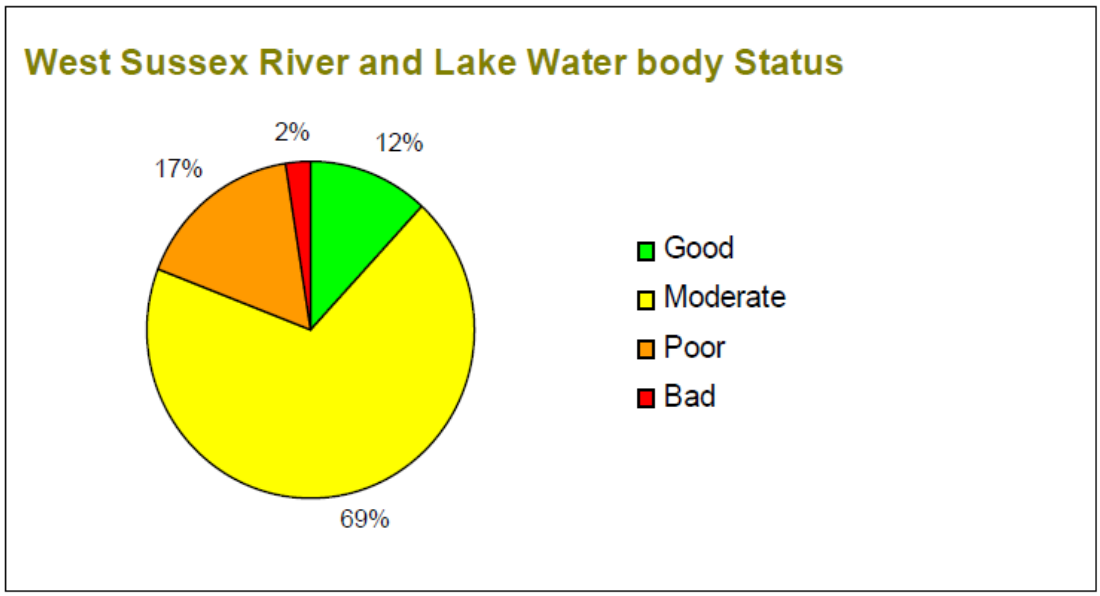
For water quality to improve we need to see:

- adequate sewage infrastructure provided alongside new development
- Sustainable Drainage Systems (SuDs) built into new development and retrofitted to existing buildings

• a reduction in urban diffuse pollution.

In West Sussex, the majority of water bodies are currently at moderate status. The diagram below shows the status of all 84 water bodies in West Sussex. Only 12 per cent of water bodies currently have good ecological status or the potential to have this status, based on a range of indicators. We need to ensure that all water bodies are at good status or good potential by 2027. We have already identified actions which will improve a further eight per cent of water bodies in West Sussex by 2015. Some of these actions are outlined below.

Figure 10: Water body status



In West Sussex, nitrate, phosphorus and organic pollution are shown to be the highest priority. Nitrate pollution can impact on both surface water and groundwater and comes principally from agriculture (61 per cent) and sewage treatment works discharges (32 per cent), (figures for England and Wales, Defra 2004). Much of the pressure from organic pollution is the result of discharges of treated sewage effluent. Both high organic pollution and high phosphorus levels can have potentially severe impacts on the whole freshwater ecosystem.

Our risk assessments for the Water Framework Directive have indicated that in West Sussex; three river catchments are at risk of failing the 50mg/l Drinking Water Standards for nitrate, five are at risk of failing Ammonia standards, and three are at risk of failing Biological Oxygen Demand (BOD).

In order to improve the status and potential of our water bodies to good, we will:
- apply DEFRA's phosphate standards to targeted water bodies where there is evidence that nutrient levels are causing undesirable ecological impacts;
- work with Southern Water to improve more than 17 sewage works at locations such as Horsham, Petersfield and Chichester, to reduce levels of phosphate, nitrate and organic pollutants;
- use new developments as an opportunity to work with planning teams to promote water efficiency measures and the necessity to provide adequate sewerage systems and treatment facilities.

The Water Framework Directive gives us a mechanism to protect West Sussex's unique environment, by working with partners to deliver the River Basin Management Plan. The South East River Basin Management Plan identifies the pressures on our entire water environment, from lakes and rivers, to groundwaters, estuaries and the coast.

Having looked at the pressures, it monitors the status of these water bodies, and puts actions in place that will bring the water bodies to 'good' status. Where water bodies are artificial or have been heavily modified, for example canalised to enable urbanisation, the River Basin Management Plan recognises that the 'good' or 'high' status is not possible. In these cases, we have to reach 'good potential', which is the best that can be achieved bearing in mind the need for people to live and work around our water bodies. The following is a summary of some key pressures on water bodies in West Sussex, and how we will be working with our partners to tackle them.

Diffuse pollution is an issue across the South East River Basin District, and West Sussex is no exception. The run off of pollutants, nutrients and silt into our waters puts pressure on the plants and animals that live there. This nutrient enrichment brings about the excessive growth of algae and other plants, reducing overall biodiversity in our rivers and estuaries. It can also pollute the groundwater bodies which we rely heavily upon as a drinking water supply.

Groundwater monitoring has highlighted increasing trends in nitrate in the Lower Greensand aquifer and the Worthing and Chichester Chalk. Groundwater quality in the Brighton Chalk is also at risk of deterioration from nitrates and pesticides, relating to rural as well as urban inputs. There are also groundwater quality risks in the Hastings aquifer. Farming practices can make sedimentation problems in our rivers worse, which harms fish and other wildlife. This has been identified as a pressure, particularly on the Western Rother.

The Downs and Harbours Clean Water Partnership will target land management advice, particularly in the River Lavant. Catchment Sensitive Farming will focus on the Western Rother. The Highways Agency, local authorities and others will improve road drainage to avoid ground or surface water pollution from road runoff. We will also investigate the sources of poor water quality in several waters in West Sussex, including bathing waters. This work will improve urban and rural land management, bringing our water bodies to 'good' status or 'potential'.

Flood risk

Surface Water flooding

Within West Sussex there are five cluster areas considered to have a substantial surface water flood risk (West Sussex PFRA). The Environment Agency's 'blue square mapping' details the following areas:

- Worthing
- Crawley
- Burgess Hill and Haywards Heath
- Southwick and Shoreham
- Chichester

Surface water flooding is not just isolated to these cluster areas, there are many localised spots across the county that flood. The mapping highlights that 6.4% of the County's land mass is susceptible to this type of flooding.

River flooding - The Adur Catchment

The River Adur catchment covers an area of 600 square kilometres and is home to around 550,000 people. The watercourses within the catchment include the main River Adur and its tributaries which drain the Low Weald area through the South Downs, flowing out to sea at Shoreham. Serious flooding does not occur very often in the River Adur catchment area, and extreme flooding is very rare.

