SURREY LOCAL FLOOD RISK MANAGEMENT STRATEGY

ANNEXE D – STRATEGIC ENVIRONMENTAL ASSESSMENT

SURREY

Surrey Local Flood Risk Management Strategy 2016

Non-Technical Summary to the Environmental Report

Prepared with reference to the requirements of the Environmental Assessment of Plans & Programmes Regulations 2004

July 2016

Contents

The following are available as separate documents:

Environmental Report for the Surrey Local Flood Risk Management Strategy

Appendix 1 Screening Assessment Records for the Objectives of the Strategy

Appendix 2 Assessment Records for the schemes identified in the 2016/17 Action Plan

Part 1: Introduction & Background

1.A Introduction

1.1 The requirement for strategic environmental assessment derives from a European Union Directive [(1)], implemented through a set of UK regulations [(2)]. For certain types of plans and programmes the Directive and Regulations require that, before the plan or programme is formally adopted, an assessment be made of the effects that implementation would be likely to have on the environment. The findings of that environmental assessment process must be taken into account in the development of the plan or programme.

1.2 The Directive identifies plans that are prepared by public authorities in relation to water management[(3)], and that set the context for projects that may require assessment under the terms of the Environmental Impact Assessment (EIA) Directive[(4)], as one of the categories of plans that require strategic environmental assessment.

1.3 The Environmental Report provides an account of the strategic environmental assessment (SEA) of the Surrey Local Flood Risk Management Strategy. The report examines the capacity of the different parts of the Strategy to give rise to adverse impacts and beneficial effects on ten different environmental receptors.

1.4 The non-technical summary for the Environmental Report sets out the key findings of the environmental assessment.

1.B Environmental receptors covered by the assessment

1.5 The environmental assessment examined the likely impacts and effects of the Surrey Local Flood Risk Management Strategy on ten different environmental receptors. For each receptor a number of pathways were identified, by which flood risk management schemes could be expected to affect the receptor.

[1] Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. *Official Journal of the European Communities*, L 197, 21/07/ 2001, pp 30-37.
[2] *The Environmental Assessment of Plans & Programmes Regulations 2004*, Statutory Instrument 2004 No. 1633, HM Government, London.
[3] Article 3 Paragraph 2(a) of Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. *Official Journal of the European Communities*, L 197, 21/07/2001, pp 30-37.
[4] Directive 85/337/EEC as amended by Directive 97/11/EC on the assessment of the environmental effects of certain public and private projects on the environment. *Official Journal of the European Communities,* L 175, 05/07/1985, p. 40 & L 73, 14/03/1997, p.5.

1.6 The ten environmental receptors covered by the environmental assessment were:

- Air Quality
- Climate Change
- Land, Soil & Geology
- Materials Efficiency & Waste
- Water Resources & Management
- Built Environment
- Historic Environment & Archaeology
- Natural Environment & Biodiversity
- Landscape & Visual Amenity
- Welfare, Health & Well-being

1.7 Further information about the impact pathways for each environmental receptor is given in Annex 1 to this non-technical summary

1.8 Each of the schemes identified in the Action Plan for 2016/17, and the objectives for the Strategy were assessed to determine how their implementation might affect the ten environmental receptors.

1.C How the assessment was carried out

1.9 The likely environmental impacts of the different parts of the Surrey Local Flood Risk Management Strategy were classified as follows (see Table 1-A). The assessment was made on the basis of information provided about the Strategy objectives and the actions that would be taken under each objective, and about the schemes identified in the Action Plan for 2012/13.

Table 1-A: Classifications of Impact Significance

Impact & Effect Classification		Explanation
Significant Adverse Impact	✗	Where the risk of an adverse impact arising from implementation of the strategy is determined to be significant, that judgement has been made on the basis that an individual project or scheme might require EIA, or Appropriate Assessment (AA), as part of the project consent or licensing process.
Adverse Impact	✗	Where the actions that might be undertaken have the potential to give rise to adverse impacts on the environment, but would not be likely to require EIA or AA at the project consent or licensing stage, those impacts are classed as non-significant.
Significant Beneficial Effect	✓	Where the opportunities for beneficial effects arising from implementation of the strategy is determined to be significant, that judgement has been made on the basis that an individual project or scheme be address known and significant problems (e.g. improving flood protection in areas with a history of surface water flooding).
Beneficial Effect	✓	Where the actions that might be undertaken have the potential to give rise to beneficial effects on the environment, but would not address known and significant problems, those effects are classed as non-significant.

Impact & Effect Classification		Explanation
No impact or effect	○	Where the actions that might be undertaken are unlikely to give rise to risks of adverse impacts or opportunities for beneficial effects on the environment.

1.D Surrey Local Flood Risk Management Strategy 2016

1.10 The structure of the Surrey LFRMS 2016 is described in section 1 (p.4) of the strategy document, which explains the relationship of the strategic aim, the seven principles, the eight objectives and the eight action plans (see Figure 1-A).

Figure 1-A: Structure of the Surrey LFRMS 2016

Strategic Aim: To understand the interaction between all sources of flooding & lead a co-ordinated, multi-agency approach for minimising the impact of flooding on Surrey residents

Principle 1: A long-term vision	Principle 2: A catchment based approach	Principle 3: Partnership working	Principle 4: Community resilience	Principle 5: Enhancing growth & wellbeing	Principle 6: Sustainable development through spatial planning & development	Principle 7: Capital investment

Objective 1: Our understanding of local & strategic flood risk will be improved through clear data management & sharing between RMAs to ensure partnership delivery of works to high risk areas	4 Actions	
Objective 2: We will reduce flood risk by delivering an effective maintenance regime for drainage assets & managing of our estates across the county in a sustainable manner	5 Actions	
Objective 3: We will agree with partners who the RMAs in Surrey are, jointly define their responsibilities & establish clear lines of communication with them to support the delivery of partnership-based flood alleviation projects	4 Actions	
Objective 4: Private owners will be made aware of their riparian responsibilities to maintain drainage assets & watercourses. We will support, promote & enforce these responsibilities	5Actions	
Objective 5: The residents of Surrey will be supported to improve community resilience. Local people will be empowered to reduce the risk of flooding on both an individual & community level	5 Actions	
Objective 6: We will reduce the risk of flooding from new & existing development through local planning policy & processes	7 Actions	
Objective 7: We will reduce flood risk from local sources via a programme of capital works, which will be integrated with the activities of other RMAs	5 Actions	
Objective 8: We will investigate significant flooding incidents in order to feedback recommendations to reduce flood risk	3 Actions	

1.11 The principles of the strategy are introduced in section 1 (p.4) of the strategy document, and are further explained in section 4 (pp.5-6). The objectives for the strategy, and the actions that will be taken in pursuit of those objectives, are discussed in section 5 (pp.7-9), with further details of the action plans provided in an annex to the document.

1.12 Implementation of the strategy will be supported by a programme of infrastructure projects, to be led by Surrey County Council, which will seek to address the problems that affect areas prone to surface water flooding or groundwater flooding. That programme of infrastructure schemes will be revised on an annual basis, and focuses on surface water flooding issues that affect the highways network. The schemes listed in the action plan for 2016/17 include sixteen schemes that will deliver improvements to existing highways drainage infrastructure, and ten schemes that will develop the business case for drainage improvement works, or will investigate areas affected by surface water flooding with a view to informing the development of future infrastructure improvement schemes.

Part 2 Summary of Assessment & Key Recommendations

2.A Introduction

2.1 For each of the environmental receptors covered by the assessment framework the key findings of the LFRMS assessment have been summarised, and a series of recommendations are made as to the steps that could be taken to address adverse impacts, to enhance beneficial effects, and to monitor and report on performance.

2.B Air Quality

2.2 Section 3 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to short term, temporary adverse impacts on air quality, as a consequence of emissions from vehicles , plant and machinery used to construct new flood management infrastructure (impact pathway AQ1), and emissions of nuisance dust during construction works (impact pathway AQ2). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
AQ1 – Emissions from the burning of fossil fuels	Adverse	×
Suggested Actions	Ascertain whether potential site is located within, or close to, an Air Quality Management Area (AQMA). Consult relevant LPA on the need for EIA in respect of the air quality impacts of traffic. Traffic management plan / method statement in place for all schemes where traffic is likely to be an issue.	

Impact Pathway	Strategy Impact	
AQ2 – Emissions of nuisance dust or nuisance odours	Adverse	×
Suggested Actions	Consult with Environmental Health Office (EHO) at District Council (DC) or Borough Council (BC) on dust management. Dust management plan / method statement in place for all schemes where dust is likely to be an issue.	

2.C Climate Change

2.3 Section 4 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to small scale impacts on climate change, as a consequence of emissions from vehicles , plant and machinery used to construct new flood management infrastructure (impact pathway CC1). The LFRMs was assessed as having no impact on

climate change as a consequence of changes in land use (impact pathway CC2). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
CC1 – Emissions from the burning of fossil fuels	Adverse	×
Suggested Actions	Investigate the feasibility of using alternatives to fossil fuels to meet direct energy demands associated with the construction of new flood risk management facilities (e.g. replacing diesel vehicles with LPG vehicles, etc.). Maximise the use of locally produced materials, & of recycled & recovered materials to reduce indirect energy consumption (especially embodied energy). Investigate the feasibility of using renewables to meet operational energy demands for flood management equipment (e.g. photovoltaics for electricity requirements).	

Impact Pathway	Strategy Impact	
CC2 – Emissions from changes in land use	No impact	○
Suggested Actions	None recommended.	

2.D Land, Soil & Geology

2.4 Section 5 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to small scale impact as a consequence of the demand for mineral resources that could be expected to arise from the construction of new flood management infrastructure (impact pathway LSG2). The LFRMs was assessed as having no impact on the receptor as a consequence of changes in land use (impact pathway LSG1). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
LSG1 – Changes in land use & associated impacts on soil	No impact	○
Suggested Actions	None recommended.	

Impact Pathway	Strategy Impact	
LSG2 – Demand for mineral resources	Adverse	×
Suggested Actions	Maximise the use of recycled & secondary mineral resources in the construction & maintenance of the new flood risk management facilities, to off-set demand for primary resources. Consult the Minerals Planning Authority (MPA) on the need for minerals planning permission, where schemes would involve the extraction & re-deposit of inert material (e.g. bund or dam creation).	

2.E Materials Efficiency & Waste

2.5 Section 6 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to adverse impacts as a consequence of the use of material resources during construction works (impact pathway MEW1), and the generation of wastes during construction and ongoing maintenance of flood management infrastructure (impact pathway MEW2). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
MEW1 – Consumption of material resources	Adverse	✗
Suggested Actions	Maximise the use of recycled & secondary mineral resources in the construction & maintenance of the new flood risk management facilities, to off-set demand for primary resources.	

Impact Pathway	Strategy Impact	
MEW2 – Generation of wastes	Adverse	✗
Suggested Actions	Consult the Waste Planning Authority (WPA) on the need for waste planning permission, & the Environment Agency on the need for an Environmental Permit where schemes would involve the deposit of inert material imported from elsewhere (e.g. bund or dam creation). Waste management plan / method statement in place for all schemes where waste is likely to be an issue.	

2.F Water Resources & Management

2.6 Section 7 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to significant beneficial impacts on the management of flood risk (impact pathway WRM1), and to beneficial impacts on water quality as a consequence of improved management of highways runoff (impact pathway WRM2). The LFRMs was assessed as having no impact on demand for water resources (impact pathway WRM3). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
WRM1 – Impacts on flow paths & floodplains	Significant Beneficial	✓
Suggested Actions	Maximise the scale & extent of flood risk reduction that can be delivered by the provision of the new flood risk management infrastructure. Consult LLFA on the need for relevant consents (e.g. Ordinary Watercourse Consent, SuDS approval, etc.).	

Impact Pathway	Strategy Impact	
WRM2 – Impacts on water quality	Beneficial	✓
Suggested Actions	Maximise the scale & extent of flood risk reduction that can be delivered by the provision of the new flood risk management infrastructure. Consult LLFA on the need for relevant consents (e.g. Ordinary Watercourse Consent, SuDS approval, etc.).	

Impact Pathway	Strategy Impact	
WRM3 – Demand for water resources	No impact	○
Suggested Actions	None recommended.	

2.G Built Environment

2.7 Section 8 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to significant beneficial impacts on existing buildings and built structures through improved flood risk management (impact pathway BE2), and to short term, temporary adverse impacts on townscape character, as a consequence of construction works (impact pathway BE1). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
BE1 – Impacts on townscape character	Adverse	×
Suggested Actions	Require that contractors be members of the 'Considerate Contractors' scheme. Ensure that contractors compounds & associated facilities are located sensitively, and for the shortest period of time feasible. Ensure that traffic, noise & dust is minimised through the implementation of appropriate management plans.	

Impact Pathway	Strategy Impact	
BE2 – Impacts on built structures	Significant Beneficial	✓
Suggested Actions	Maximise the number of properties benefiting from an improved level of flood protection as a consequence of the delivery of the new flood management scheme. Consult the Environment Agency, LLFA & relevant LPAs to ensure the design of the scheme is fit for purpose & capable of adapting to the impacts of future development on the behaviour of the catchment.	

2.H Historic Environment & Archaeology

2.8 Section 9 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to adverse impacts on known and unknown archaeological assets as a consequence of the construction of new flood management infrastructure (impact pathway HEA1), and to significant beneficial impacts on built heritage through improved flood risk management (impact pathway HEA2). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
HEA1 – Impacts on archaeological assets	Adverse	✗
Suggested Actions	Minimise the amount of land permanently altered as a consequence of the development of new flood management infrastructure. Where a Scheduled Monument, County Site of Archaeological Importance (CSAI), or Area of High Archaeological Potential (AHAP) could be affected by a scheme consult Historic England & the County Archaeologist. Management plan / method statement in place for all schemes where there is potential for impacts on heritage assets.	

Impact Pathway	Strategy Impact	
HEA2 – Impacts on built heritage or historic landscape	Significant Beneficial	✓
Suggested Actions	Maximise the number of properties benefiting from an improved level of flood protection as a consequence of the delivery of the new flood management scheme. Consult the Environment Agency, LLFA & relevant LPAs to ensure the design of the scheme is fit for purpose & capable of adapting to the impacts of future development on the behaviour of the catchment. Where a Listed Building, Conservation Area, Registered Park & Garden, AONB or National Park could be affected by a scheme consult the relevant authorities (e.g. Historic England, DC or BC Conservation Officers, the Surrey Hills AONB Partnership, the High Weald AONB Unit, or the South Downs National Park Authority). Management plan / method statement in place for all schemes where there is potential for impacts on heritage assets.	

2.I Natural Environment & Biodiversity

2.9 Section 10 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to a combination of beneficial and significant adverse impacts on the natural environment, as a consequence of the construction of new flood management infrastructure (impact pathway NEB1). The LFRMs was assessed as having no indirect impacts on the natural environment (impact pathway NEB2). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
NEB1 – Direct impacts on habitats & species	Beneficial	✓
	Significant Adverse	×
Suggested Actions	Minimise the amount of land permanently altered as a consequence of the development of the new flood risk management facilities. Maximise the amount of ecological enhancement (i.e. new high quality habitat created) delivered through the creation of new flood risk management facilities Consult relevant LPA & Natural England on the need for EIA, & Habitat Regulations Assessment (HRA) where relevant, in respect of impacts on ecology. Consult Natural England on the need for species licensing, & approvals under Section 28 (SSSIs) of the Wildlife & Countryside Act (W&CA) 1981 (as amended). Consult the County Ecologist, & the Surrey Wildlife Trust. Management plan / method statement in place for all schemes where there is potential for impacts on ecology.	