The main source of flooding in the River Adur catchment area is from rivers. Tidal conditions influence flooding on the lower reaches of the Adur, on the Ferring Rife and Teville Stream. There is also a risk of flooding from groundwater, surface water run-off from the land, and from overloaded drainage networks. There have been several river flooding events over the last century and a number of groundwater flooding incidents. Groundwater flooding affects areas along the coastal plain. Surface water flooding is also an issue within the catchment. Serious flooding caused by surface water runoff from the South Downs has occurred in areas such as Worthing

River flooding - The Arun Catchment

Although largely rural, the River Arun catchment is home to approximately 300,000 people. The rivers in this catchment lie mainly in the West Sussex districts of Chichester, Arun and Horsham. Flow characteristics of the rivers vary, with fast flowing streams emerging from the High Weald area to the north, flowing into the low-lying coastal plain where the gradient reduces and the river flows are much slower. Tidal influence affects the character of the lower parts of the River Arun and extends to above Pulborough.

The catchment has a history of fluvial, surface water, groundwater and tidally influenced flooding. Notable flood events have occurred seven times in the last 40 years, with the most serious being in December 1995 when over 200 properties were flooded across the catchment, and in autumn 2000 when over 150 houses and over 50 caravans were flooded.

Coastal flooding

On the South coast the long history of coastal defence intervention to reduce the risk of flooding and erosion means that the shoreline is today generally in an ‘unnatural’

form, and one which would not necessarily revert to ‘naturally functioning’ if simply allowed to develop unmanaged.

It is likely that for much of the coastal frontage in West Sussex, the removal or failure of defences would result in the breakdown of beaches, with little or no protection of the land behind from erosion and flooding. However, the management of potential flooding issues on the coastline will require a more ‘natural’ shoreline in the long-term, where feasible. The planning process must also appreciate that ‘Hold the Line’ policies (that is maintenance of the current coastal position) will not necessarily be appropriate or possible in the very long term (that is beyond 100 years), particularly when major developments are being considered.

Floodzones

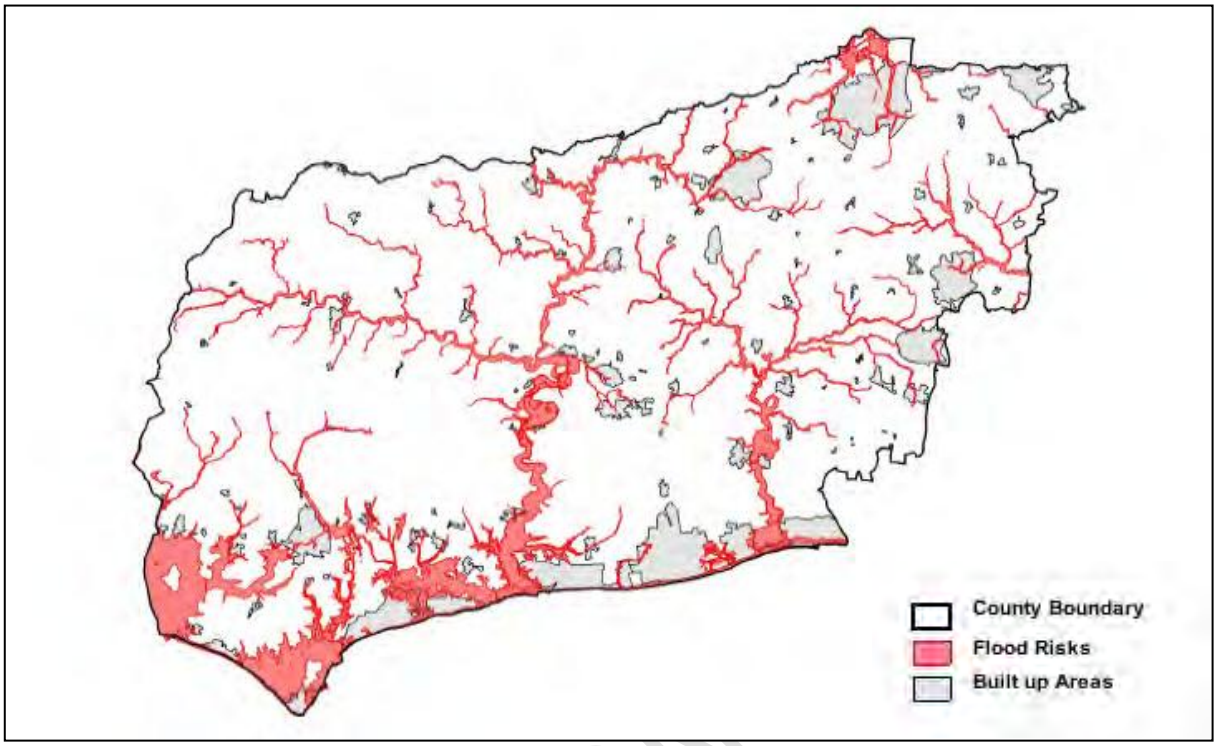
Flood zones are used to highlight the probability of flooding in an area, essentially mapping areas of the county that are at greatest risk. There are three flood zones:

Zone 1 areas are those with the lowest probability of flooding from rivers and the sea, where the chance of flooding in any one year is less than 0.1 per cent (that is a 1000 to 1 chance);

Zone 2 areas are those areas with a chance of flooding in any one year between 0.1 per cent and 1 per cent for river flooding or 0.5 per cent for coastal flooding (that is a chance of between 1000 to 1 and 100 to 1 from rivers or a chance 200 to 1 from the sea);

Zone 3 areas are those with the highest probability of flooding. The chance of flooding in any one year is greater than or equal to 1 per cent (that is a 100 to 1 chance) for river flooding and greater or equal to 0.5 per cent (that is a 200 to 1 chance) for coastal and tidal flooding.

Figure 11: The River and Sea Flood Map



Effect of the LFRMS on Water

The Strategy supports positive effects on water and the flood risk in the County, however flooding will always carry residual risk of negative effects that cannot managed. While the Strategy will work towards reducing flood risk for communities, during flooding it is likely that water will become polluted as it overtops infrastructure and fills the flood plain.

By increasing sustainable drainage in our planning, using methods that prevent pollution being washed into our watercourses and rivers, water quality can be improved. This is example of how clever management can give our county dual benefits, with the provision of greener developments that are more pleasurable to spend time in, reduced flood risk, and, a reduction in pollutants.

Options in the Strategy may include changing or water levels and flow. In these instances, protected areas must be assessed, as must areas that are known to fail water quality.

There is a relationship between water and flood risk management, and so this theme has been scoped in to the SEA assessment.

Air Quality

All the documents reviewed have identified the need to minimise the impact of pollution sources that lead to poor indoor and outdoor air quality. Flood risk management should not contribute to increasing poor air quality, particularly in identified pollution "hot spots", and should be designed to minimise existing air quality problems, including reducing the exposure of vulnerable people to poor air quality. Impacts upon health and biodiversity have also been documented. In West Sussex, the main pollutants of concern are Nitrogen Dioxide (NO2) and fine particulates (PM10).

Effect of the LFRMS → **on air quality**

The Strategy is concerned with reducing flood risk to the communities of West Sussex, and therefore it is considered very unlikely that the projects resulting from it will affect air quality. It is proposed that air quality is scoped out at this stage.

Climate Change

Our climate is changing - both in Britain and round the world. Atmospheric concentrations of carbon dioxide have increased by nearly 30 per cent since the beginning of the industrial revolution. The 1990s was the warmest decade in 100 years, with 1998 being the warmest year on record, and the global sea level has risen between 10 and 20 centimetres over the past century.