Impact Pathway	Strategy Impact	
NEB2 – Indirect impacts on habitats & species	No impact	○
Suggested Actions	None recommended.	

2.J Landscape & Visual Amenity

2.10 Section 11 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to beneficial impacts on landscape character (impact pathway LVA1) and visual amenity (LVA2) through the design and implementation of new flood management infrastructure. Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
LVA1 – Impacts on landscape character	Beneficial	✓
Suggested Actions	Maximise the amount of landscape enhancement delivered through the creation of new flood risk management facilities Consult Natural England, the LPA, the County Landscape Architect, the Surrey Hills AONB partnership, the High Weald AONB Unit, or the South Downs NPA as appropriate, to ensure the design of the scheme is appropriate to the context in which it would be delivered. Management plan / method statement in place for all schemes where there	

Impact Pathway	Strategy Impact	
LVA2 – Impacts on visual amenity	Beneficial	✓

Suggested Actions	Ensure that new structures or features created as part of flood risk management schemes are in keeping with the character of the area affected, in terms of the visual amenity. Consult Natural England, the LPA, the County Landscape Architect, the Surrey Hills AONB partnership, the High Weald AONB Unit, or the South Downs NPA as appropriate, to ensure the design of the scheme is appropriate to the context in which it would be delivered. Management plan / method statement in place for all schemes where there is potential for impacts on the visual amenity.

2.K Welfare, Health & Wellbeing

2.11 Section 12 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to significant beneficial impacts in terms of physical health (impact pathway WHWB1), and mental wellbeing (impact pathway WHWB2), as a consequence of improved flood risk management. Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
WHWB1 – Changes in exposure to risks to physical health & well-being	Significant Beneficial	✓
WHWB2 – Changes in exposure to risks to mental health & well-being	Significant Beneficial	✓
Suggested Actions	Maximise the number of people benefiting from an improved level of flood protection as a consequence of the delivery of the new flood risk management scheme. Consult the Environment Agency, LLFA & relevant LPAs to ensure the design of the scheme is fit for purpose & capable of adapting to the impacts of future development on the behaviour of the catchment.	

Annex 1: Environmental Receptors & Impact Pathways

Environmental Receptors	Impact Pathways
Air Quality: The air quality receptor is concerned with potential impacts on the atmosphere in terms of levels of sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10}), ground level ozone (O_3), dust and other sources of localised air pollution. *Listed as 'air' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'air' in paragraph (6)(h) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway AQ1: Emissions from the burning of fossil fuels Impact Pathway AQ2: Emissions of nuisance dust or nuisance odours
Climate Change: The receptor covers effects on the emission of greenhouse gases in relation to the generation of energy by conventional and alternative means, and the use of energy for heating, lighting, power and transportation. *Listed as 'climatic factors' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'climatic factors' in paragraph (6)(i) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway CC1: Emissions from the burning of fossil fuels Impact Pathway CC2: Emissions from changes in land use
Land, Soil & Geology: The receptor covers the effects of development on land use, and the safeguarding of soil quality and mineral resources. *Listed as 'soil' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'soil' in paragraph (6)(f) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway LSG1: Changes in land use & associated impacts on soils Impact Pathway LSG2: Demand for mineral resources
Materials Efficiency & Waste: The receptor covers effects on the generation of wastes and the management of waste disposal, the recovery, reuse and recycling of materials, and the efficiency with which existing infrastructure is used. *Listed as 'material assets' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'material assets' in paragraph (6)(j) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway MEW1: Consumption of material resources Impact Pathway MEW2: Generation of wastes
Water Resources & Management: The receptor covers effects on the biological and chemical quality of surface waters and ground waters, the use and management of water resources, and the management of flooding and flood risk. *Listed as 'water' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'water' in paragraph (6)(g) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway WRM1: Impacts on flow paths & floodplains Impact Pathway WRM2: Impacts on water quality Impact Pathway WRM3: Demand for water resources

Environmental Receptors	Impact Pathways
Built Environment: The receptor covers effects on the quality and character of the built environment in existing and new developments, and in the provision of new and maintenance of existing infrastructure. *Listed as 'material assets' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'material assets' in paragraph (6)(j) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway BE1: Impacts on townscape character Impact Pathway BE2: Impacts on built structures
Historic Environment & Archaeology: The receptor covers effects on the historic environment in terms of archaeological assets and sites, buildings, structures and features of historic significance and value. *Listed as 'cultural heritage including architectural & archaeological heritage' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'cultural heritage, including architectural & archaeological heritage' in paragraph (6)(h) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway HEA1: Impacts on archaeological assets Impact Pathway HEA2: Impacts on built heritage or historic landscapes
Natural Environment & Biodiversity: The receptor covers effects on the natural environment in terms of plants, animals and earth heritage assets, and on biodiversity in terms of habitats and species. A separate Habitat Regulations Assessment report has been prepared for the strategy. *Listed as 'biodiversity', 'fauna' &'flora' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'biodiversity', 'fauna' and 'flora' in paragraphs (6)(a), (d) & (e) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway NEB1: Direct impacts on habitats & species Impact Pathway NEB2: Indirect impacts on habitats & species
Landscape & Visual Amenity: The receptor covers effects on the character and integrity of the landscape and the effects that changes have on visual amenity. *Listed as 'landscape' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'landscape' in paragraph (6)(l) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway LVA1: Impacts on landscape character Impact Pathway LVA2: Impacts on visual amenity
Welfare, Health & Well-being: The receptor covers effects on the human population resident in the area covered by the plan in terms of impacts on their welfare, health and wellbeing (e.g. noise, odour, light pollution, etc.). *Listed as 'population' & 'human health' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'population' & 'human health' in paragraphs (6)(b) & (c) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway WHWB1: Changes in exposure to risks to physical health & well-being Impact Pathway WHWB2: Changes in exposure to risks to mental health & well-being

Surrey Local Flood Risk Management Strategy 2016

Environmental Report

Prepared with reference to the requirements of the Environmental Assessment of Plans & Programmes Regulations 2004

July 2016

SURREY

Statement of Purpose

This environmental report has been prepared by Surrey County Council's in-house environmental assessment service, which comprises of a single officer within the County Council's Minerals & Waste Planning service. Minerals & Waste Planning is located within the Environment & Infrastructure Directorate.

The Flood Risk Management Strategy & Partnerships Team has commissioned the report, and the strategic environmental assessment of which it forms the final output, as part of the local flood risk management strategy preparation process.

The report identifies and assesses the likely significant environmental impacts of the new local flood risk management strategy, and recommends steps that could be taken to address those potential effects. The report is prepared in response to the requirements set out in the Environmental Assessment of Plans & Programmes Regulations 2004 (Statutory Instrument 2004 No.1633).

Statement of Limitations

This report has been prepared for the sole use of Surrey County Council's Flood Risk Management Strategy & Partnerships Team ("Client"). No other warranty, expressed or implied, is made as to the professional advice included in this report or any other services provided by the County Council's environmental assessment service.

The preparation of this report was undertaken between May 2016 and July 2016, and is based on the information available to the County Council's environmental assessment service during that period of time. The scope of this report is accordingly factually limited by these circumstances.

Contents

This page is left intentionally blank

Requirements of the Environment Assessment of Plans & Programmes Regulations 2004 (Statutory Instrument 2004 No.1633)

Requirements of the Environmental Assessment of Plans & Programmes Regulations 2004 (as set out in Schedule 2)	Where to find the relevant information in the Environmental Report & Appendices
1. An outline of the contents & main objectives of the plan or programme, and of its relationship to other relevant plans & programmes.	The contents & main objectives of the Local Flood Risk Management Strategy, & the wider policy context for the strategy are set out in Section 2 of the Environmental Report.
2. The relevant aspects of the current state of the environment & the likely evolution thereof without implementation of the plan or programme.	See sections X.2 of Sections 3 to 12 of the Environmental Report.
3. The environmental characteristics of the area likely to be significantly affected.	See section X.2 of Section 3 to 12 of the Environmental Report, & Appendix 2 to the Environmental Report
4. Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Council Directive 79/409/EEC on the conservation of wild birds & the Habitats Directive.	See section X.2 of Sections 3 to 12 of the Environmental Report.
5. The environmental protection objectives established at international, Community or Member State level, which are relevant to the plan or programme & the way those objectives & any environmental considerations have been taken into account during its preparation.	The relevance of environmental protection objectives to the Local Flood Risk Management Strategy is covered in Sections 3 to 12 of the Environmental Report.
6. The likely significant effects on the environment, including short, medium & long-term effects, permanent & temporary effects, positive & negative effects, & secondary, cumulative and synergistic effects, on issues such as:	See Sections 3 to 12 of the Environmental Report & the Appendices to the Environmental Report.
(a) biodiversity;	See Section 10 of the Environmental Report & all parts of the Appendices to the Environmental Report.
(b) population;	See Section 12 of the Environmental Report & all parts of the Appendices to the Environmental Report.
(c) human health;	See Section 12 of the Environmental Report & all parts of the Appendices to the Environmental Report.
(d) fauna;	See Section 10 of the Environmental Report & all parts of the Appendices to the Environmental Report.
(e) flora;	See Section 10 of the Environmental Report & all parts of the Appendices to the Environmental Report.
(f) soil;	See Section 5 of the Environmental Report & all parts of the Appendices to the Environmental Report.
(g) water;	See Section 7 of the Environmental Report & all parts of the Appendices to the Environmental Report.

Requirements of the Environmental Assessment of Plans & Programmes Regulations 2004 (as set out in Schedule 2)	Where to find the relevant information in the Environmental Report & Appendices
(h) air;	See Section 3 of the Environmental Report & all parts of the Appendices to the Environmental Report.
(i) climatic factors;	See Section 4 of the Environmental Report & all parts of the Appendices to the Environmental Report.
(j) material assets;	See Section 6 & 8 of the Environmental Report & all parts of the Appendices to the Environmental Report.
(k) cultural heritage, including architectural & archaeological heritage;	See Section 9 of the Environmental Report & all parts of the Appendices to the Environmental Report.
(l) landscape; &	See Section 11 of the Environmental Report & all parts of the Appendices to the Environmental Report.
(m) the inter-relationship between the above.	See Section 3 to 12 of the Environmental Report.
7. The measures envisaged to prevent, reduce & as fully as possible off-set any significant adverse effects on the environment of implementing the plan or programme.	See the main analytical sections (Sections 3 to 12) of the Environmental Report & the Appendices to the Environmental Report.
8. An outline of the reasons for selecting the alternatives dealt with, & a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information.	See Section 2 of the Environmental Report. See Section 1 of the Environmental Report for a description of how the assessment was undertaken.
9. A description of measures envisaged concerning monitoring in accordance with regulation 17.	See Section 13 of the Environmental Report.
10. A non-technical summary of the information provided under paragraphs 1 to 9 above.	See separate Non-Technical Summary.

List of Abbreviations

AA	Appropriate Assessment
AGLV	Area of Great Landscape Value
ALC	Agricultural Land Classification
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
AWI	Ancient Woodland Inventory
BAP	Biodiversity Action Plan
BC	Borough Council
CFMP	Catchment Flood Management Plan
CO	Carbon monoxide
CO_2	Carbon dioxide
CPA	County Planning Authority
DC	District Council
DCLG	Department for Communities & Local Government
DCMS	Department for Culture, Media & Sport
Defra	Department for the Environment, Food & Rural Affairs
DfT	Department for Transport
DMC	Domestic Material Consumption
EHO	Environmental Health Office
EIA	Environmental Impact Assessment
EPS	European Protected Species
ES	Environmental Statement
F&WMA 2010	Flood & Water Management Act 2010
FRA	Flood Risk Assessment
GCR	Geological Conservation Review
GHG	Greenhouse Gas
HAP	Habitat Action Plan
HCs	Hydrocarbons
HER	Historic Environment Record
HFCs	Hydrofluorocarbons
HRA	Habitat Regulations Assessment
LA	Local Authority
LBAP	Local Biodiversity Action Plan
LDA 1991	Land Drainage Act 1991
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority

LNR	Local Nature Reserve
LPA	Local Planning Authority
MPA	Minerals Planning Authority
NFCERMS	National Flood & Coastal Erosion Risk Management Strategy
NAQS	National Air Quality Strategy
NH_3	Ammonia
NNR	National Nature Reserve
N_2O	Nitrous oxide
NO_x	Nitrogen oxides
NO_2	Nitrogen dioxide
NPA	National Park Authority
NPPF	National Planning Policy Framework
O_3	Ozone
OWC	Ordinary Water Course
PFCs	Perfluorocarbons
PM_{10} & $PM_{2.5}$	Particulate matter
PFRA	Preliminary Flood Risk Assessment
RBMP	River Basin Management Plan
RIGS	Regionally Important Geological Site
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SF_6	Sulphur hexafluoride
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SNCI	Site of Nature Conservation Importance
SO_2	Sulphur dioxide
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
TDM	Transport Development Management
W&CA 1981	Wildlife & Countryside Act 1981 (as amended)
WFD	Water Framework Directive
WPA	Waste Planning Authority

Section 1: Introduction to the Environmental Report for the Surrey Local Flood Risk Management Strategy 2016

1.A The need for strategic environmental assessment

1.1 The requirement for strategic environmental assessment (SEA) derives from a European Union (EU) Directive [(1)], which requires that a systematic assessment and evaluation be undertaken of the environmental impacts of certain types of plans and programmes (and reasonable alternatives), and that the findings of that work be taken into account in the decision making process relating to the proposed plan or programme. The SEA Directive has been transposed into UK law through the Environmental Assessment of Plans & Programmes Regulations 2004 (Statutory Instrument 2004 No.1633).

1.2 The SEA Directive identifies plans that are prepared by public authorities in relation to water management[(2)] and that set the context for the future development consent of projects of the types listed in the Environmental Impact Assessment (EIA) Directive[3], as one of the categories of plans and programmes that require SEA.

1.3 The purpose of the Environmental Report is to provide an account of the SEA of the proposed Surrey Local Flood Risk Management Strategy (LFRMS). The report examines the extent to which the LFRMS could give rise to significant environmental impacts and effects.

1.4 The SEA of the Surrey LFRMS has been prepared to satisfy the requirements of EU Directive and the UK Regulations, which requires that the environment be taken into account in plan and programme making, and to help to inform the plan making process, by offering a critique of the proposals under consideration and their likely consequences for the environment.

1.5 The Surrey LFRMS will also be subject to Habitat Regulations Assessment (HRA), as required by the EU Habitats Directive (92/43/EEC) and the UK Conservation of Habitats & Species Regulations 2010 (SI 2010 No.490) (as amended) to protect the integrity of

[1] Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. *Official Journal of the European Communities*, L 197, 21/07/ 2001, pp 30-37.

[2] Article 3 Paragraph 2(a) of Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. *Official Journal of the European Communities*, L 197, 21/07/2001, pp 30-37.

[3] Directive 85/337/EEC as amended by Directive 97/11/EC on the assessment of the environmental effects of certain public and private projects on the environment. *Official Journal of the European Communities,* L 175, 05/07/1985, p. 40 & L 73, 14/03/1997, p.5. The EIA Directive is transposed into UK law through a range of Statutory Instruments, of which the most pertinent for the LFRMS are the Town & Country Planning (Environmental Impact Assessment) Regulations 2011 (SI 2011 No.1824) (which replaced SI 1999 No.293 in England on 24 August 2011) and the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999 (SI 1999 No.1793) (as amended by SI 2005 No.1399 and SI 2006 No.618).

sites designated, or proposed for designation, under the EU Habitats Directive (92/43/EEC) (Special Areas of Conservation or SACs), and the EU Wild Birds Directive (2009/147/EC) (Special Protection Areas or SPAs). The findings and conclusions of the HRA will be documented in a separate report.

1.B The requirements of the SEA Directive & Regulations

1.6 The SEA must be carried out in accordance with the requirements set out in Schedule 2 of the UK Regulations, and Annex I of the EU Directive. The following information should be provided and be made available in two formats – a full report which includes technical detail, and a non-technical summary that sets out the key findings and conclusions in non-technical language.

- A description of the plan and analysis of its relationship with other relevant plans and programmes, and an outline of the alternatives to the proposed plan that will be subjected to an assessment in parallel to the plan to enable the comparative analysis of its impact on the environment.
- A description of the current state of the environment in the area covered by the plan, including aspects that are likely to be significantly affected and any relevant existing environmental problems, and an analysis of its likely future condition in the absence of the proposed plan.
- Description and assessment of the likely significant effects of the proposed plan on the following environmental receptors: air quality; biodiversity, flora & fauna (plant & animal populations); climatic factors; cultural heritage (including architecture & archaeology); human population & health; landscape; material assets; soil; water resources
- The effects of the plan should be described and assessed in terms of their duration (short, medium or long term, and permanent or temporary), their consequence (beneficial or adverse), their status (direct, indirect or induced) and their capacity to contribute to cumulative and synergistic impacts.
- Description of measures that could be taken to prevent, minimise or compensate for the significant adverse effects that the proposed plan is expected to have on the environment, and of the steps that should be taken to monitor and report on the actual environmental performance of the plan when it is implemented.

1.7 The SEA process may help to support the implementation of the Surrey Local Flood Risk Management Strategy, providing information about the potential environmental consequences of the schemes that would be brought forward under the strategy's objectives. The SEA can enable those implementing the strategy to take early and effective account of the likely environmental consequences of the schemes that are being delivered, and to take appropriate action to address any adverse impacts.

1.C The method of assessment

1.C.1 The assessment framework

1.8 The assessment framework for the Surrey LFRMS is formed of a series of environmental receptors (see Table 1-A). The receptors relate to the environmental topics identified by the relevant European and UK environmental assessment legislation[4].

1.9 The purpose of the assessment is to identify where schemes that would be brought forward under the Surrey LFRMS strategy might place the environment at risk of significant adverse impacts, and to suggest ways in which those risks could be avoided or mitigated.

Table 1-A: Framework for the assessment of the Surrey LFRMS

Environmental Receptors	Impact Pathways
Air Quality: The air quality receptor is concerned with potential impacts on the atmosphere in terms of levels of sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10}), ground level ozone (O_3), dust and other sources of localised air pollution. *Listed as 'air' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'air' in paragraph (6)(h) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway AQ1: Emissions from the burning of fossil fuels Impact Pathway AQ2: Emissions of nuisance dust or nuisance odours
Climate Change: The receptor covers effects on the emission of greenhouse gases in relation to the generation of energy by conventional and alternative means, and the use of energy for heating, lighting, power and transportation. *Listed as 'climatic factors' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'climatic factors' in paragraph (6)(i) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway CC1: Emissions from the burning of fossil fuels Impact Pathway CC2: Emissions from changes in land use
Land, Soil & Geology: The receptor covers the effects of development on land use, and the safeguarding of soil quality and mineral resources. *Listed as 'soil' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'soil' in paragraph (6)(f) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway LSG1: Changes in land use & associated impacts on soils Impact Pathway LSG2: Demand for mineral resources
Materials Efficiency & Waste: The receptor covers effects on the generation of wastes and the management of waste disposal, the recovery, reuse and recycling of materials, and the efficiency with which existing infrastructure is used. *Listed as 'material assets' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'material assets' in paragraph (6)(j) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway MEW1: Consumption of material resources Impact Pathway MEW2: Generation of wastes

[4] Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. *Official Journal of the European Communities*, L 197, 21/07/ 2001, pp 30-37. *The Environmental Assessment of Plans & Programmes Regulations 2004*, Statutory Instrument 2004 No. 1633, HM Government, London.

Environmental Receptors	Impact Pathways
Water Resources & Management: The receptor covers effects on the biological and chemical quality of surface waters and ground waters, the use and management of water resources, and the management of flooding and flood risk. *Listed as 'water' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'water' in paragraph (6)(g) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway WRM1: Impacts on flow paths & floodplains Impact Pathway WRM2: Impacts on water quality Impact Pathway WRM3: Demand for water resources
Built Environment: The receptor covers effects on the quality and character of the built environment in existing and new developments, and in the provision of new and maintenance of existing infrastructure. *Listed as 'material assets' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'material assets' in paragraph (6)(j) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway BE1: Impacts on townscape character Impact Pathway BE2: Impacts on built structures
Historic Environment & Archaeology: The receptor covers effects on the historic environment in terms of archaeological assets and sites, buildings, structures and features of historic significance and value. *Listed as 'cultural heritage including architectural & archaeological heritage' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'cultural heritage, including architectural & archaeological heritage' in paragraph (6)(h) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway HEA1: Impacts on archaeological assets Impact Pathway HEA2: Impacts on built heritage or historic landscapes
Natural Environment & Biodiversity: The receptor covers effects on the natural environment in terms of plants, animals and earth heritage assets, and on biodiversity in terms of habitats and species. A separate Habitat Regulations Assessment report has been prepared for the strategy. *Listed as 'biodiversity', 'fauna' &'flora' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'biodiversity', 'fauna' and 'flora' in paragraphs (6)(a), (d) & (e) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway NEB1: Direct impacts on habitats & species Impact Pathway NEB2: Indirect impacts on habitats & species
Landscape & Visual Amenity: The receptor covers effects on the character and integrity of the landscape and the effects that changes have on visual amenity. *Listed as 'landscape' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'landscape' in paragraph (6)(l) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway LVA1: Impacts on landscape character Impact Pathway LVA2: Impacts on visual amenity
Welfare, Health & Well-being: The receptor covers effects on the human population resident in the area covered by the plan in terms of impacts on their welfare, health and wellbeing (e.g. noise, odour, light pollution, etc.). *Listed as 'population' & 'human health' in paragraph (f) of Annex I to EU Directive 2001/42/EC* *Listed as 'population' & 'human health' in paragraphs (6)(b) & (c) of Schedule 2 to UK Statutory Instrument 2004 No.1633*	Impact Pathway WHWB1: Changes in exposure to risks to physical health & well-being Impact Pathway WHWB2: Changes in exposure to risks to mental health & well-being

1.C.2 Determining impact significance

1.10 The Surrey LFRMS is composed of a strategic aim, a number of principles, a number of objectives and a range of supporting action plans (see section 2 of this report). The LFRMS will be implemented through a range of capacity building and communications

actions, and a rolling programme of infrastructure projects and schemes. The latter are identified in an annual action plan.

1.11 The strategy's objectives have been subject to a screening assessment, the purpose of which was to ascertain the extent to which they might generate infrastructure projects that may require statutory Environmental Impact Assessment (EIA), or 'appropriate assessment', in line with the requirements of EU EIA Directive in the former case, or of Article 6(3) of the EU Habitats Directive in the latter. The findings of those screening assessments are recorded in Appendix 1 to this report, and summarised in sections 3 to 12.

1.12 For the proposed infrastructure projects a more detailed phase of the assessment was carried out. Each scheme was assessed on the basis of the information currently available about the project. For each proposed scheme the significance of the anticipated impacts or effects was classified on the basis of the categories described in Table 1B. The findings of the detailed assessment made for each scheme listed in the action plan for 2016/17 are recorded in Appendix 2 to this report, and summarised in sections 3 to 12.

Table 1-B: Classifications of Impact Significance

Impact & Effect Classification		Explanation
Significant Adverse Impact	✗	Where the risk of an adverse impact arising from implementation of the strategy is determined to be significant, that judgement has been made on the basis that an individual project or scheme might require EIA, or Appropriate Assessment (AA), as part of the project consent or licensing process.
Adverse Impact	✗	Where the actions that might be undertaken have the potential to give rise to adverse impacts on the environment, but would not be likely to require EIA or AA at the project consent or licensing stage, those impacts are classed as non-significant.
Significant Beneficial Effect	✓	Where the opportunities for beneficial effects arising from implementation of the strategy is determined to be significant, that judgement has been made on the basis that an individual project or scheme be address known and significant problems (e.g. improving flood protection in areas with a history of surface water flooding).
Beneficial Effect	✓	Where the actions that might be undertaken have the potential to give rise to beneficial effects on the environment, but would not address known and significant problems, those effects are classed as non-significant.
No impact or effect	o	Where the actions that might be undertaken are unlikely to give rise to risks of adverse impacts or opportunities for beneficial effects on the environment.

1.D The Environmental Report: structure & sources of information

1.D.1 Structure of the report

1.13 The Environmental Report is organised around the environmental receptors identified in Table 1A. Sections 3 to 12 address the risks of adverse impact and opportunities for beneficial effect that the implementation of the strategy might present for each of the receptors.

1.14 Each of the sections provides the following information in respect of the environmental receptors.

- A definition of the receptor, a review of the baseline situation for the receptor within Surrey, and a summary of key issues and challenges for the receptor in the future.
- A definition of the key impact pathways used to assess the likely implications for the receptor of the Surrey LFRMS.
- A summary of the findings and conclusions of the assessments made for the objectives of the Surrey LFRMS and the schemes listed in the 2016/17 action plan.

1.15 The Environmental Report is supported by two appendices.

- Appendix 1 – which documents the screening assessment for the objectives of the Surrey LFRMS
- Appendix 2 – which documents the assessment of the infrastructure schemes listed in the action plan for 2016/17.

1.D.2 Sources of information

1.16 The environmental assessment for the Surrey LFRMS has drawn on information derived from the following sources.

- Background information provided by the team responsible for the preparation of the Surrey LFRMS.
- Background information about the infrastructure schemes provided by the team responsible for the preparation of the Surrey LFRMS.
- Digital sources of environmental information held by Surrey County Council.
- Internet based resources including those held on the Environment Agency website (for flood risk and water quality issues), the Natural England website (for nature conservation issues), on the Magic (Multi Agency Geographic Information for the

Countryside) website, and the Exploring Surrey's Past website (which provides access to the Surrey Historic Environment Record).

1.D.3 Difficulties encountered

1.17 The main difficulty encountered over the course of the assessment work has been limitations in the level of detail that it has been possible for the Surrey LFRMS team to make available about some of the works that would be carried out under the strategy (i.e. information about the location, timing and scale of specific schemes is not yet available in many cases).

1.18 Another difficulty, from an SEA perspective, with the development of the strategy has been the lack of any consideration of alternatives, particularly at the strategic level, but also in respect of the schemes that are being proposed as part of the programme of infrastructure works. At the strategic level, it is assumed that the non-consideration of alternatives is a consequence of the prescriptive nature of the requirements of both the Flood & Water Management Act 2010 and the Flood Risk Regulations 2009, in respect of the expected content and intended purpose of the local flood risk management strategies. In terms of the individual infrastructure schemes, the reasons for alternatives not having been identified are likely to relate to either the very small scale nature of the proposed works (i.e. many of the highways drainage schemes are on a micro-scale), or to the schemes being at the investigation and feasibility stage of the development process.

Section 2: The Surrey Local Flood Risk Management Strategy

2.A Background to the Surrey Local Flood Risk Management Strategy

2.1 In accordance with the Flood & Water Management Act 2010, a lead local flood authority (LLFA) must develop, maintain, apply and monitor a strategy for local flood risk management in its area (a 'local flood risk management strategy' or LFRMS). The LFRMS must reflect local circumstances and set out a clear vision for the management of flood risk from surface water runoff, groundwater and ordinary watercourses. Flood risk from main rivers, the sea and reservoirs is not classified as local flood risk, and is the responsibility of the Environment Agency. The LFRMS must be consistent with the Environment Agency's 'National Flood Risk & Coastal Erosion Strategy'.

2.2 The Flood & Water Management Act 2010 (Section 9) requires that the local flood risk management strategy provide the following information:

- The identity of the risk management authorities (RMAs) in the LLFA area and details of the flood risk management functions they may exercise in relation to the area;
- The objectives for managing local flood risk, which should be relevant to the circumstances of the local area and reflect the level of local risk;
- The measures proposed to achieve the objectives, and timescales for their implementation;
- The costs and benefits of the proposed measures, and options for funding them;
- An assessment of local flood risk for the purposes of the strategy, including gaps in understanding, and the actions that need to be taken to address those gaps.
- Details of how and when the local strategy is to be reviewed.
- Details of how the local strategy contributes to the achievement of wider environmental objectives.

2.3 The first version of the Surrey LFRMS was published in December 2014, since which time the context for local flood risk management has been subject to change. In particular, changes to the legislation have placed greater emphasis on the role of RMAs in the management of local flood risk. To take account of the altered context, the Surrey LFRMS is being revised and refreshed, to better reflect current needs and obligations.

2.B Policy Context for the Local Flood Risk Management Strategy

2.4 The policy context for the Surrey LFRMS is defined from national to local level by the following policies and plans.

- **National Flood & Coastal Erosion Risk Management Strategy for England, 2010 -** The **overall aim** of the National Flood & Coastal Erosion Risk Management Strategy for England is to: ensure the risk of flooding & coastal erosion is properly managed by using the full range of options in a co-ordinated way (section 3.1, p. 13).

- **Thames Catchment Flood Management Plan, 2008 -** The **key objective** of the Thames CFMP is to understand the risk of fluvial flooding across the region & to identify long-term policies to manage the risk in a sustainable way (section 5.3, p. 267).

- **Arun & Western Streams Catchment Flood Management Plan, 2008 -** The **main aims** of the Arun & Western Streams CFMP are 'to reduce the risk of flooding where it causes harm to people, the historic & built environment;', 'to work with natural processes so that flood risk management brings benefits & contributes effectively to sustainable development;', & 'to inform & support planning policies, statutory land use plans & implementation of the WFD.' (section 1.2, p.2). A single policy unit (Policy Unit 1 – Upper Arun) within the CFMP falls within the area covered by the Surrey LFRMS.

- **River Medway Catchment Flood Management Plan 2008 -** The **key objective** of the River Medway CFMP is to develop complementary policies for long-term management of flood risk within the catchment that take into account the likely impacts of changes in climate, the effects of land use & land management, deliver multiple benefits & contribute towards sustainable development (section 1.2, p. 4). A single policy unit (Policy Unit 1 – Upper Medway) within the CFMP falls within the area covered by the Surrey LFRMS.