We will have hotter, drier summers and warmer, wetter winters. These changes will impact on all aspects of the environment in the region. The wetter winters and drier summers will change river flows. There will be a reduction in dilution of discharges in the summer and an increase in silt runoff in the winter. Storm overflows from sewage works and consented outfalls could increase. Reduced summer rainfall and increased variability in weather could increase the frequency of droughts in West Sussex and threaten the supply of water for homes and businesses.

Globally species, habitats and landscapes will be affected by changes in temperature, rainfall, and rising sea levels. Approximately 10,000 species of animals are likely to vanish over the next 30 years, nearly 1,000 of these are deemed to be critically endangered already. Flood risk will increase because of rising sea levels threatening the coast and increased winter rainfall and summer flash flood events. Sea level will rise by approximately one metre in the next 100 years.

Higher storm surges and low tide levels will reduce the ability of drains to discharge to the sea, potentially increasing fresh water flooding in low lying areas. Greater frequency and intensity of short duration rainfall events will put pressure on drainage systems (surface water and combined) and lead to localised flooding.

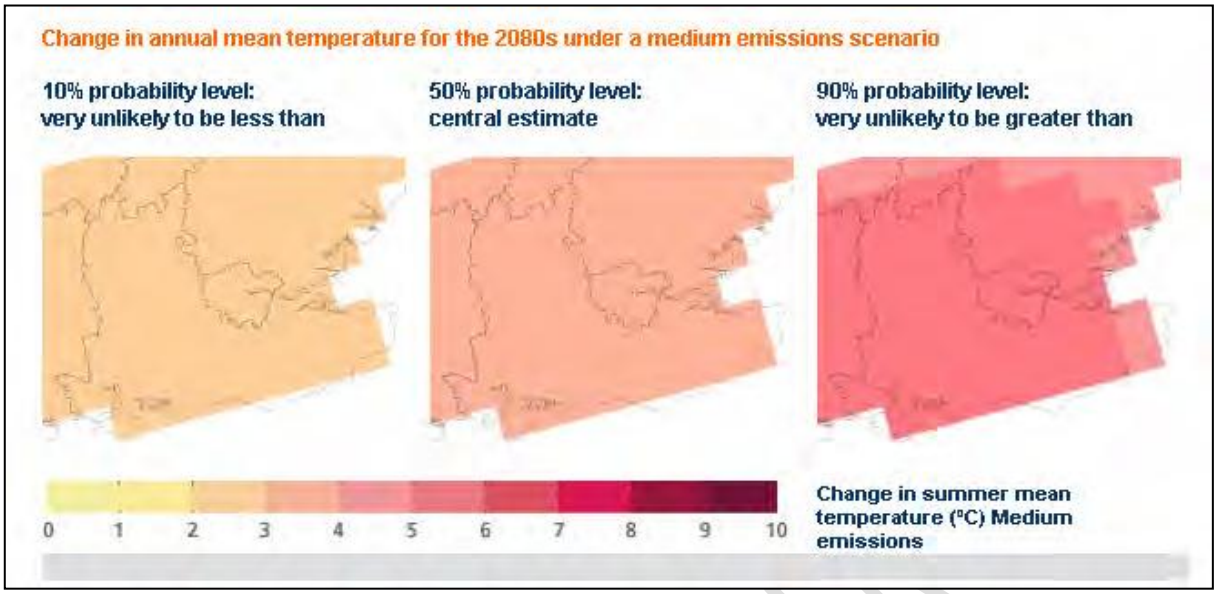
Climate projections

We have time to adapt to climate change but we need others to continue to work with us to make sure the country is prepared. Adaptation and mitigation plans are at the heart of our work, for example our current plans to manage flood risk and water resources incorporate future climate change.

On average, we produce 6.9 tonnes of carbon dioxide per person per year in West Sussex. We must reduce this if we are to avoid even more severe changes to the climate which will be felt across West Sussex.

Climate change will impact upon all social, economic and environmental factors. Flood risk management has an important role in tackling climate change in terms of both mitigation and adaptation. The Strategy should seek to limit carbon dioxide and other greenhouse gas emissions and minimise future vulnerability in a changing climate.

Figure 12: Climate change



Effect of the LFRMS on climate change

The Strategy can have both a positive and negative effect on climate change. The work that the Strategy will programme and fund will be sensitive to future climate change. Future climate is considered in the size standard of a structure or pipe size. controlling where buildings are build and how they are built for example.

Construction and maintenance of the assets built from the work plan in the Strategy will have an effect on the emissions of greenhouse gases that West Sussex are responsible for.

There is a relationship between climate change and flood risk management, and so this theme is included in the SEA assessment.

Material Assets

Critical Infrastructure

The UK Climate Change Risk Assessment shows that flooding as a result of climate change is likely to pose an increasing threat to critical UK infrastructure. As a result, transport networks, water supplies and sewage treatment, energy supplies, hospital and schools will all face a higher risk. There is a high risk of confidence in the 'significant likelihood of flooding' risk posed to roads and a medium level of

confidence in relation to power stations, hospitals and schools. Waste management infrastructure could also be described as critical infrastructure.

The Strategy will manage flood risk to critical infrastructure and material assets. The location of critical infrastructure may influence the range of available flood risk management options and measures. Access to and use of critical infrastructure is an important consideration of any project supported by the Strategy.

- A&E Hospitals
- Airports
- Ambulance Stations
- Community Hospitals
- Day Care Centres
- Traffic Management Control Centre
- Fire & Rescue Stations
- Prepared Rest Centres
- Maritime & Coastguard Agency
- Important mineral reserves
- Electricity generating power stations and grid and primary substations
- Medical Centres
- Mental health service
- National Air Traffic Control Centres
- Police Control
- Police Stations
- Power Stations
- Prison
- Schools
- South Central Ambulance Services
- Supermarket Distribution Centres
- Waste management infrastructure
- West Sussex Fire & Rescue Service Headquarters

Housing

The risk of flooding to the population is the central consideration of the Strategy.
The South East Plan allocated some 74,600 homes per year to be built in West Sussex between now and 2026. More people will mean a greater demand on our water resources, as well as more pressure on our sewerage infrastructure and the environment as a whole. Shoreham has been identified as a development growth point, however there is increasing development in general across the coastal plain.

Economy

A common theme across waste strategies is the need to realise economic development in its widest sense, but to also link it to communities through accessibility and support. The overarching aim is to address barriers to growth. Supporting sustainable economic development which mitigates or combats the effects of climate change is another headline theme.

Addressing barriers to growth, accessibility to services and employment, and tourism will be a consideration in the development of the Strategy. Moving forward in a sustainable manner will be an important factor for the projects that are implemented.