- **National Planning Policy Framework (England), 2012 -** Paragraphs 99 to 104 (pp.) deal with flood risk and the role and responsibilities of the land use planning system with respect to the management of flood risk.

- **Borough & District Council Local Plans** – the majority of the districts and boroughs in Surrey now have adopted Local Plans (excepting Guildford, Runnymede and Waverley), the majority of which include policies that address the question of flood risk.

2.C Structure of the Surrey LFRMS 2016

2.5 The structure of the Surrey LFRMS 2016 is described in section 1 (p.4) of the strategy document, which explains the relationship of the strategic aim, the seven principles, the eight objectives and the eight action plans (see Figure 2-A).

Figure 2-A: Structure of the Surrey LFRMS 2016

Strategic Aim: To understand the interaction between all sources of flooding & lead a co-ordinated, multi-agency approach for minimising the impact of flooding on Surrey residents

Principle 1: A long-term vision	Principle 2: A catchment based approach	Principle 3: Partnership working	Principle 4: Community resilience	Principle 5: Enhancing growth & wellbeing	Principle 6: Sustainable development through spatial planning & development	Principle 7: Capital investment

Objective 1: Our understanding of local & strategic flood risk will be improved through clear data management & sharing between RMAs to ensure partnership delivery of works to high risk areas	4 Actions	
Objective 2: We will reduce flood risk by delivering an effective maintenance regime for drainage assets & managing of our estates across the county in a sustainable manner	5 Actions	
Objective 3: We will agree with partners who the RMAs in Surrey are, jointly define their responsibilities & establish clear lines of communication with them to support the delivery of partnership-based flood alleviation projects	4 Actions	
Objective 4: Private owners will be made aware of their riparian responsibilities to maintain drainage assets & watercourses. We will support, promote & enforce these responsibilities	5 Actions	
Objective 5: The residents of Surrey will be supported to improve community resilience. Local people will be empowered to reduce the risk of flooding on both an individual & community level	5 Actions	
Objective 6: We will reduce the risk of flooding from new & existing development through local planning policy & processes	7 Actions	
Objective 7: We will reduce flood risk from local sources via a programme of capital works, which will be integrated with the activities of other RMAs	5 Actions	
Objective 8: We will investigate significant flooding incidents in order to feedback recommendations to reduce flood risk	3 Actions	

2.6 The principles of the strategy are introduced in section 1 (p.4) of the strategy document, and are further explained in section 4 (pp.5-6). The objectives for the strategy, and the actions that will be taken in pursuit of those objectives, are discussed in section 5 (pp.7-9), with further details of the action plans provided in an annex to the document.

2.7 Implementation of the strategy will be supported by a programme of infrastructure projects, to be led by Surrey County Council, which will seek to address the problems that affect areas prone to surface water flooding or groundwater flooding. That programme of infrastructure schemes will be revised on an annual basis, and focuses on surface water flooding issues that affect the highways network. The schemes listed in the action plan for 2016/17 include sixteen schemes that will deliver improvements to existing highways drainage infrastructure, and ten schemes that will develop the business case for drainage improvement works, or will investigate areas affected by surface water flooding with a view to informing the development of future infrastructure improvement schemes.

Section 3 The Air Quality Receptor

3.A Definition

3.1 The **air quality** receptor covers the topic of 'air' as required by the EU Directive and the UK Regulations on the environmental assessment of plans and programmes. The receptor covers effects on air quality, in terms of changes in concentrations of pollutants identified in the *National Air Quality Strategy for England, Wales, Scotland & Northern Ireland* (2007), which sets objectives that define standards of good air quality for the human population, and for natural ecosystems (see Table 3-A).

Table 3-A: National air quality objectives for the protection of human health & the protection of vegetation & ecosystems

Pollutant	Objective	Concentration measured as	Beneficiary
Particulate Matter (PM_{10})	50µg/m^{-3} not to be exceeded more than 35 times a year	24 hour mean	Humans
	40µg/m^{-3}	Annual mean	
Particulate Matter ($PM_{2.5}$)	25µg/m^{-3}	Annual mean	Humans
	Target of 15% reduction in concentrations at urban background	Between 2010 & 2020	
Nitrogen Dioxide (NO_2)	200µg/m^{-3} not to be exceeded more than 18 times a year	1 hour mean	Humans
	40µg/m^{-3}	Annual mean	
Nitrogen Oxides (NO_x)	30µg/m^{-3}	Annual mean	Vegetation & Ecosystems
Sulphur Dioxide (SO_2)	266µg/m^{-3} not to be exceeded more than 35 times a year	15 minute mean	Humans
	350µg/m^{-3} not to be exceeded more than 24 times a year	1 hour mean	
	125µg/m^{-3} not to be exceeded more than 3 times a year	24 hour mean	
	20µg/m^{-3}	Annual mean	Vegetation & Ecosystems
	20µg/m^{-3}	Winter average	

3.B Baseline Conditions

3.2 The county of Surrey is affected by high levels of traffic and congestion, with the resultant transport emissions impacting on air quality at the local level. The main pollutants of concern are nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$). Defra's ambient air quality maps for the UK (http://uk-air.defra.gov.uk/data/gis-

mapping) indicate that air quality is poorest in the extreme north of Surrey, and along the major highway corridors that dissect the county, in terms of concentrations of nitrogen dioxide and of particulate matter (PM_{10} and $PM_{2.5}$).

3.3 Eight of the eleven boroughs and districts that make up the county have declared one or more Air Quality Management Area (AQMA) (see table 3-B), in areas where the standards set in the National Air Quality Strategy for the safeguarding of human health have or are likely to be exceeded.

Table 3-B: Air Quality Management Areas (AQMAs) declared within Surrey

Pollutant	Boroughs & AQMAs	Total
Nitrogen dioxide	**Elmbridge Borough Council**: Esher AQMA; Molesey AQMA; Cobham AQMA; Weybridge AQMA; Walton-on-Thames High Street AQMA; Hinchley Wood AQMA; Hampton Court Parade AQMA.	7 AQMAs
	Epsom & Ewell Borough Council: Ewell AQMA	1 AQMA
	Reigate & Banstead Borough Council: AQMA No.1 (M25 motorway within RBBC); AQMA No.2 (M23 motorway within RBBC & south of M25 motorway); AQMA No.3 (south west quadrant of Horley); AQMA No.4 ('Taisboro House', No.30 London Rd, at junction of A217 & Rushworth Rd); AQMA No.5 (No.1 Dean Lane, Hooley at junction of A23 & Dean Lane); AQMA No.6 ('Highlands', Brighton Rd, Tadworth); AQMA No.8 ('Driftways Cottage' on Reigate Rd, & 'Crossways' on Fir Tree Rd, north of junction of A240 & A2022 in Nork); AQMA No.9 (Reigate High St, Church St, Bell St, West St, & London Rd); AQMA No.10 (A23 Merstham High St)	9 AQMAs
	Runnymede Borough Council: Addlestone AQMA	1 AQMA
	Spelthorne Borough Council: Spelthorne AQMA (covers the whole of the borough)	1 AQMA
	Waverley Borough Council: AQMA No.1 (Farnham); AQMA No.2 (Godalming); AQMA No.3 (Hindhead)	3 AQMAs
	Woking Borough Council: AQMA No.1 (Anchor Hill)	1 AQMA
Nitrogen Dioxide & Particulate Matter	**Runnymede Borough Council**: M25 AQMA (M25 motorway within RBC)	1 AQMA
	Surrey Heath Borough Council: Surrey Heath AQMA (M3 motorway from Frimley Rd to the Ravenswood Roundabout in Camberley)	1 AQMA

3.C Future Trends & Key Issues

3.4 According to national statistics on emissions of air pollutants between 1987 and 2013, released by Defra on 17 December 2015, the following trends have been observed over that period of time.

- Nitrogen dioxide – Emissions of nitrogen oxides decreased in 2014 compared to 2013 by 8.4%, dropping to the lowest level since 1987.
- Sulphur dioxide – Emissions of sulphur dioxide decreased in 2014 compared to 2013 by 20.3%, dropping to the lowest level since 1987. The rate of reduction has slowed since the large decreases seen in the 1990s and emissions have remained fairly level since 2009, around an average of 0.39 million tonnes.
- Particulates – emissions of particulate matter (PM_{10} & $PM_{2.5}$) continue to decline (by 2% and 3.1 % respectively between 2013 and 2014). The rate of decline was most pronounced in the 1990s, and has slowed in recent years.

3.5 Future trends for air pollution in the UK, in terms of the types and incidence of pollutants will be determined by a range of factors, including the dominant forms of energy generation technology, modes of transport, and levels and types of industrial activity that characterise the economy.

3.6 The main air pollutant of concern in Surrey is nitrogen dioxide, although levels of particulate matter are problematic in certain parts of the county, particularly those that host major components of the road network. Future trends in air quality in Surrey are likely to be significantly influenced by levels of road traffic and the incidence of congestion, and by the composition of the vehicle fleet.

3.D Impact Assessment

3.D.1 Impact pathways

3.7 There are two pathways by which the implementation of the revised Surrey LFRMS could give rise to impacts on air quality.

3.8 Impact Pathway AQ1: Emissions from the burning of fossil fuels

The pathway focuses on the extent to which the proposed course(s) of action may contribute to changes in the volumes of combustion related air pollutants (e.g. PM_{10} and $PM_{2.5}$, NO_x SO_2, PAHs, etc.) emitted in Surrey.

3.9 Impact Pathway AQ2: Emissions of nuisance dust or nuisance odour

The pathway focuses on the extent to which the proposed course(s) of action may contribute to emissions of nuisance dust at the local level, most typically associated with construction and demolition works, or may exacerbate existing risks of odour, or contribute to the creation of new risks of odour for local communities.

3.D.2 Assessment findings & discussion

3.10 Assessment of Objectives: Four (objectives two, four, six and seven) of the eight objectives for the Surrey LFRMS were considered to be likely to give rise to the implementation of infrastructure works and schemes that could result in changes to the physical environment, including potential impacts on local air quality.

3.11 Assessment of Infrastructure Schemes (2016/17 Action Plan): Of the twenty-seven schemes listed under the action plan for 2016/17, a total of sixteen were classed as having the potential to give rise to adverse impacts with reference to impact pathway AQ1 and to impact pathway AQ2. The primary reason for schemes having been assessed as having the potential to give rise to adverse impacts on air quality was the scope for the construction of new flood management infrastructure to generate dust, and emissions from vehicles, plant and machinery. There is also some potential for odour nuisance (from stagnant water and rotting vegetation) to arise from flood management infrastructure such as detention basins, drainage channels and balancing ponds if appropriate maintenance regimes are not sustained over the longer term.

3.D Recommendations for Impact Management

3.12 The greatest potential for flood management schemes to give rise to impacts on air quality arise during the construction phase, although depending on the nature of the scheme there may be a risk of odour nuisance if appropriate maintenance is not undertaken.

3.13 During the construction phase the key impacts on air quality that need to be considered are:

- Emissions of dust arising from construction, particularly if excavation (e.g. to create detention basins, ponds or drainage channels) or the deposition of large volumes of material (e.g. to create dams) is required.
- Transport related emissions of pollutants, particularly from vehicle movements generated by the construction works.

3.14 Where the scheme involves the provision of areas such as wetlands, ponds or detention basins the design of the facilities, and the arrangements for their long term management and maintenance, should ensure that the risk of any standing water becoming stagnated, and consequently giving rise to nuisance odour, is adequately controlled.

3.15 Where schemes are being developed for areas that fall within, or are in close proximity to, designated AQMAs, the advice of the air quality specialists within the Environmental Health departments of the relevant district or borough council should be sought. Early consultation with the relevant experts will help to ensure that the scheme is designed and implemented in a way that minimises the risks of adverse impacts, and maximises the opportunities for beneficial effects to be delivered.

Section 4 The Climate Change Receptor

4.A Definition

4.1 The **climate change** receptor covers 'climatic factors' as required by the EU Directive and the UK Regulations on the environmental assessment of plans and programmes. The receptor covers the causes of climate change, in terms of the emission of greenhouse gases arising from the generation of energy by conventional (i.e. fossil fuel based) and alternative (recovery of energy from waste, use of wood fuel, etc.) means, and the use of energy for heat, power and transportation.

4.B Baseline Conditions

4.2 The chemical composition of the atmosphere has been changing since the Industrial Revolution, as a consequence of the emission of greenhouse gases from energy generation and use, and from transportation. The main impact that the change in concentrations of the main greenhouse gases in that atmosphere has had is that global average surface temperature has increased by 0.80^{o}C since 1880 (NASAs Goddard Institute for Space Studies). The World Meteorological Organisation gives the following data for the atmospheric concentrations of the main greenhouse gases in 2014.

- Concentrations of **carbon dioxide** (CO_2) had increased from a pre-industrial level of 278 parts per million (ppm) to 397.7 ppm by 2014 – the main sources of emissions include the use of fossil fuels, the production of cement, and changes in land use.
- Concentrations of **methane** (CH_4) had increased from a pre-industrial level of 715 part per billion (ppb) to 1,833 ppb by 2014 – the main sources of emissions include agriculture, the production and distribution of natural gas, and landfills.
- Concentrations of nitrous oxide (N_2O) had increased from a pre-industrial level of 270 ppb to 327.1 ppb by 2014 – the main sources of emissions include the production and use of fertilisers, the combustion of biomass, the production of cattle, and industrial processes.

4.3 Estimates of CO_2 emissions have been produced for all local authorities across England, Scotland, Wales and Northern Ireland on an annual basis since 2005. Those estimates cover emissions from a range of sources, including industry and commerce, domestic consumption, road transport, and land use, land use change and forestry. Estimated total emissions of CO_2 attributable to the county of Surrey have fallen from 8,817 kilotonnes of CO_2 in 2005 to 8,116 Kt CO_2 in 2012, with the change in per capita emissions over that period being from 8.2 tonnes per person to 7.1 tonnes per person.

4.4 Within Surrey, per capita emissions of CO_2 have, on average, fallen across the eleven districts and boroughs (see Table 4-A) between 2005 and 2012, although figures are typically higher than the Surrey average for those boroughs and districts that have major roads passing through their areas (e.g. the M25, M23 and M3 motorways, and the A3).