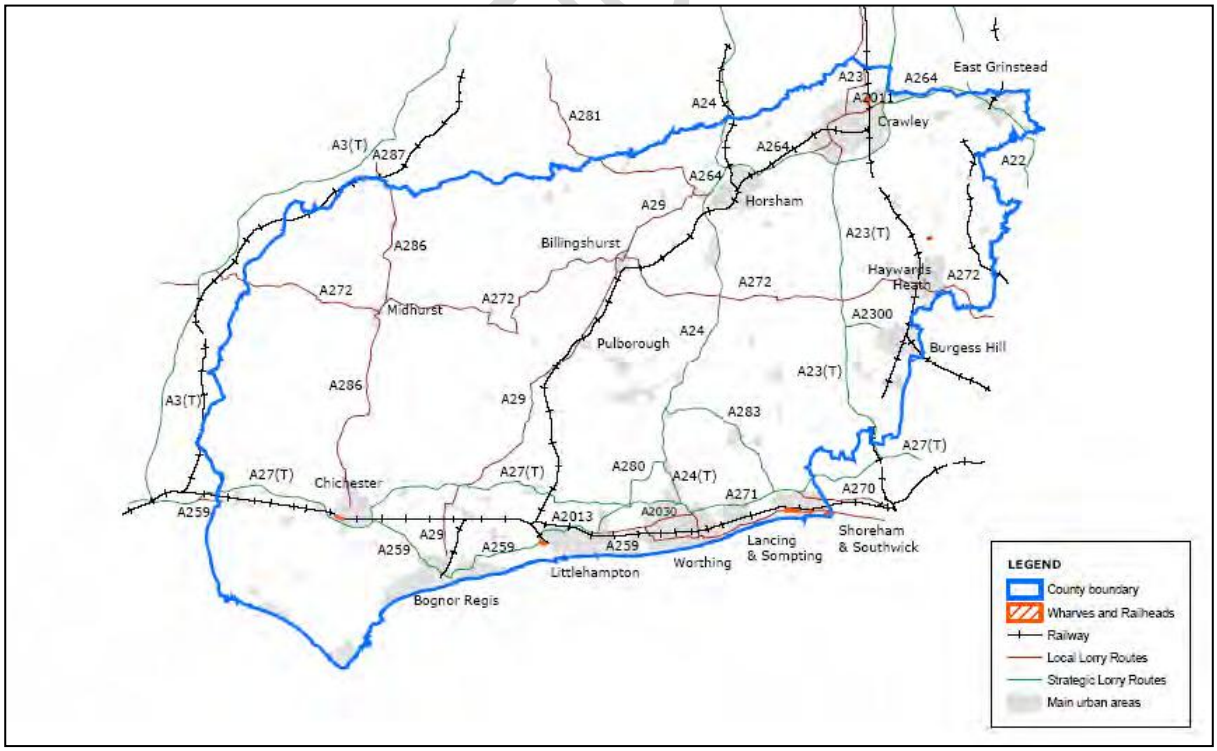
Supporting economic competitiveness and growth is one of the goals that we will contribute towards. Particular attention will be given to addressing locations which suffer from deprivation, whilst enhancing areas that already benefit from a strong economy. The current areas of deprivation within the County are mapped out in Figure 3.

Transport Infrastructure

West Sussex has a wide variety of roads and footways, from high volume congested carriageways to single lane rural roads. The transport plan aims is to balance the local, regional and national need for transport and accessibility, with the environmental, economic and social cost to the county as a whole.

The key messages arising from the transport plan are the promotion of sustainable transport choices and greater accessibility by public transport, walking and cycling. The plan aims to provide sustainable transport infrastructure as a part of any new development, and, aims to reduce the need to travel through the appropriate location and design of new development.

Figure 13 : Transport



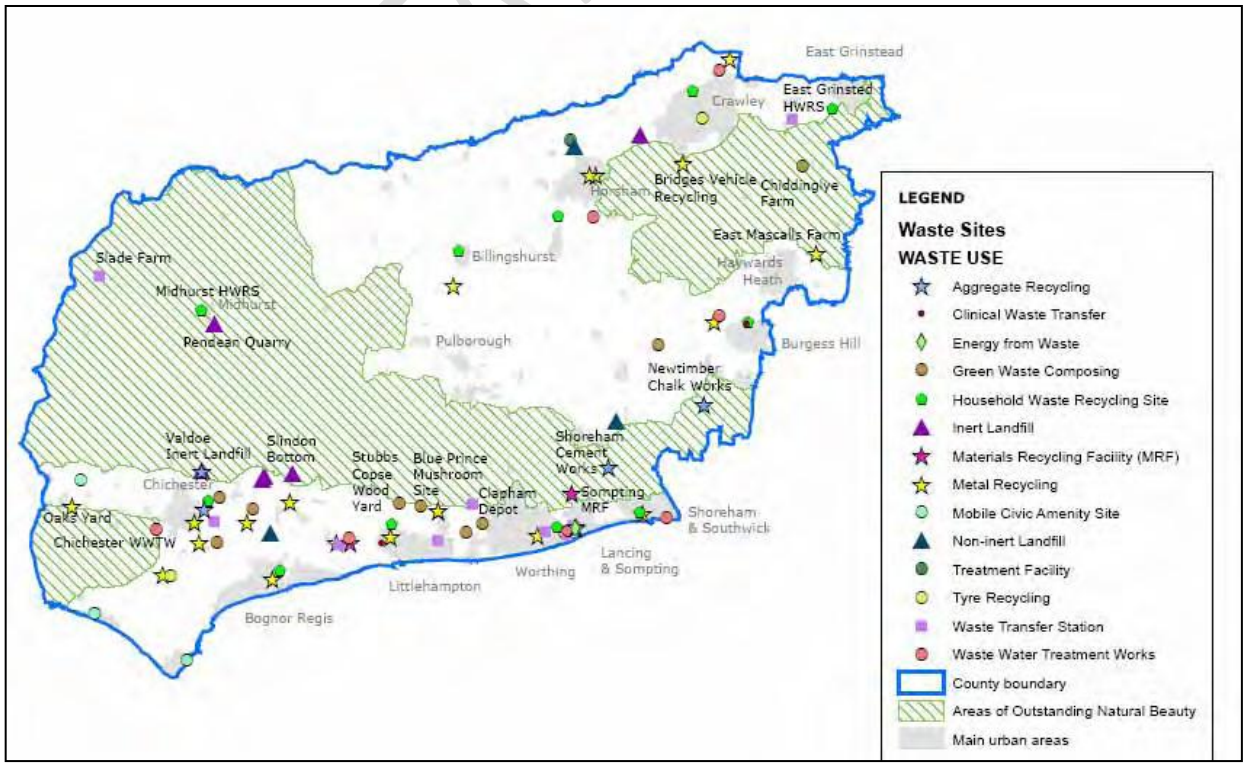
Waste and Recycling

The non-municipal element is managed through a network of commercial Waste Transfer Stations and Materials Recovery Facilities which collect and sort commercial waste, with the remainder going to landfill. Landfill sites are for non-hazardous waste. West Sussex has a policy not to consider energy recovery facilities for municipal waste until after 2015.

The Strategy requires that any flood risk recommendations be examined in terms of their potential impacts. For the treatment of liquid waste, West Sussex's infrastructure includes 591 separate sites for treatment. Works implemented under the Strategy will have to consider the resilience of these sites. The forecast long term growth in population and housing will lead to an increased demand for wastewater treatment in the county. Planned growth areas, such as those at Horsham, Billingshurst, Littlehampton, Burgess Hill and Haywards Heath, will also need to have supporting local waste facilities.

The Strategy will need to consider flood risk to existing facilities, proposed changes to existing facilities and proposed new waste management facilities, including the sewerage network. Inundation of sites that contain contaminated land could potentially release and spread contaminants into the environment through floodwater. Figure 14 shows the distribution of waste sites.