Table 4-A: Estimated CO_2 emissions for boroughs & districts in Surrey for 2005 & 2012

Administrative Unit	Year	Total Emissions (tonnes of CO_2)	Population	Per Capita Emissions	Trend
Elmbridge	2005	957,800	127,300	7.5 tonnes	-
	2012	888,700	131,500	6.8 tonnes	Fall
Epsom & Ewell	2005	383,500	69,200	5.5 tonnes	-
	2012	346,500	76,100	4.6 tonnes	Fall
Guildford	2005	1,137,200	129,000	8.8 tonnes	-
	2012	1,031,300	139,700	7.4 tonnes	Fall
Mole Valley	2005	808,500	81,800	9.9 tonnes	-
	2012	701,200	85,800	8.2 tonnes	Fall
Reigate & Banstead	2005	1,053,600	127,800	8.2 tonnes	-
	2012	954,600	139,900	6.8 tonnes	Fall
Runnymede	2005	826,400	77,000	10.7 tonnes	-
	2012	772,800	82,200	9.4 tonnes	Fall
Spelthorne	2005	658,800	90,600	7.3 tonnes	-
	2012	667,400	96,700	6.9 tonnes	Fall
Surrey Heath	2005	720,700	82,300	8.8 tonnes	-
	2012	662,800	86,600	7.7 tonnes	Fall
Tandridge	2005	856,100	79,400	10.8 tonnes	-
	2012	767,500	83,700	9.2 tonnes	Fall
Waverley	2005	807,600	116,400	6.9 tonnes	-
	2012	720,300	121,900	5.9 tonnes	Fall
Woking	2005	607,100	91,100	6.7 tonnes	-
	2012	603,000	99,400	6.1 tonnes	Fall
Surrey Total	2005	8,817,100	1,071,900	8.2 tonnes	-
	2012	8,116,000	1,143,500	7.1 tonnes	Fall

4.C Future Trends & Key Issues

4.5 The UK Government anticipates that greenhouse gas emissions will decline over the short to medium term, as total final energy demand falls and the efficiency with which energy is used improves progressively. In November 2015 updated energy and emissions projections were published which indicate that the UK is likely to meet the targets defined for the first three five-yearly carbon budgets introduced under the Climate Change Act 2008, for the periods 2008-2012, 2013-2017 and 2018-2022, but to exceed

the target defined for the 2023-2027 period. According to the Government's projections from November 2015, the anticipated trend for carbon emissions is downward:

- The budget for the period 2008-2012 was met with a shortfall of 36 $MtCO_2e$ (actual emissions projected to be 2,982 $MtCO_2e$ cf. a target of 3,018 $MtCO_2e$).
- For the period 2013-2017 the shortfall is projected to be 60 $MtCO_2e$ (actual emissions projected to be 2,722 $MtCO_2e$ cf. a target of 2,782 $MtCO_2e$).
- For the third budget period, 2018-2022, the shortfall is projected to be 51 $MtCO_2e$ (actual emissions projected to be 2,493 $MtCO_2e$ cf. a target of 2,544 $MtCO_2e$).
- For the fourth budget period, 2023-2027, the target is expected to be exceeded by 187 $MtCO_2e$ (actual emissions projected to be 2,137 $MtCO_2e$ cf. a target of 1,950 $MtCO_2e$).

4.6 Those projections are updated on an annual basis, and are underpinned by a set of key assumptions about likely future economic growth, prices of fossil fuels on the world market, the size of the UK population, and about the likely effectiveness of carbon emissions reduction policies. Important assumptions about energy generation technologies include, that renewables account for 30% of UK electricity generation by 2020, and that any new coal-fired power stations built prior to 2025 will have been converted to full carbon capture and storage by that date.

4.D Impact Assessment

4.D.1 Impact pathways

4.7 There are two pathways by which implementation of the revised Surrey LFRMS could give rise to impacts and effects on climate change.

4.8 Impact Pathway CC1: Emissions from the burning of fossil fuels

Implementation of the strategy may involve the delivery of capital works programmes, which will involve the use of plant and machinery, and raw materials, all of which have implications for energy consumption in terms of either their operation or production.

4.9 Impact Pathway CC2: Emissions from changes in land use

The implementation of the proposed strategy could give rise to circumstances that may affect the capacity of areas of undeveloped land to function as carbon sinks, specifically as a consequence of measures used to minimise the risks to communities from flooding.

4.D.2 Assessment findings & discussion

4.10 Assessment of Objectives: Four (objectives two, four, six and seven) of the eight objectives for the Surrey LFRMS were considered to be likely to give rise to the implementation of infrastructure works and schemes that could result in changes to the physical environment, including potential contributions to carbon emissions.

4.11 Assessment of Infrastructure Schemes (2016/17 Action Plan): Of the twenty-seven schemes listed under the action plan for 2016/17, a total of sixteen were classed as having the potential to give rise to adverse impacts with reference to impact pathway CC1. The primary reason for schemes having been assessed as having the potential to give rise to adverse impacts on climate change was the scope for the construction of new flood management infrastructure to require the consumption of energy, and consequently the generation of greenhouse gases, in terms of the production of construction materials, and the use of vehicles, plant and machinery.

4.E Recommendations for Impact Management

4.12 The greatest potential for flood management schemes to give rise to impacts in respect of climate change arise during the construction phase, although depending on the nature of the scheme there may be a longer term requirement for energy use associated with ongoing maintenance.

4.13 During the construction phase the key impacts on climate change that need to be considered are:

- Emissions of greenhouse gases associated with construction, particularly in terms of the requirement for material resources (embodied energy) and the consumption of energy by plant and equipment.
- Transport related emissions of greenhouse gases, particularly from vehicle movements generated by the construction works.
- Emissions of greenhouse gases associated with changes in land use (i.e. inundation of areas that are currently dry).

Section 5 The Land, Soil & Geology Receptor

5.A Definition

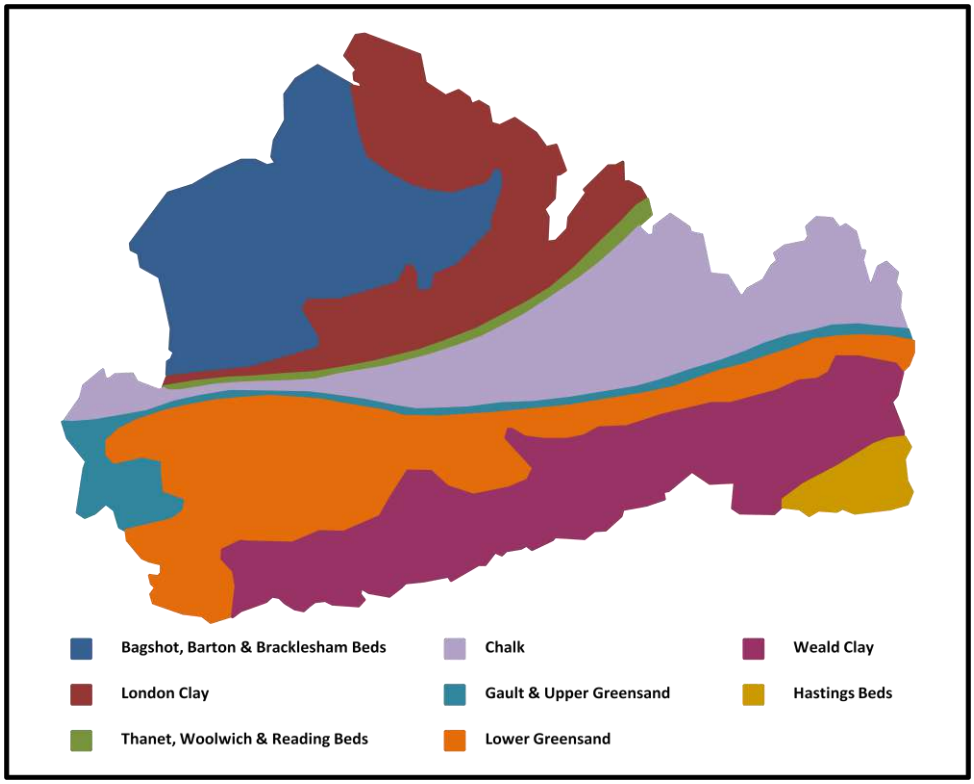
5.1 The **land, soil and geology** receptor covers effects on land, geology (including mineral resources), and soils. The receptor covers the topic of 'soil' as required by the EU Directive and the UK Regulations on the environmental assessment of plans and programmes. The receptor covers changes in land use, which can arise as a consequence of new development, the demand for mineral resources generated by new development, and changes in the physical and chemical properties of soils that can arise when land is developed or subject to a change of use.

5.B Baseline Conditions

5.B.1 Baseline Conditions: Geology

5.2 The geology of Surrey is diverse (see Figure 5-A), ranging from clays overlain by sands and gravels deposited at the end of the last Ice Age in the north west, to the chalk escarpment of the North Downs across the centre of the county, with the sandstones and clays of the Low Weald in the south, and the interbedded clays, silts, siltstones, sands and sandstones of the Hastings Beds which underlie the High Weald.

Figure 5-A: A simplified representation of the geology of Surrey



5.3 The main types of bedrock geology that underlay Surrey are briefly described below.

5.3.1 The **London Clay** is a uniform, stiff, blue-grey clay that weathers to brown when exposed to the air. The upper beds may contain sand and are known as the Claygate Beds. Where not covered by more recent deposits, typically of sands and gravels, the London Clay forms a wide, gently undulating outcrop, dipping gently towards the Thames.

5.3.2 The **Bagshot, Barton & Bracklesham Beds** are primarily composed of sand and clay horizons, with occasional ironstone bands, and cover much of north-west Surrey and east Hampshire, around Aldershot, Woking, Chobham, Chertsey and Oxshott. The soils are light and infertile and much of the outcrop is open heathland.

5.3.3 The **Thanet, Woolwich** and **Reading Beds** form a mile wide band from Farnham to Ewell, their outcrop being marked by springs and a line of villages. The **Thanet Beds** are relatively thin and consist of fine yellow or grey sand,. The **Woolwich Beds** are composed of sands and clays, and are located in the north east of the county. The Reading Beds, which run across central and west Surrey, are composed of mottled, plastic clay and light sand.

5.3.4 The **Chalk** gives rise to the characteristic south facing escarpment of the North Downs. The chalk is subdivided into three Formations, the Upper, the Middle and the Lower, with most of the chalk downland in the county consisting of the Upper Chalk. The Middle and Lower Chalk is only exposed along the scarp face of the North Downs, or in some of the valleys of the dip slope. Much of the Downs is capped with clay-with-flints and the remains of more recent deposits, often supporting fine beech woods.

5.3.5 The **Gault Clay** Formation consists of soft mudstones that weather to yellow or brown clays. It forms a narrow outcrop lying between the North Downs escarpment and the dip slope of the Lower Greensand Group.

5.3.6 The **Upper Greensand** includes a number of rock types – silt, sandstone (known as 'malmstone') and clayey sandstones. It forms a narrow strip of land above the Gault along the foot of the North Downs. Hard (firestone) and soft (hearthstone) varieties of malmstone occur.

5.3.7 The **Lower Greensand** is made up of the Atherfield Clay, the Hythe Formation, the Sandgate Formation, and the Folkestone Formation. The Atherfield Clay *Formation* is a narrow outcrop along the northern edge of the Weald Clay composed of clay with beds of silt and ironstone. The Hythe Formation consists mainly of sands and sandstones with limestones and chert, with clay and silt

sometimes present in the lower parts of the beds. The Sandgate Formation consists of sandstone and sandy limestone in the east of the county, with lenses of fullers' earth around Nutfield, whilst west of Dorking beds of sand and calcareous sandstone predominate. The Folkestone Formation is uppermost within the Lower Greensand, and consists of loosely consolidated quartzose sands, including deposits of clean, white silica sand, often with irregular bands of ferruginous sandstone.

5.3.8 The **Weald Clay** forms a wide tract of low-lying land surrounding the High Weald. It consists of green, grey, blue, brown or red clays and mudstones, interspersed with thin beds of sandstones, limestones and ironstones. The clay thickens towards the west and is over 400 metres thick near Guildford.

5.3.9 The **Hastings Beds** are the oldest strata outcropping in Surrey, found in the extreme south east of the county around Lingfield, comprised of Tunbridge Wells Sand, Wadhurst Clay and Ashdown Sand.

5.B.2 Baseline Conditions: Soils

5.4 The range of soil types encountered across Surrey is strongly influenced by the underlying geology of the county.

5.4.1 In the southern and south eastern parts of the county underlain by the Weald Clay, surface water gley soils are dominant, typically greyish in colour, characterised by slow permeability with a tendency towards seasonal waterlogging, and often found beneath grassland and woodland. The area around Lingfield, in the south east, is characterised by argillic (clay containing) brown earths, non-alluvial clayey or loamy soils with slow permeability and subject to slight seasonal waterlogging, typically found beneath grassland, arable land, and woodland.

5.4.2 The south west and central south areas of the county are characterised by podzolic soils, which underlie much of the Thursley, Hankley and Frensham Commons to the west and south west of Godalming. Podzolic soils are typically black or dark brown in colour, are well drained, and form an excellent substrate for heathland habitat.

5.4.3 The North Downs is characterised by a range of soil types, including shallow well drained calcareous silty soils over chalk (grey rendzinas), shallow well drained calcareous coarse loamy, silty and sandy soils over chalk or chalk rubble (brown rendzinas) which provide a good substrate for grassland communities, and paleo-argillic brown earths (typically well drained, loamy or

clayey reddish or reddish mottled soils with a clay enriched subsoil) which provide a suitable substrate for grassland and woodland.

5.4.4 In the west and north west, in an area defined by Guildford, Woking and Weybridge in the east, Aldershot, Farnborough and Camberley in the west, and Bracknell and Wokingham in the north is another area of podzolic soils, which forms the substrate for many of the heathlands that characterise that part of the county.

5.4.5 A further band of surface water gley soils runs between Aldershot in the west and Leatherhead in the east, swinging to the north of Guildford and the south of Woking.

5.4.6 In the vicinity of the many rivers that cross the county the soils are typically alluvial gley soils, which are subject to waterlogging from groundwater.

5.B.3 Baseline Conditions: Agricultural Land

5.5 Large areas of Surrey are rural in character, and 35.7% of the county's land – some 59,688 hectares, is maintained in some form of agricultural production. In 2013 there were 991 commercial agricultural holdings in Surrey, a drop of 69 from the 1,060 recorded in 2010[(5)]. In terms of arable farming, some 12,582 hectares within the county is dedicated to the production of cereal crops, some 12,139 hectares to general cropping, and some 1,717 hectares to horticulture. In terms of pastoral production, some 20,572 hectares is used for grazing livestock (e.g. sheep, cattle), some 4,804 hectares is used for dairying, some 416 hectares is in poultry use, and some 133 hectares dedicated to pig rearing. A further 7,223 hectares is in mixed farming use, and some 102 hectares is in other forms of farming use.

5.6 The majority of agricultural land within Surrey is classed as either Grade 3a (of good quality) or Grade 3b (of moderate quality). National policy on the protection of the productive capacity of the agricultural industry indicates that the 'best and most versatile' agricultural land – that classed as Grade 1, Grade 2 or Grade 3a – should be safeguarded from development.

5.C Future Trends & Key issues

5.7 Geology – the main way in which human activities impact upon geological resources is through the extraction and consumption of minerals. Historically, Surrey has been extensively worked for key construction materials (gravels, sands and clays), and the recently adopted Minerals Plan for the county makes provision for the continued

[5] *Structure of the agricultural industry in England & the UK at June*, 2015, National Statistics.

extraction of sand and gravel, soft sand, silica sand and brick clay up to 2026. Subsequent to that date extraction of sand and gravel is expected to wind down within the county, due to a lack of accessible reserves.