Figure 14 : Waste sites



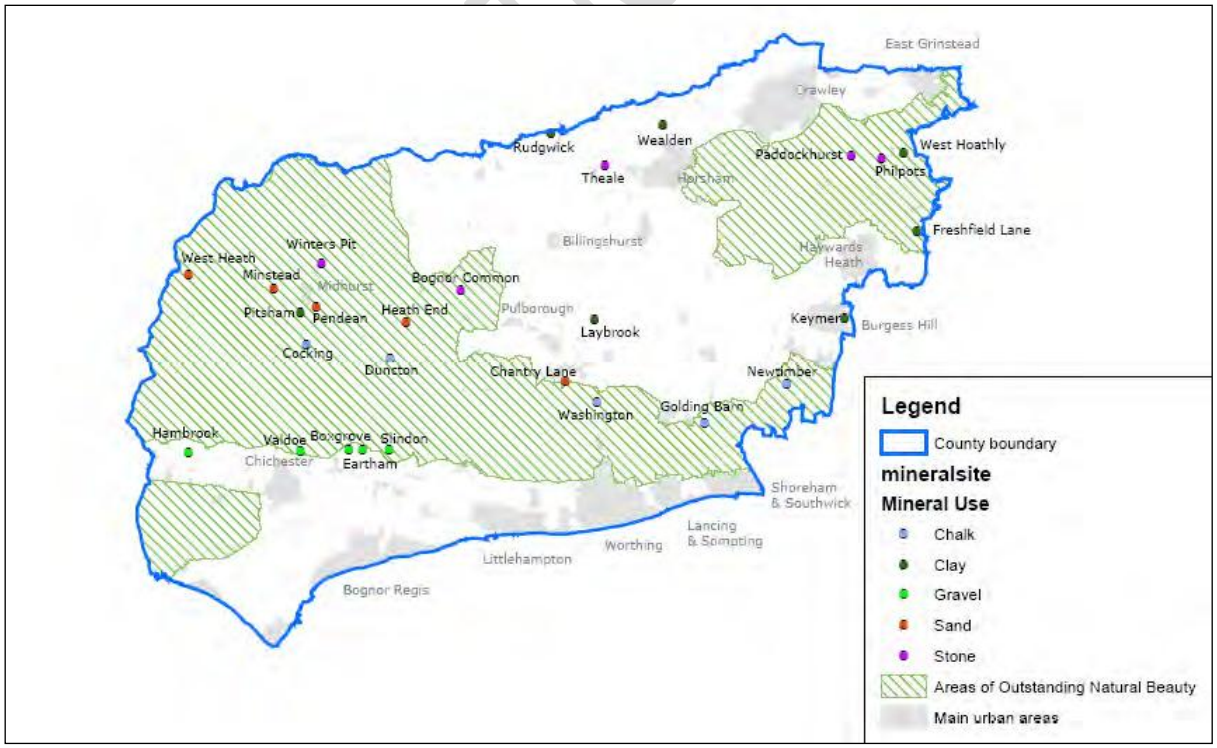
Minerals

The mineral resources in West Sussex occur in sedimentary rocks ranging from Jurassic to Quaternary age. Historically, the majority of the sedimentary units within the county have been worked for specific minerals including ironstone, brick, and tile clays, cement raw materials, agricultural lime, building stone and aggregate.

Major extractive industries surviving in the county include aggregates won from the Quaternary Head and Fan Gravels of the Sussex Coastal Plain around Chichester. These gravels constitute an extensively exploited and locally important source of aggregates.

Sand extracted from bedding deposits in the Lower Creatceous in the central part of the county supplies the whole of Sussex and South Eastern Hampshire with building and concrete sand. The Hastings Group clays and Weald Clay in the northern portion of West Sussex form the basis for an industry manufacturing bricks and tiles used in large volumes across south east England. Chalk is worked on a relatively small scale for agricultural lime and fill. Until recently it was worked as a raw material for cement. Cement is no longer manufactured in the county.

Figure 15 : Mineral use



West Sussex is prospective for both oil and gas. A number of exploration holes and been drilled, resulting in the discovery of one producing field at Singleton. It is highly likely that further wells will be drilled with more discoveries possible. Extraction of aggregates, particularly from the limited remaining gravel resources of the coastal plain, and from the Folkestone Formation, is likely to be the prominent issue in the future of mineral process in West Sussex.

Effect of the LFRMS on material assets

The Strategy will work towards improving the resilience of West Sussex's material assets into the future. The projects supported by the Strategy will only seek to reduce flood risk for key infrastructure, and make the county a more resilient should a flood event occur.

There is a relationship between material assets and flood risk management, and so this theme has been included in the SEA assessment. Waste and recycling have been omitted.

Landscape, Cultural, Architectural and Archaeological Heritage

Landscape

The Strategy should ensure that it contributes to maintaining the cultural and heritage identity of West Sussex. This may be in the form of creating accessibility to such areas or creating complementary assets.

A variety of legislation and guidance, from the international to local, provides policy for its protection and enhancement, which enables change to be managed through planning and other mechanisms. A key message is that heritage-led regeneration has a key role to play in economic development.

Landscape characterisation is a tool to provide a greater understanding of the landscape as a resource. There is the need to accommodate the development pressures of the community within characterisation tool that will ensure special qualities and distinctiveness is maintained.

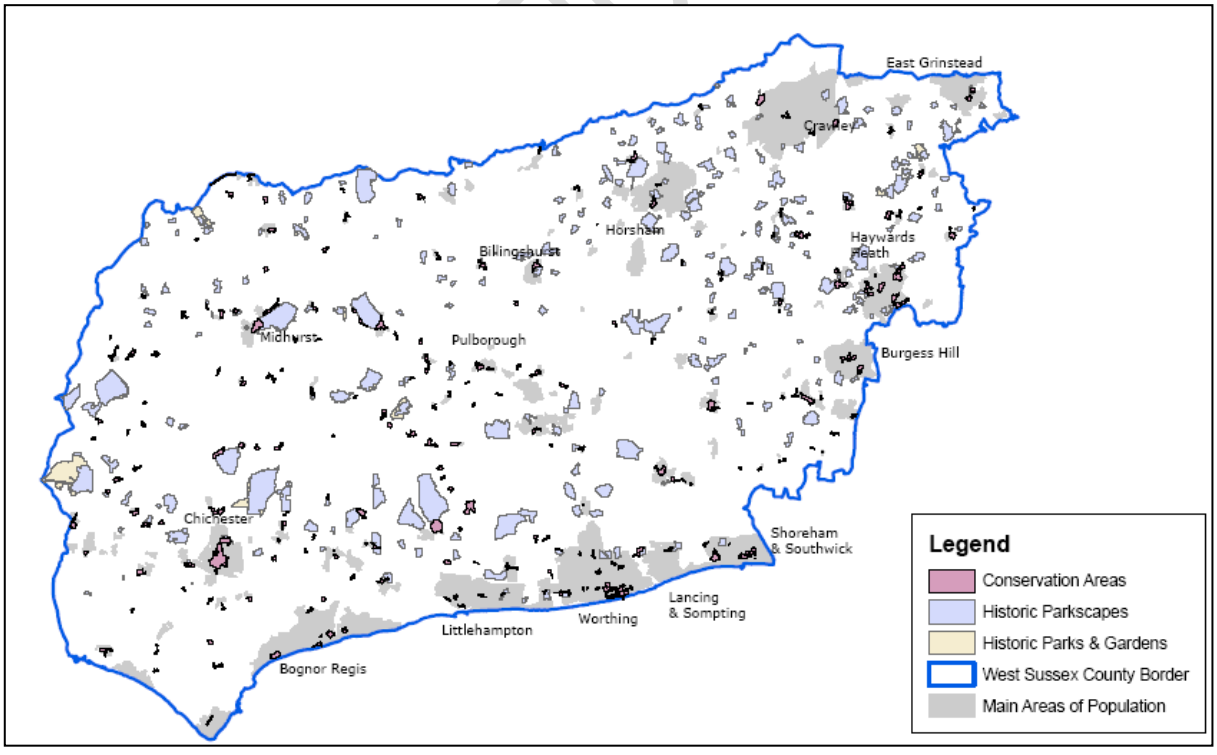
Landscape character is defined as; 'a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather

than better or worse'. Put simply, landscape character is 'that which makes an area unique'. The West Sussex Character Assessment identifies 42 separate and distinct areas throughout the County.