5.8 Soils – the condition of soils can be affected by a range of impacts, arising as a consequence of human activities and from natural processes. As pressure on land increases, due primarily to the growing population, the risks of adverse effects arising through physical disturbance and intensifying use of the land increase. The changing climate is likely to further exacerbate the risks to soil resources that arise from human activity, for example increased incidence of drought conditions is likely to affect the structure and functioning of soils, and increase their susceptibility to erosion by wind and water.

5.9 Agricultural land – Surrey has limited stocks of high quality agricultural land, and that which remains should be prioritised for protection. The population of the UK is projected to grow, and the global population is expected to exceed 9 billion by 2050, which combined with the anticipated loss of cultivatable land due to climate change, particularly in the tropics, is likely to contribute to increased pressure on agricultural land in the UK.

5.D Impact Assessment

5.D.1 Impact pathways

5.10 There are two pathways by which implementation of the revised Surrey LFRMS could give rise to impacts and effects on the land, soil and geology receptor.

5.11 Impact Pathway LSG1: Changes in land use & associated impacts on soil

Implementation of the strategy may involve the delivery of capital works programmes, which would involve the use of areas of land, and may therefore result in a change of land use and associated changes in the composition and structure of soils.

5.12 Impact Pathway LSG2: Use of mineral resources

Implementation of the strategy may involve the delivery of capital works programmes, which will require raw materials, including those derived from geological sources.

5.D.2 Assessment findings & discussion

5.13 Assessment of Objectives: Four (objectives two, four, six and seven) of the eight objectives for the Surrey LFRMS were considered to be likely to give rise to the implementation of infrastructure works and schemes that could result in changes to the physical environment, including potential changes in land use and associated soil effects, and demand for mineral resources.

5.14 Assessment of Infrastructure Schemes (2016/17 Action Plan): Of the twenty-seven schemes listed under the action plan for 2016/17, a total of sixteen were classed as having the potential to give rise to adverse impacts with reference to impact pathway LSG2. The primary reason for schemes having been assessed as having the potential to give rise to adverse impacts was the scope for the construction of new flood management infrastructure to create demand for mineral resources (e.g. for the construction of dams, retaining walls, culverts, etc.).

5.E Recommendations for impact management

5.15 The greatest potential for flood management schemes to give rise to impacts in respect of the land, soils, and mineral resources arise during the construction phase, although depending on the nature of the risk management facilities provided there may be a longer term need for further consumption of mineral resources as part of routine maintenance.

5.16 During the construction phase of a flood risk management scheme the key impacts on the land, on soil and on mineral resources that need to be considered are:

- Changes in land use, particularly where excavation and subsequent inundation (e.g. to create detention basins, ponds or drainage channels), or the deposition of large volumes of material (e.g. to create dams), is required.
- Changes in the structure and composition of the soils of any areas of land permanently altered as a consequence of the development, or used temporarily for the storage of materials or equipment during the construction phase. Topsoil, in particular, is sensitive to perturbation and should be retained and safeguarded for reuse on site wherever possible. Soil moving operations should be carefully managed to minimise the risks of damage arising from compaction, waterlogging, drying, or contamination with chemicals. Particular care should be exercised if the affected soils fall within ALC Grade 1, Grade 2 or Grade 3a.

- The use of primary mineral resources, which should be minimised as much as possible, with preference given to the use of recycled and secondary minerals and mineral products wherever feasible.

5.17 Where schemes are being developed for areas of land that are of high quality in terms of the ALC, the advice of Natural England should be sought. Early consultation with the relevant experts will help to ensure that the scheme is designed and implemented in a way that minimises the risks of adverse impacts, and maximises the opportunities for beneficial effects to be delivered. Where a scheme requires the extraction of material from a borrow pit on site the advice of the Minerals Planning Authority (Surrey County Council) should be sought with respect to planning permission for such activity.

Section 6 The Materials Efficiency & Waste Receptor

6.A Definition

6.1 The **materials efficiency and waste** receptor covers effects on the total volume of material moving through the economy, the generation of wastes, the recovery, reuse and recycling of materials, and the management and disposal of wastes. The receptor covers the topic of 'material assets' as required by the EU Directive and the UK Regulations on the environmental assessment of plans and programmes.

6.B Baseline Conditions

6.2 According to the 2014/15 Annual Monitoring Report for minerals and waste, Surrey was estimated to have given rise to 2.66 million tonnes of waste in 2014/15. The main categories of waste generated included municipal solid waste, commercial and industrial wastes, and construction and demolition wastes.

6.3 Between 2013/14 and 2014/15 the amount of waste collected from households by local authorities in Surrey rose slightly from 571,923 tonnes to 572,100 tonnes. Of the household waste collected by local authorities in 2014/15, some 310,930 (54.3%) tonnes were reused, recycled or composted, some 226,819 tonnes (39.6%) were sent for energy recovery, and some 34,351 tonnes (6%) went to landfill. The majority of the waste sent for energy recovery was transport out of Surrey, to facilities in Kent, London, Slough and Oxfordshire. Of the waste disposed of to landfill, only 13,397 tonnes went to facilities within Surrey, with the other 20,954 tonnes being sent out of county for disposal.

6.4 During 2014/15 some 143,936 tonnes of waste was received by the Community Recycling Centres that operate across the county, of which 92,119 tonnes (64%) was reused or recycled, 46,059 tonnes (32%) went for energy recovery, and 5,757 tonnes (4%) went to landfill for disposal.

6.5 Arisings of industrial and commercial waste have been estimated on the basis of information derived from the Environment Agency's 'Waste Data Interrogator', which records data for the volumes of different waste streams managed through permitted facilities. For 2014, the volume of industrial and commercial waste arising in Surrey was estimated as 617,000 tonnes, based on information sourced from the 'Waste Data Interrogator'.

6.6 Arisings of construction, demolition and excavation waste have also been estimated using the Environment Agency's 'Waste Data Interrogator', again in terms of the volumes of such waste handled by permitted facilities. During 2014 some 2,038,000 tonnes of construction, demolition and excavation wastes were disposed of in Surrey, of which some 978,000 tonnes arose within the county, with the balance imported.

6.C Future Trends & Key issues

6.7 Surrey generates significant volumes of domestic, commercial and industrial, and construction and demolition wastes. Much of that waste is managed within the county, although there is currently no in-county capacity for the recovery of energy from waste. A proportion of wastes arising elsewhere within the south east of England, and in particular London, are disposed of within Surrey.

6.8 Up to 2020 it is anticipated that waste arising from households in Surrey will grow at slower rates than has previously been observed. That slowing is expected to arise as a consequence of changes in consumer behaviour, greater participation in waste avoidance and minimisation practices, and improvements in product design.

6.9 Up to 2020 it is anticipated that commercial and industrial wastes arising in Surrey will grow by between 11% and 23%, from 703,000 in 1999 to between 780,730 tonnes and 864,690 tonnes.

6.10 Up to 2020 it is anticipated that construction and demolition wastes arising in Surrey will demonstrate growth of between 0% and 16%, with an average rate of 8%. Arisings of construction and demolition waste will be heavily influenced by activity rates within the construction sector, and poor performance in the wider economy is likely to be a significant factor.

6.D Impact assessment

6.D.1 Impact pathways

6.11 There are two pathways by which implementation of the revised Surrey LFRMS could give rise to impacts and effects on the materials efficiency and waste receptor.

6.12 Impact Pathway MEW1: Use of material resources

Implementation of the strategy may involve the delivery of capital works programmes, which will require the use of a range of construction materials.

6.13 Impact Pathway MEW2: Generation of wastes

Implementation of the strategy may involve the delivery of capital works programmes, which are likely to give rise to construction and demolition wastes.

6.D.2 Assessment findings & discussion

6.14 Assessment of Objectives: Four (objectives two, four, six and seven) of the eight objectives for the Surrey LFRMS were considered to be likely to give rise to the implementation of infrastructure works and schemes that could result in changes to the physical environment, including potential demand for material resources and the generation of wastes. It is anticipated that the majority of the schemes brought forward under the strategy would be of a modest scale, and the associated demands for material resources and risks of waste generation, would be similarly modest.

6.15 Assessment of Infrastructure Schemes (2016/17 Action Plan): Of the twenty-seven schemes listed under the action plan for 2016/17, a total of sixteen were classed as having the potential to give rise to adverse effects with reference to impact pathway MEW1 and to impact pathway MEW2. The primary reason for schemes having been assessed as having the potential to give rise to adverse impacts on the materials efficiency and waste receptor was the scope for the construction of new flood management infrastructure to require the use of material resources (e.g. pipes, manufactured blocks, aggregate, metalwork, etc.) and to generate wastes (e.g. from the excavation of lagoons and swales) that will need to be managed appropriately.

6.E Recommendations for impact management

6.16 The greatest potential for flood management schemes to give rise to impacts in respect of materials efficiency and wastes arise during the construction phase, although depending on the nature of the scheme there may be an on-going requirement for additional material input, and scope for wastes to arise as a consequence of maintenance works.

6.17 During the construction phase of a flood management scheme the key impacts on materials efficiency and waste that need to be considered are:

- Wastes arising from construction, particularly if excavation is required (e.g. to create detention basins, ponds or drainage channels), although it should be noted that the creation of dams and retaining walls through the deposition of large volumes of material can present opportunities for the re-use of inert construction and demolition wastes.

- Demand for material resources for use in the construction of flood risk management structures, and in their maintenance over the longer term.

6.18 Schemes should be designed to be as materials efficient as possible, and best practice should be observed in terms of the disposal of, or use of, waste materials. Where a scheme would involve the deposition of material that has arisen elsewhere advice on the need for waste planning permission should be sought from the Minerals & Waste Planning Authority (Surrey County Council), and advice on the need for an Environmental Permit (or an exemption) should be sought from the Environment Agency.

Section 7 The Water Resources & Management Receptor

7.A Definition

7.1 The **water resources and management** receptor covers effects on the biological and chemical quality of surface waters and ground waters, the safeguarding, use and management of water resources, and the management of flood risks. The receptor covers the topic of 'water' as required by the EU Directive and UK Regulations on the environmental assessment of plans and programmes.

7.B Baseline Conditions

7.B.1 Baseline Conditions: Water Quality

7.2 The condition of the water environment, in terms of surface waters, groundwaters, estuaries and coastal waters out to one nautical mile, is monitored by the Environment Agency. The EU Water Framework Directive seeks to improve the quality of the water environment across the EU, and sets targets for the management of the water environment with respect to both ecological and chemical condition. For each of the major catchments in the UK a River Basin Management Plan (RBMP) has been prepared, which provides information, on a catchment by catchment basis, about the condition of the water environment, the targets for improvement, and the actions needed to achieve those targets. The county of Surrey encompasses waterbodies and catchments that lie within the Thames RBMP area and the South East RBMP area.

7.3 The current overall status (derived by an assessment of ecological condition or potential and chemical status) of the surface waterbodies that have catchments located wholly or partly within Surrey is summarised in Table 7.A (data source: http://environment.data.gov.uk/catchment-planning/). Of the 95 surface watercourses or lakes (including reservoirs and ponds) with catchments wholly or partly within Surrey, only 4 (4.2%) exhibit 'good' overall status. The majority exhibit either 'moderate' overall status (57 or 58%), or 'poor' overall status (27 or 28.4%), with 7 watercourses or lakes (7.4%) exhibiting 'bad' overall status.

7.4 The principal reasons given in the RBMPs for watercourses and waterbodies not achieving the 'good' overall status required by the Water Framework Directive include, pollution from point sources (e.g. water industry sewage works) and diffuse sources (e.g. agriculture), abstraction from watercourses and supporting groundwaters, and physical alterations.

Table 7-A: Ecological potential/status of surface waterbodies & catchments in Surrey

River Catchment		Current Overall Status/Potential				Key influences/issues
		Good	Mode-rate	Poor	Bad	
Colne	Watercourses	0	3	0	0	Agricultural run-off; interaction of watercourses & canal network; pollution incidents; physical modification of rivers & poor maintenance; demand for water
	Lakes	0	4	1	0	
Darent & Cray	Watercourses	0	1	0	0	Lack of water; low flows due to abstraction from chalk aquifer
	Lakes	0	0	0	0	
Loddon	Watercourses	0	2	2	1	High nutrient levels (esp. phosphate) from sewage treatment work effluent & agricultural runoff
	Lakes	1	0	0	0	
London	Watercourses	0	4	1	1	Urban pollution (incl. surface run-off, sewerage system overflows & misconnections); sewage treatment works effluent; physical modification of watercourses; invasive species
	Lakes	0	1	0	0	
Medway	Watercourses	0	4	2	1	Agricultural runoff
	Lakes	0	2	0	0	
Lower Mole & Rythe	Watercourses	0	5	4	0	Demand for water; effluent discharge; surface water runoff
	Lakes	1	2	0	0	
Lower Thames	Watercourses	0	1	1	0	High nutrient levels (esp. phosphate) from sewage treatment works effluent; high levels of abstraction
	Lakes	0	2	0	0	
Upper Mole Tributaries	Watercourses	1	3	2	1	Demand for water; effluent discharge; surface water runoff
	Lakes	0	0	0	0	
Wey	Watercourses	0	16	8	2	High levels of nutrients (esp. phosphate), from sewage treatment works effluent & agricultural runoff
	Lakes	0	4	2	1	
Arun & Western Streams	Watercourses	0	3	4	0	High levels of nutrients from sewage treatment works effluent & agricultural runoff
	Lakes	1	0	0	0	

7.5 Groundwater is susceptible to pollution from point sources (e.g. leachate from landfill sites, effluent from industrial sites, etc.), and from diffuse sources (e.g. runoff of fertilisers or pesticides from agricultural land, runoff from roads, etc.), with typically slow recharge and circulation rates making pollution control and mitigation difficult. Surrey is underlain by a number of different groundwater bodies that fall within the area covered by the Thames RBMP (see Table 7.B, data source: http://environment.data.gov.uk/catchment-planning/). The majority of the groundwater bodies beneath Surrey exhibit 'poor' overall status, due to issues with water availability (quantitative status) or chemical condition (chemical status), or a combination of the two. Six of the groundwater bodies underlying the county are currently classified as exhibiting 'good' overall status.

Table 7-B: Status of groundwater waterbodies underlying Surrey

Area of the County	Groundwater Body	Current Overall Status
Under eastern Surrey	Bromley Tertiaries	Poor
	Kent Greensand Middle	Poor
	Kent Greensand Western	Poor
	West Kent Darent & Cray Chalk	Poor
Under mid-Surrey	Epsom North Downs Chalk	Poor
	Dorking North Downs Chalk	Poor
	Effingham Tertiaries	Good
	Reigate Lower Greensand	Poor
Under north west Surrey	Lower Thames Gravels	Good
Under south east Surrey	Kent Weald Western Medway	Poor
	Copthorne Tunbridge Wells Sands	Good
Under south west Surrey	Alton Chalk	Good
	Godalming Lower Greensand	Poor
Under western Surrey	Chobham Bagshot Beds	Good
	Old Basing Tertiaries	Poor
	Farnborough Bagshot Beds	Good

7.B.2 Baseline Conditions: Water Resources

7.6 Water resources and the water environment in the South East of England are subject to significant and growing pressures, in particular as a consequence of rising demand from a growing population and the impacts of a changing climate. Based on the information set out in the State of the Environment Report for the South East of England for 2010, produced by the Environment Agency, average daily water consumption per person living in the south east in 2008/09 was 156 litres. That figure represents a small reduction on the levels of consumption observed in 2007/08, and is consistent with a downward trend in water use. The State of the Environment Report notes a difference in the levels of consumption observed in metered households compared with non-metered households, the former using an average of 141 litres per person per day and the latter consuming approximately 163 litres per person per day.