Conserving the character of West Sussex, it's countryside and landscapes is a primary concern for the County Council, due to both self imposed targets and those of national government policy, at a time when the County is subject to enormous pressure for development.

The Strategy will have a high regard to these policies and ensure that the design of flood risk management assets reflects and responds to local character and distinctiveness wherever this is an important consideration. The assessment of this need would involve working with the designers, developers and County Council departments to ensure that these opportunities are not missed. New infrastructure has the unintentional capacity to erode and destroy local character and distinctiveness. In many cases it is possible to avoid this situation through bespoke and sympathetic designs, and careful selection of locally appropriate materials. The SEA will identify in the design process how these potential effects can be anticipated, assessed and mitigated.

Figure 16 : Cultural and historical sites

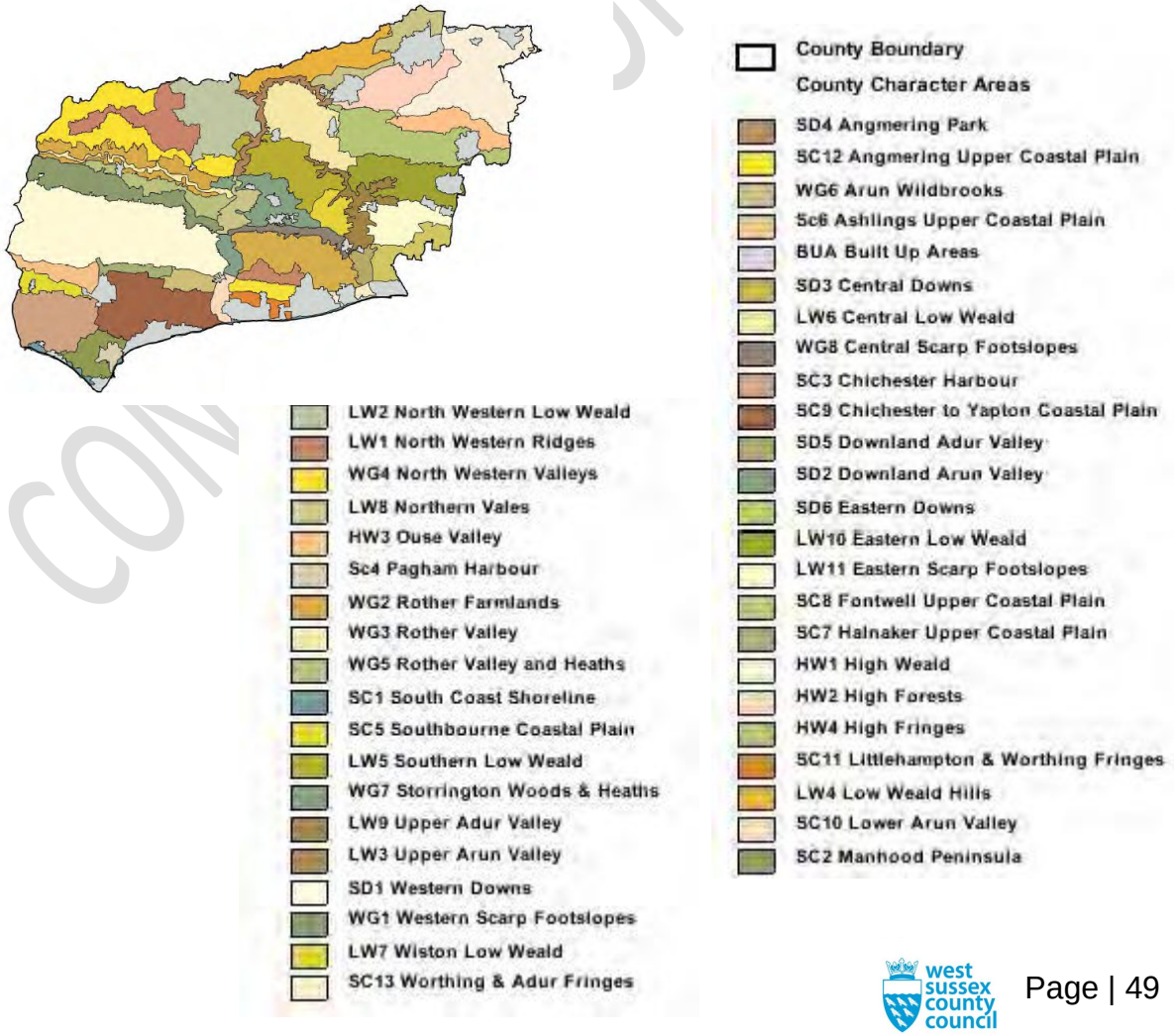


Listed buildings

West Sussex has many buildings of architectural and historic interest. They cover every kind and age, reflecting the traditions and history of West Sussex, and include the great country houses, such as Petworth House, medieval townhouse and farm buildings, and modern architectural masterpieces. There are approximately 500,000 listed buildings in England, and over 7000 in West Sussex. 730 of these buildings are within areas susceptible to surface water flooding.

Of those buildings that are statutorily listed as being of special architectural or historic interest (known as 'listed buildings'), nearly half are in Chichester District. Some historic towns contribute greatly to the total number, notably Chichester, Arundel and the small market town of Petworth. Other buildings included range from churches, country houses and picturesque cottages to walls, railings and telephone boxes. There are 172 Grade I listed buildings in the County that include Arundel Castle, Chichester Cathedral and Lancing College Chapel.

Figure 17: Landscape character



Scheduled monuments

Scheduled Ancient Monuments are legally protected and works cannot be carried out on them without the consent of the Secretary of State. Other, non-scheduled, monuments and sites of importance and their settings must also be protected and, where possible, enhanced. The County contains over 200 Scheduled Ancient Monuments, including early fortifications and burial sites on the downs.

Archaeological interest

West Sussex has an exceptionally rich archaeological heritage which contributes to its character. The County contains important areas and sites from all eras of human activity, notably Bronze and Iron Age forts and burial sites and a rich legacy of Roman remains typified by the mosaic pavements at Fishbourne and Bignor and remains of the Wealden iron industry. In addition, some 1,500 sites and places have been defined as Archaeologically Sensitive Areas, worthy of protection. Whilst most of these are in the countryside, the historic towns and other urban areas also contain invaluable reminders of the past comprising sites, monuments and ancient buildings.