7.7 Water resources management in Surrey is undertaken by a number of different water companies, who are responsible for supplying water to residents and businesses. The activities of the water companies and other industries in respect of the sourcing of water resources (e.g. abstraction) are overseen by the Environment Agency (through the

Environmental Permitting regime). All the water companies produce Water Resources Management Plans, statutory plans that explain how they will balance the supply of and demand for water over the period up to 2035.

7.8 Groundwater resources need to be protected from over-abstraction and pollution to ensure that they remain available for use today and into the future, to support rivers and wetland habitats and to provide drinking water. Pressure on water resources is particularly intense in the South East of England, due to the density of the human population.

7.B.3 Baseline Conditions: Flooding

7.9 Flooding is a natural process, a consequence of the normal functioning of the planet's hydrological cycle. The development by humans of settled patterns of land use has created situations in which flood events can create significant risks to human communities and the built environment, and to the natural environment. Flooding can arise from a number of different sources, fluvial flood risk is associated with river systems, but surface water flooding and groundwater floods can also arise as a consequence of intense and/or prolonged rainfall.

7.10 **Fluvial flood risk** is defined by the Environment Agency in terms of three broad zones of risk:

- Zone 1 – where the chance of flooding occurring every year is estimated to be less than 1 in 1,000, or less than a 0.1% annual event probability (AEP).
- Zone 2 – where the chance of flooding occurring every year is estimated to be between 1 in 1,000 and 1 in 100, or between 0.1% and 1.0% AEP.
- Zone 3 – where the chance of flooding occurring every year is estimated to be greater than 1 in 100, or more than a 1.0% AEP.

7.11 Within Surrey areas subject to Zone 2 or Zone 3 fluvial flood risk are concentrated around the main rivers that dissect the county. In north west Surrey the main sources of fluvial flood risk for the boroughs of Spelthorne, Runnymede and Elmbridge are the river Thames, the river Wey and the river Mole, with the Bourne also forming a source of fluvial flood risk in Runnymede, and the Colne being a further source of fluvial flood risk in north west Spelthorne. For the borough of Epsom and Ewell the main source of fluvial flood risk is the Hogsmill, which flows through the northern part of the borough to its confluence with the river Thames. For the borough of Woking, the river Wey and the river Bourne form the main sources of flood risk. For the borough of Surrey Heath the main source of fluvial flood risk is the river Bourne

7.12 **Surface water flooding** usually happens when heavy rainfall overwhelms drainage capacity, occurring rapidly, but receding quickly. Surface water flood risk is defined by the Environment Agency in terms of four broad zones of risk:

- Very Low – where the chance of flooding occurring every year is estimated to be less than 1 in 1,000, or less than a 0.1% AEP.
- Low– where the chance of flooding occurring every year is estimated to be between 1 in 1,000 and 1 in 100, or between 0.1% and 1.0% AEP.
- Medium – where the chance of flooding occurring every year is estimated to be between 1 in 100 and 1 in 30, or between 1.0% and 3.3% AEP.
- High – where the chance of flooding occurring every year is estimated to be greater than a 1 in 30, or more than a 3.3% AEP.

7.13 Surface water flooding is most likely to occur when catchments are already saturated, or the surface of the land has been rendered impermeable by development. Surface water flood risk occurs throughout Surrey, based on Environment Agency data it is estimated that approximately 46,500 properties in the county are at risk from flooding to a depth of more than 0.3 metres during a rainfall event with a 1 in 200 annual chance of occurring. The Surrey Preliminary Flood Risk Assessment (PFRA) identified five areas within the county that are at greatest risk of surface water flooding: Epsom and Ewell; Woking and Byfleet; Caterham and Warlingham; Guildford; and, Reigate and Redhill.

7.14 Groundwater flooding generally occurs in low-lying areas, as the result of groundwater rising above the surface of the land. The underlying geology has a significant influence on the risk of groundwater flooding. There can be substantial time-lags between the persistent or heavy rainfall events that lead to rising groundwater levels and flooding resulting from the emergence of groundwater. This is due to the relatively slow rate at which water percolates into and moves through permeable strata (a series of layers of rock in the ground).

7.15 Groundwater flooding in Surrey is most common in areas with chalk strata, such as the North Downs. It can occur in any area with underlying permeable deposits (for example sandstone, sands and gravels). Localised occurrences have been observed in low-lying areas throughout the county. The risk of groundwater flooding can be affected by development, which alters the natural flow patterns and pathways.

7.C Future Trends & Key Issues

7.16 The projected impacts of climate change for the South East of England, coupled with a growing population, would have a range of implications for the freshwater environment and water resources. If average temperatures were to increase in the projected range, and summers to become hotter and drier the region's water resources and freshwater environments would be placed at risk of adverse effect due to scarcity of the resource coinciding with a likely increase in demand from the human population.

7.17 High demand in periods of hot weather coupled with restricted availability of surface water supplies could also adversely affect groundwaters and aquifers, the depletion of which would, in turn adversely affect the base-flows of rivers and streams.

7.18 In the event of the projected scenario of warmer and wetter winters being realised, the likely surfeit of incident rainfall could result in a rise in the risks of flooding from fluvial sources and from non-fluvial sources (i.e. surface water runoff during periods of heavy rain).

7.D Impact Assessment

7.D.1 Impact pathways

7.19 There are three pathways by which implementation of the revised Surrey LFRMS could give rise to impacts and effects on the water resources and management receptor.

7.20 Impact Pathway WRM1: Impacts on the flow of water & the functioning of floodplains

Implementation of the strategy may involve the delivery of capital works programmes, which would be primarily designed to minimise or eliminate risks of flooding arising from non-fluvial sources.

7.21 Impact Pathway WRM2: Impacts on water quality

Implementation of the strategy may involve the delivery of capital works programmes, which would be primarily designed to minimise or eliminate risks of flooding arising from non-fluvial sources, and could dependent on the methods of flood risk alleviation employed and the context in which they are delivered, affect water quality in the receiving environment.

7.22 Impact Pathway WRM3: Demand for water resources

Implementation of the strategy may involve the delivery of capital works programmes, which would be primarily designed to minimise or eliminate risks of flooding arising from non-fluvial sources.

7.D.2 Assessment findings & discussion

7.23 Assessment of Objectives: Four (objectives two, four, six and seven) of the eight objectives for the Surrey LFRMS were considered to be likely to give rise to the implementation of infrastructure works and schemes that could result in changes to the physical environment. Given that the purpose of such works and schemes would be to deliver improved management of surface water flooding, it is concluded that pursuit of the objectives would be expected to result in significant beneficial effects with reference impact pathway WRM1, to beneficial effects with reference to impact pathway WRM2, and to have negligible effects on impact pathway WRM3.

7.24 Assessment of Infrastructure Schemes (2016/17 Action Plan): Of the twenty-seven schemes listed under the action plan for 2016/17, sixteen were classed as having the potential to give rise to significant beneficial effects with reference to impact pathway WRM1, as a result of the reductions in surface water flood risk that would arise following their implementation. The same sixteen schemes were also classed as having the potential to give rise to beneficial effects with reference to impact pathway WRM2, based on the assumption that better management of surface water flooding on the highway network would help to reduce the risks that runoff from the highways can present to the quality of local watercourses and waterbodies.

7.25 The beneficial effects of the strategy's implementation, in terms of improved flood risk management, should act in combination with the positive impacts arising from a range of other flood risk management initiatives, including the Environment Agency's CFMPs and the NFCERMS, and the SWMPs being produced by local planning authorities to inform their development planning activities.

7.E Recommendations for Impact Management

7.26 The greatest potential for flood management schemes to give rise to adverse impacts in respect of the water environment arise during the construction phase. The development of new flood management facilities should improve the opportunities for water to drain across land whilst reducing the risks to the environment and society, but could present a range of risks to water quality (surface water and groundwaters) during the construction and operational phases, including risks associated with changes in sediment loading, and

in exposure to sources of contamination – schemes should be designed to contribute to realising the improvements in water quality required under the Water Framework Directive.

7.27 Where schemes are being developed for areas that fall within, or are in close proximity to, surface waters or groundwaters for which quality is a concern, the advice of the Environment Agency and the appropriate water supply company (or companies) should be sought. Early consultation with the relevant experts will help to ensure that the scheme is designed and implemented in a way that minimises the risks of adverse impacts, and maximises the opportunities for beneficial effects to be delivered.

Section 8 The Built Environment Receptor

8.A Definition

8.1 The **built environment** receptor covers effects on the quality and character of the built environment in the maintenance and restoration of existing structures and the construction of new developments. The receptor covers the topic of 'material assets' as required by the EU Directive and the UK Regulations on the environmental assessment of plans and programmes.

8.B Baseline Conditions

8.B.1 Townscape Character

8.2 The quality of the built environment, in terms of the design and positioning of buildings, infrastructure and amenity facilities influences the extent to which a place, irrespective of whether it is urban or rural, is perceived to be a pleasant and conducive setting in which to live or do business. Places need to be designed and built for people, providing a setting in which they can feel safe and secure, and that enable them to go about their daily lives with ease. Surrey is the most urbanised shire county in England, but is also perceived as a place the offers a good living environment[(6)]. A report on urban capacity prepared in 2000, as a background paper to the former Surrey Structure Plan, indicated that 85% of dwellings within the county were located in urban areas[(7)]. The challenge for the future development of the county will be to safeguard and enhance that perception.

8.3 The eleven districts and boroughs in Surrey each contain a number of towns and larger villages in which much of their resident population has been concentrated. Some of the districts and boroughs, particularly those in the north west of the county, have been more extensively affected by urban development than is the case for those in the south, south west and east. The majority of the district and borough councils in Surrey have undertaken townscape or urban character studies as part of the work to inform the development of their Local Plans. In a number of cases that work has been captured in supplementary guidance, which provides advice on the standards that should be observed in the design of new development within different character areas.

[6] Community Survey, 2000, Surrey County Council
[7] *Surrey Urban Capacity Study*, 2000, Surrey County Council

8.3.1 Elmbridge Borough Council: the Design & Character Supplementary Planning Document (SPD) adopted in 2012, and accompanying companion guides, describe the different character types encountered across the borough, and provide guidance for new development. The SPD and companion guides can be accessed on the council's website (http://www.elmbridge.gov.uk/planning/policy/dcspd.htm)

8.3.2 Epsom & Ewell Borough Council: the Environmental Character Study, published in 2008, identified seven different character types within the developed areas of the borough.

8.3.3 Guildford Borough Council: Volume 3 (Townscape Assessment) of the Guildford Landscape Character Assessment & Guidance, published in 2007, identified twelve different townscape types within the borough. The townscape assessment can be accessed on the council's website (http://www.guildford.gov.uk/media/1009/Townscape-Assessment-Master-copy/pdf/Townscape_Assessment_Master_copy.pdf)

8.3.4 Mole Valley District Council: four character appraisal based SPDs were adopted in 2010 for the built up areas of Ashtead (identifies ten character areas), of Bookham and Fetcham (identifies ten character areas), of Leatherhead (identifies seven character areas), and of Dorking, North Holmwood and Pixham (identifies twenty seven character areas). The character appraisal SPDs can be accessed on the council's website (http://www.molevalley.gov.uk/index.cfm?articleid=17327).

8.3.5 Reigate & Banstead Borough Council: the Borough Wide Landscape and Townscape Character Assessment published in 2008, identified eleven different land use and character types within the borough. The character assessment report can be accessed on the council's website (http://www.reigate-banstead.gov.uk/downloads/download/168/landscape_and_townscape_character_assessment).

8.3.6 Runnymede Borough Council: the Urban Area Character Appraisal published in 2009, identified four different character types within the borough. The character appraisal documents can be accessed on the council's website (https://www.runnymede.gov.uk/article/5242/Design-and-Built-Environment-policy-documents-and-guidance).

8.3.7 Spelthorne Borough Council: the Design of Residential Extensions & New Residential Development SPD published in 2011, provides guidance on quality of design in new development. The SPD can be accessed on the

council's website (https://www.spelthorne.gov.uk/article/3015/Supplementary-Planning-Documents).

8.3.8 Surrey Heath Borough Council: five SPDs which provide guidance on urban character and built environment matters, amongst other issues, have been published by the borough council, for Lightwater, Yorktown, Deepcut, the Western Urban Area, and Camberley town centre. The SPDs can be accessed on the council's website (http://www.surreyheath.gov.uk/residents/planning/planning-policy/supplementary-planning-documents).

8.3.9 Tandridge District Council: the Woldingham Character Assessment published in 2011, identified ten character areas within the village, and the Harestone Character Assessment published in 2011, identified twelve character areas within the village.

8.3.10 Waverley Borough Council: the Bramley Village Conservation Area Appraisal SPD was published in 2005, the Farnham Conservation Area Appraisal SPD was published in 2005, the Blackheath, Shamley Green & Wonersh Village Design Statement SPD was published in 2007, and the Residential Extensions SPD was published in 2010. All four documents provide guidance on a range of issues that affect quality in the built environment.

8.3.11 Woking Borough Council: the Woking Character Study was published in 2010, and identifies thirty different character areas within the borough.

8.B.2 Properties & infrastructure at risk from flooding

8.4 The majority of the land located within the borders of the county of Surrey falls within the area covered by the Thames CFMP. According to the Thames CFMP (section 3.3.3, p.140), published by the Environment Agency in 2009, there are in excess of 280,000 properties within the CFMP area that are subject to a 1 in 1,000 year risk of fluvial flooding (i.e. that are within flood zone 2), and some 188,000 properties that are at risk from a 1 in 100 year flood event (i.e. are located within flood zone 3). The Thames CFMP policy units that cover parts of the county of Surrey include, Addlestone Bourne, Cut & Emm Brook policy unit, the Byfleet & Weybridge policy unit, the Colne policy unit, the Guildford policy unit, the Hoe Stream policy unit, the Hogsmill policy unit, the Lower Mole policy unit, the Lower Thames policy unit, the Middle Mole policy unit, the Rural Wey policy unit, the Upper & Middle Blackwater policy unit, the Upper Mole policy unit, and the Wandle policy unit.

8.5 The Thames CFMP (table 3.5, pp.143-144) estimates of the numbers of properties at risk of flooding, for flood zone 3 and flood zone 2, within all the policy units within the CFMP area. The figures for the policy units that coincide with areas within Surrey are set out in Table 8-A.