Archaeological or historic features are often associated with rivers and waterways. The most visible are the bridges crossing the rivers together with canals and other buildings associated with industry. West Sussex was connected to London via an extensive system of waterways. This system is now largely lost, although significant stretches remain. Today, the Chichester and the Wey and Arun Canals have considerable wildlife value. A balance needs to be struck between attempts to restore them to navigation for recreational use and their protection as important habitats and as part of the historic environment.

Archaeological remains are a finite, non-renewable resource and can contain irreplaceable information about our past. They are vulnerable to damage and destruction and, therefore, there is a need to preserve and record important archaeological remains.

Registered parks and gardens

The historic parks and gardens of West Sussex complement the historic buildings and historic landscape of the County and contribute to the character of the built-up areas and countryside. The treescapes of historic and other parks and gardens are a precious legacy. English Heritage maintains a Register of Parks and Gardens of Special Historic Interest. Many of the larger ones lie in the west of the County, centred on great houses. Notable examples include Cowdray Park, Goodwood,

Petworth, Stansted, Uppark, Wakehurst Place, West Dean and the Norfolk Estate at Arundel.

The County Council has assisted the Sussex Gardens Trust in identifying historic parks or gardens of local importance. Some have been developed with housing, some have been converted to arable or other agricultural use but there are a number of survivors which fall below the threshold for inclusion in the English Heritage Register.

It is important not only to protect and enhance the features of the historic parks and gardens on the English Heritage Register as well as those of local importance but also to protect their settings, and public views to and from them.

The Strategy gives West Sussex County Council the opportunity to improve the resilience of the local cultural heritage. Projects and investigation work can lead to improved access, appearance and protection of the surrounding area.

Projects proposed by the Strategy could impact negatively, such as those that involve construction, land-use change or alterations that detract from the environment. Any works conducted nearby should have due regard for altered flows and erosion that could in turn affect the future resilience of the site. Any works undertaken should be managed to minimise these risks from design stage. Construction may of course lead to further discovery and items of historic value.

There is a relationship between cultural heritage and flood risk management, and so this theme has been scoped into the SEA assessment.

Summary of the scope

Not all of the SEA topics are relevant to each plan, so scoping in and out is necessary at this stage to identify what the focus of the assessment is. The table below summarises the baseline information and the scope of the SEA, with justification.

Receptor	Topic	Scope	Justification
Population and Human Health	Population and properties at risk of flooding	☑	Work resulting from the Strategy will affect the people and property in a positive way.
	Social deprivation	☑	The Strategy will consider and prioritise those living in deprived areas.
	Employment	☑	Employment maybe created through flood risk related design and construction projects. Flood risk events also impact on existing emergency response roles.
	Health	☑	Physical and mental health can be affected by flooding. Contaminated flooding is common, as is the longer mental effect on those who been flooded. The Strategy aims to improve the Counties health in relation to flooding.
	Recreation and leisure	☑	Access to recreational space maybe impacted positively or negative by construction projects. Flood risk management could create additional leisure space.
Biodiversity, Flora and Fauna	Sites of international, national, and local importance	☑	West Sussex has several sites of international, national, and local importance. These sites hold a significant amount of recognised biodiversity that can be enhanced or eroded depending on water management.

Water and Water Quality	Water Quality		The Strategy includes investigations and processes to improve water quality.
	Flood Risk		The Strategy will reduce flood risk to communities across the county.
Air	Air Quality		The Strategy will not affect the air quality of the County and is therefore screened out.
Climate Change	Climate Change		The Strategy must account for future forecast changes, most notably sea level change with regard to any coastal or estuarine works.
Material Assets	Critical Infrastructure		The Strategy will manage risks to critical infrastructure as a priority.
	Housing		The Strategy provides further evidence to the locations most at risk. The work programme will link developer contributions to potential projects through planning control. The Strategy with therefore help manage sustainable housing growth.
	Economy		By reducing flooding the work supported by the Strategy will make the local economy more resilient during floods and more profitable in the long run.

	Transport infrastructure		The Strategy aims to reduce flooding to the infrastructure in the County, including the road and rail network.
	Waste and recycling		The Strategy is unlikely to affect the waste and recycling in the County and has been screened out.
	Minerals		Water level management may affect mineral abstraction but an impact is thought to be very low. Any negative impacts would need to be investigated and mitigated.
Soil, Geology and Geomorphology	Geology		The impact of the Strategy is unlikely to have any effect on geology of the county.
	Soils		Water management projects resulting from the Strategy have the potential to affect soils in flood risk areas. The county supports land areas of agricultural land that maybe affected by projects.
	Contaminated land		The Strategy will separate and manage flood risk and contaminated land areas. Flood risk or storage should not be increased or considered in areas of contamination.
Cultural, Architectural and Archaeological	Listed Buildings		The aim of the Strategy id to reduce flooding to property at risk, including listed buildings.

	Historic Environment		Areas of historic value may be impacted upon in negative or positive way. In reducing flood risk, these knock on effect would need to be closely considered.
Landscape and landscape use	Landscape		Opportunities may exist to improve the existing landscape character by incorporating land management at design stage.
	Land use		Flood risk management can influence land acquisition and land use. The level of risk at each site would be considered against the industry and output of the site.

A3 The Environmental Issues and Problems

The SEA process must provide information on any existing and relevant environmental problems in relation to key issues. The table identifies these issues and problems.

Key Issue	Description	Data Source	Problem
Population and properties at risk of flooding	Population as of 2011 Census was 806, 900. Population could rise to 863,100 by 2026.	Office for National Statistics Census 2011.	Increased risk or numbers at risk of flooding
Social deprivation	West Sussex is a relatively undeprived county ranking 130th out of a total of 152 upper tier authorities in England in 2010 for the Index of Multiple	Department for Communities and local Government	Significant changes to current status

	Deprivation. In relation to neighbouring authorities, West Sussex is relatively less deprived than Brighton and Hove (ranked 53rd) and East Sussex (ranked 90th) and more deprived than Hampshire (ranked 141st) and Surrey (ranked 150th) in 2010. The overall rate of low income families in West Sussex in 13.8%, well below the national average of 21.3%, but above the national target of 10% by 2020.	(DCLG).	
Employment	2.4% claiming job seekers allowance in 2011 (11,500 people out of work) £26,329 average salary	2010 Annual Survey of Hours and Earnings, ONS	Significant changes to current status
Health	Life expectancy at birth 2006/08 Male : 79 years (UK avg. 78 years) Female : 83 years (UK avg 82 years)	ONS life expectancy at birth 2006-08	Significant changes to current status
Recreation and leisure	Adur (35 parks and gardens) Worthing (56 parks and gardens) Chichester (117 acres) Crawley (9 parks and gardens) Horsham (400 hectares) Mid Sussex (9 parks and gardens)	District and Borough Councils	Significant changes to current status
Sites of	82 Sites of Special Scientific	JNCC	Significant

international, national, and local importance	Interest (SSSI) 2 National Nature Reserves (NNRs) 266 Sites of Nature Conservation Importance (SNCI) 23 Local Nature Reserves 4 Special Protection Areas (SPAs) 7 Special Areas for Conservation (SACs) 3 Ramsar sites 3 Areas of Outstanding Natural Beauty 1 National Park		changes to current status and number of sites
Water Quality	As of 2008, of the 84 water bodies in West Sussex: 69% moderate quality 2% bad quality 12% good quality 17% poor quality	River Basin Management Plan 2008	The potential for little or no improvement
Flood Risk	12.8% of West Sussex county is floodplain. 12,500 properties at risk of flooding from the sea or a river. 91,200 properties at risk of surface water flooding. 5,500 properties at risk from combined sources. Groundwater flood risk is increasing. Reliance on flood alleviation schemes, and coastal schemes	PFRA (West Sussex)	The potential increase to current numbers at risk

	to manage flood risk		
Climate Change	Increase in summer temperature by 2.8 degrees and winter by 2.2 degrees. Increase in winter precipitation by 16% and decease in winter by 19%. Sea level rise up to 1 meter. Possible amplification or urban heat island affect in summer months.	UK CCP (2009)	Significant changes to current status
Critical Infrastructure	2 of the 31 hospitals in West Sussex are within areas susceptible to surface water flooding (1 in 200 yr rainfall event) 164 Waste water and sewerage infrastructure buildings are within areas susceptible to surface water flooding (1 in 200 yr rainfall event) Of the 323 schools in West Sussex, 12 are in areas susceptible to surface water flooding (1 in 200 yr rainfall event) Of the 74 railway stations in West Sussex, 14 are in areas susceptible to surface water flooding (1 in 200 yr rainfall event)	Flood Map for Surface Water (PFRA mapping) The National Property Dataset	Significant changes to current status, increasing the amount of infrastructure at flood risk
Housing	74,600 homes per year to be built in West Sussex between now and 2026	The West Sussex County Plan	The potential for houses to be built in risk areas

Economy	20,100 businesses in West Sussex are in areas susceptible to surface water flooding (1 in 200 yr rainfall event)	PFRA (West Sussex)	Increased flood risk to businesses
Transport infrastructure	Several important roads including the A23, A24, A27 and A272	Flood Map for Surface Water (PFRA mapping)	An increase in flooding frequency or other infrastructure being affected
Soils	Soils tend to seasonally waterlogged Impact on agricultural land and production is possible	Catchment Flood Management Plans (2008)	Significant changes to current status
Contaminated land	213 of the 312 historic landfill sites are in areas susceptible to surface water flooding (1 in 200 yr rainfall event)	The National Property Dataset	Significant changes to current status
Listed Buildings	7,247 listed buildings, of which 730 are in areas susceptible to surface water flooding (1 in 200 yr rainfall event)	The National Property Dataset	Significant changes to current status
Historic Environment	1,500 sites in West Sussex are defined as Archaeologically Sensitive Areas	The National Property Dataset	Significant changes to current status
Landscape	The West Sussex Character Assessment identifies 42 separate and distinct areas throughout the County	Catchment Flood Management Plans (2008)	Significant changes to current status

A4 The SEA and Framework Task

The SEA framework requires a set of objectives that mark key indicators for future reviews to compared against. The indicators can be used to monitor the effects of the plans implementation.

SEA Objectives

SEA objectives have been drafted to cover the environmental factors scoped in. So that each factor can be measured in the future the objectives include assessment criteria. There following table shows the draft objectives.

SEA Objective	Key Issue	Potential monitoring indicators	How Often	When should action be considered	What could be done?
Minimise flood risk to property and businesses	12,500 properties at risk from river and sea flooding 91,200 properties at risk from surface water flooding 5,500 properties at risk from combined sources	Number of properties at risk Number of businesses at risk	Every 2 years	When conditions get worst	Consider prioritising projects
Enhance biodiversity	Sites of International and National importance (SPA, SAC, Ramsar, SSSI)	Changes in condition at sites Chemical and ecological status	Every 2 years	When conditions do not improve, or get worst	Consider prioritising projects
Protect and enhance quality of life	Current population is 806,900, increasing at 7% Deprivation areas	Number of flood related health reports Number of properties at risk Number of businesses at risk	Every 2 years	When conditions get worst	Prioritise deprived areas
Protect and enhance water quality and	The ecological and chemical status of water	The chemical and ecological status of	Every 2 years	When conditions get	Change current

resource	bodies Pressure on water abreaction and water supply	water bodies in West Sussex		worst	management technique
Minimise flood risk to infrastructure	Accessibility and function of key infrastructure sites	Number of flood events that affect transport, health care, education, water and power supply	Every 2 years	When conditions get worst	Consider prioritising projects
Protect soils	The contamination of water from historic landfill sites or industrial sites	The number of projects undertaken in areas where there are landfill sites or industrial areas. Changes to the quality of agricultural land	Every 2 years	When conditions get worst	Consider prioritising projects
Adapt to climate change	Climate change projections and related sea level rise Energy consumption	CO2 emissions Energy consumption levels per head The extent of areas at risk from flooding	Every 2 years	When conditions get worst	Consider prioritising projects
Enhance sites of interest	The countries cultural heritage and its long term resilience to flooding and	Number of listed buildings at flood risk Number of scheduled	Every 2 years	When conditions get	Consider prioritising projects

	potential damage	monuments at risk Number of schemes implemented to protect historical or cultural sites		worst	

Assessment Approach

The methodology checks each measure or project against each of the SEA objectives to ensure a positive effect is achieved. The assessment will consider the baseline information and effects that the project is expected to achieve. The significance score table is below.

Score	Description
Major positive ++	Significantly beneficial to SEA Objectives. Maximises opportunities for environmental enhancement or resolves existing environmental issues.
Minor positive +	Partially beneficial (not significant) to the SEA objectives. Contributes to resolving an existing environmental issue or offers some opportunities for enhancement.
Neutral (N)	Neutral effect on the SEA objectives.
Uncertain (?)	Insufficient detail on the option or baseline. Cannot effectively assess the significance of the option on the SEA objectives.
Minor negative X	Option would partly (not significantly) undermine the SEA objective. Option would contribute to an environmental issue or reduce opportunities for enhancement.
Major negative XX	Option would severely undermine the SEA objective. Will significantly contribute to an environmental problem or undermine opportunity for enhancement.

Secondary effects of the Strategy

Under the SEA Directive there is a requirement to continue to monitor the environmental impacts of the Strategy. This monitoring is key in recognising cumulative effects of the various projects undertaken, and, will indicate positive or negative changes in the baseline.

A5 Next Steps - Consultation

Consultation

The environmental report public consultation period runs from 17th June 2013 – 9th September 2013 alongside the Local Flood Risk Management Strategy. The revised environmental report will be the next output of the SEA process.

The majority of the projects within the Strategy are considered because they will have a positive effect on the environment and flood risk with the county. However, the effects of some of the measures, because they are not yet detailed, will be difficult to assess at the strategic level.

Any new project supported by the Strategy that is yet to fully investigate a problem, or has not yet reached detailed design stage, will require further environmental assessment. An Environmental Impact Assessment (EIA) will be required on projects to mitigate any adverse effects.

Natural England approval at screening stage will be required for any project or measure that could potentially have a significant effect on the environment.

How to comment on this report

Please consider the following points when making comments:

- Are any environmental indicators missing from the report?
- Do the objectives satisfactorily cover our environmental concerns?

Please send all comments addressed to West Sussex County Council at:

Drayton Depot
Drayton Lane
Drayton
Chichester
West Sussex
PO20 2BW

Or email:

Joss.carter@environment-agency.gov.uk

Please note consultation will end on the 9th September 2013.

NOTES PAGE

WS1354 June 2013

www.westsussex.gov.uk/floodconsultation