Table 8-A: Properties at risk of flooding for Thames CFMP policy units that cover Surrey

Thames CFMP Policy Unit	No. properties in...		'High Vulnerability'	'Lower Vulnerability'
	Zone 3 (>1.0% AEP)	Zone 2 (0.1% to 1.0% AEP)		
Addlestone Bourne, Cut & Emm Brook	1,423	2,288	1 school; 1 emergency response centre; 4 power & gas stations	4 sewage & water treatment site
Byfleet & Weybridge	1,258	4,389	4 power & gas stations	1 industrial site with an Environmental Permit; 1 sewage & water treatment site
Colne	3,563	7,172	1 hospital; 1 school; 1 care home; 21 power & gas stations	1 railway station; 2 sewage & water treatment sites
Guildford	495	988	1 power & gas station	None
Hoe Stream	260	495	1 school	1 sewage & water treatment site
Hogsmill	3,641	5,692	2 schools; 3 emergency response centres; 5 power & gas stations	None
Lower Mole	1,971	8,956	1 school; 1 care home; 1 camp/caravan site; 2 emergency response centres; 3 power & gas stations	1 railway station; 1 sewage & water treatment site
Lower Thames	32,786	44,665	9 schools; 3 camp/caravan sites; 3 emergency response centres; 51 power & gas stations; 1 telephone exchange	1 railway station; 2 industrial sites with Environmental Permits; 1 radioactive substances site; 2 sewage & water treatment sites
Middle Mole	705	2,370	1 school; 1 emergency response centre; 2 power & gas stations	3 railway stations; 1 sewage & water treatment site
Rural Wey	2,988	4,413	1 school; 2 care homes; 3 emergency response centres; 5 power & gas stations; 1 telephone exchange	1 industrial site with an Environmental Permit; 10 sewage & water treatment sites
Upper & Middle Blackwater	1,372	3,999	2 schools; 2 care homes; 5 power & gas stations	2 railway stations; 3 sewage & water treatment sites
Upper Mole	2,756	5,146	1 school; 4 care homes; 1 camp/caravan site; 9 power & gas stations	1 airport; 3 sewage & water treatment works
Wandle	11,698	12,372	5 schools; 6 care homes; 1 emergency response centre; 34 power & gas stations	1 industrial site with an Environmental Permit; 1 radioactive substances site

8.6 The Thames CFMP (p.150) notes that there are a range of facilities and infrastructure that has been built within areas subject to the 1 in 100 year (zone 3) flood risk, some of which, such as hospitals, schools and police stations is classified as highly vulnerable to flooding in the NPPF. Details of the different categories of infrastructure that, according to the Thames CFMP (Table 3.8, pp.151-152) are located within the extent of flood zone 3 for the policy units that cover parts of Surrey are set out in Table 8-A.

8.7 The Thames CFMP (table 3.7, p.150) notes that there are significant lengths of road and railway located within the floodplain, which means that many transport routes face disruption as a result of flood risk with an impact at the local and wider regional and national level. It is estimated that within the area covered by the CFMP, some 47 kilometres of motorway, some 281 kilometres of 'A' roads, and some 268 kilometres of main railways fall within the extent of flood zone 3. For the area of land affected by flood zone 2, those figures rise to 60km of motorway, 349 kilometres of 'A' roads, and 329 kilometres of main railway.

8.8 Certain areas of land within Surrey fall within either the Arun & Western Streams CFMP, in the south of the county around the intersection of the borders between Mole Valley District Council and Waverley Borough Council in Surrey and Horsham District Council in West Sussex, or the River Medway CFMP, where the Upper Medway policy unit covers areas in the south and east of Surrey. The risk assessment for properties affected by flooding in the Upper Arun policy unit of the Arun & Western Streams CFMP focuses on the settlements of Billingshurst and Horsham, both of which are located in West Sussex, and consequently does not provide any data that is relevant to Surrey. The risk assessment for properties within the Upper Medway policy unit of the River Medway CFMP does not differentiate between areas located in Kent and those that fall within Surrey.

8.9 For surface water flooding, data provided by the Environment Agency to inform the development of the PFRA for Surrey indicated that approximately 46,500 properties within the county could be at risk of flooding as a consequence of surface water events. Those floods, it is estimated, could reach depths in excess of 0.3 metres during a 1 in 200 year rainfall event.

8.C Future Trends & Key Issues

8.10 Surrey is a densely populated county, and the population is expected to continue to grow in future years. Such growth will give rise to additional demands for housing, for employment space and for supporting social and community infrastructure (e.g. schools, hospitals and health centres, retail provision, etc.). Further development of the built environment will be required to meet the needs of the growing population. Growing demand for housing and the other built infrastructure vital to the well-being

of society, combined with the impacts of a changing climate may affect the number of properties, and thus people, who are at risk as a consequence of flooding from pluvial and fluvial sources.

8.11 The desire of the community to safeguard the Green Belt, and the wider countryside, is likely to increase development pressure within existing settlements and urban areas in the county. Such concentration of development, and consequently populations, within relatively small geographical areas will increase the importance of ensuring that high standards are achieved in the design of new development.

8.D Impact Assessment

8.D.1 Impact pathways

8.12 There are two pathways by which implementation of the revised Surrey LFRMS could give rise to impacts and effects on the built environment receptor.

8.13 Impact Pathway BE1: Impacts on townscape character
The pathway focuses on the extent to which the proposed course(s) of action may result in changes in the character or amenity of the existing townscape.

8.14 Impact Pathway BE2: Impacts on built structures
The pathway focuses on the extent to which the proposed course(s) of action may result in changes in the extent to which built structures are exposed to risks of adverse impact.

8.D.2 Assessment findings & discussion

8.15 Assessment of Objectives: Four (objectives two, four, six and seven) of the eight objectives for the Surrey LFRMS were considered to be likely to give rise to the implementation of infrastructure works and schemes that could result in changes to the physical environment. The extent to which such works could result in impacts or effects on townscape character and amenity, and on the integrity of existing built structures would be dependent on the scale and type of scheme proposed. There is therefore potential for the implementation of the strategy to give rise to a range of impacts, from beneficial (e.g. the reduction of flood risk), to adverse (e.g. disruption of the local visual environment during the construction of new flood management infrastructure, particularly where groundworks are required).

8.16 Assessment of Infrastructure Schemes (2016/17 Action Plan): Of the twenty-seven schemes listed under the action plan for 2016/17, a total of sixteen were classed as having the potential to give rise to significant beneficial effects with reference to impact

pathway BE2, and thirteen were assessed as having the potential to give rise to short term and temporary adverse impacts with reference to impact pathway BE1, as consequence of the visual intrusion of construction works and associated facilities (e.g. contractors compounds, etc.). The primary reason for schemes having been assessed as having the potential to give rise to beneficial effects on the built environment receptor was the scope for the construction of new flood management infrastructure to improve the level of protection afforded to existing buildings, other built structures and future development. There is also some scope for the provision of areas of greenspace associated with new flood management facilities to deliver amenity improvements and enhance access to natural areas, particularly in urban locations.

8.E Recommendations for Impact Management

8.17 The greatest potential for flood management schemes to give rise to impacts in respect of the built environment arise during the operational phase, when the attenuation and improved management of flood waters presents opportunities for the better protection of existing buildings and built structures.

8.18 To maximise the opportunities for improved protection of the built environment through the creation of new flood risk management facilities, such schemes should be designed to have sufficient 'spare' capacity to accommodate the additional flood risks that may rise because of other development in the affected area. Wherever possible the design of a scheme should factor in the likely implications of further development within the scheme's catchment for its capacity to deliver the anticipated benefits.

8.19 Where schemes are being developed for areas that are already subject to significant urbanisation, information on potential major future development should be sought from the Local Planning Authority. In developing flood risk management schemes advice should be sought from the Environment Agency, and from drainage experts within the relevant local councils or the lead local flood authority. Early consultation with the relevant experts will help to ensure that the scheme is designed and implemented in a way that minimises the risks of adverse impacts, and maximises the opportunities for beneficial effects to be delivered.

Section 9 The Historic Environment & Archaeology Receptor

9.A Definition

9.1 The **historic environment and archaeology** receptor covers effects on the historic environment in terms of archaeological assets (both known and unknown) and sites, structures and features of historic significance and value. The receptor covers the topic of 'cultural heritage including architectural and archaeological heritage' as required by the EU Directive and UK Regulations on the environmental assessment of plans and programmes.

9.B Baseline Conditions

9.2 The only source of evidence for the great majority of Surrey's past, and particularly that, which predates recorded history, comes from archaeology. The archaeology of an area can give insights into the past social and cultural life of an area that could not be achieved with documentary records and evidence alone. Archaeological assets are fragile and finite, as sites cannot be restored or replaced once they have been damaged or destroyed. Buried evidence, which can be little more than marks or layers in the soil, accounts for much of the archaeological record.

9.3 Surrey is host to some 166 Scheduled Monuments (see Table 3.F-1), including buildings, sites, features and structures, which are of national importance for their historic and heritage interest, and are designated for protection under the *Ancient Monuments & Archaeological Areas Act 1979*.

9.3.1 The majority of Scheduled Monuments located within the county date from the Neolithic period and the Bronze Age (56 Scheduled Monuments), and are distributed across nine of the eleven districts and boroughs within Surrey (the exceptions are Elmbridge, and Epsom & Ewell). Some 14 Scheduled Monuments, distributed across the boroughs of Elmbridge, Reigate & Banstead, Runnymede and Waverley, and the districts of Mole Valley and Tandridge, date from the Iron Age, and a further 14 Scheduled Monuments distributed across the same set of boroughs and districts date from the Roman period. A single Scheduled Monument that dates to the Mesolithic period is located in the district of Mole Valley.

9.3.2 Some 42 Scheduled Monuments, distributed across nine of the eleven districts and boroughs within Surrey (the exceptions are Elmbridge and Surrey Heath), date from the Medieval period. Some 7 Scheduled Monuments, located in the

boroughs of Guildford, Reigate & Banstead, and Waverley, and the districts of Mole Valley and Tandridge, date specifically from the Norman period. Some 6 Scheduled Monuments, located in the boroughs of Guildford, Reigate & Banstead, Spelthorne and Waverley, and the district of Tandridge, date specifically to the Anglo-Saxon period. There are 2 Scheduled Monuments, located in the boroughs of Elmbridge and Epsom & Ewell, that date from the Tudor period.

9.3.3 Some 5 Scheduled Monuments, located in the boroughs of Guildford and Spelthorne, and the district of Tandridge, date from the 17th century. Some 6 Scheduled Monuments, located in the boroughs of Elmbridge, Runnymede, Spelthorne and Woking, and the district of Tandridge, date from the 18th century. Some 10 Scheduled Monuments, located in the boroughs of Guildford and Reigate & Banstead, and the districts of Mole Valley and Tandridge, date from the 19th century. A single Scheduled Monument, located in the borough of Elmbridge, dates from the 20th century.

9.3.4 There are some 3 Scheduled Monuments whose date is recorded as unconfirmed on the National Heritage List.

Table 9-A: Overview of heritage assets in Surrey

District / Borough	Scheduled Monuments	Listed Buildings			Conserv-ation Areas	Registered Parks & Gardens		
		Grade I	Grade II*	Grade II		Grade I	Grade II*	Grade II
Elmbridge	6	8	23	477	25	2	0	1
Epsom & Ewell	2	0	17	307	21	0	0	1
Guildford	32	30	41	1,008	39	2	2	5
Mole Valley	27	6	50	954	26	0	3	2
Reigate & Banstead	25	6	21	403	21	0	0	2
Runnymede	7.5	4	20	282	7	2	2	2
Spelthorne	4.5	3	12	187	8	0	0	0
Surrey Heath	4	1	5	173	9	0	0	2
Tandridge	23	20	52	526	19	0	0	2
Waverley	29	22	95	1,596	43	1	3	4
Woking	5	4	11	170	25	1	1	1
Totals	**165**	**104**	**347**	**6,083**	**243**	**7**	**10**	**22**

9.4 In addition to the nationally important Scheduled Monuments, there are also areas in Surrey protected by local designations. There are some 248 County Sites of Archaeological Importance (CSAIs) distributed across the county, and some 1,077 Areas of High Archaeological Potential (AHAP).

9.5 The built heritage of Surrey is characterised by great variety and good quality (see Table 3.F-1). The county hosts some 6,534 statutorily Listed Buildings of Grade I, Grade II* and Grade II status, which are recorded on the National Heritage List for England (held by Historic England). The county's stock of Listed Buildings include examples of churches and country houses, buildings that typify the local vernacular style, dwellings and buildings used for agriculture, industry, transport or commerce, and the work of architects of international renown and innovative inclination. There are also some 243 Conservation Areas (see Table 3.F-1) designated across the county, covering the historic hearts of towns and villages.

9.6 Two forms of designation that afford protection to the historic landscapes on heritage grounds are the Register of Historic Parks & Gardens (for sites of national importance), and Areas of Special Historic Landscape Value. Surrey is host to many historic parks and gardens, of which 39 are of national importance, and are consequently listed on the Register of Historic Parks & Gardens (see Table 3.F-1). There are also two Area of Outstanding Natural Beauty (AONB) designations located wholly or partly within Surrey, which contain and consequently help to protect numerous historic sites. The Surrey Hills AONB runs across the county from west to east following the North Downs, and part of the High Weald AONB covers the south east corner of the district of Tandridge.

9.7 The most recent *Heritage at Risk* survey, produced by Historic England in 2015, reported that 33 sites located within Surrey were at risk of decay, damage or loss, the lowest number for any county in the south east of England.

9.7.1 A total of nine non-religious buildings and structures, distributed across the boroughs of Elmbridge and Reigate & Banstead, and the districts of Mole Valley and Tandridge, are listed as being 'at risk'. The three 'at risk' buildings or structures in Elmbridge include two that are designated as Scheduled Monuments and Listed Buildings, and one designated as a Listed Building. The one 'at risk' building or structure located in Reigate & Banstead is designated as a Scheduled Monument. The four 'at risk' buildings located in Mole Valley include three that are designated as Scheduled Monuments and Listed Buildings, and one designated as a Listed Building. The one 'at risk' building or structure located in Tandridge is designated as a Scheduled Monument.

9.7.2 A total of eleven places of worship, distributed across the boroughs of Guildford, Reigate & Banstead, and Spelthorne, and the districts of Mole Valley and Tandridge, are listed as being 'at risk'. The four 'at risk' places of worship in Guildford comprise two Grade I listed buildings, and two Grade II listed buildings. The one 'at risk' place of worship in Reigate & Banstead is Grade I listed. The two 'at risk' places of worship in Spelthorne comprise one Grade I listed building, and one Grade II* listed building. The three 'at risk' places of

worship in Mole Valley comprise one Grade II* listed building and two Grade II listed buildings. The one 'at risk' place of worship in Tandridge is Grade I listed.

9.7.3 A total of four archaeological sites, located in the districts of Mole Valley and Tandridge, and the borough of Waverley, are listed as being 'at risk'. The two 'at risk' archaeological sites in Mole Valley are both Scheduled Monuments, as are the one in Tandridge and the one in Waverley.

9.7.4 A total of four historic parks and gardens, located in the boroughs of Guildford, Runnymede and Woking, and the district of Mole Valley, are listed as 'at risk'. The one 'at risk' site in Guildford is a Grade II Registered Park & Garden, as is the one 'at risk site in Mole Valley, and the one 'at risk' site in Runnymede. The one 'at risk' site in Woking is a Grade I Registered Park & Garden.

9.7.5 A total of five Conservation Areas, located in the boroughs of Elmbridge (one Conservation Area), Epsom & Ewell (three Conservation Areas), and Guildford (one Conservation Area), are listed as 'at risk'.

9.C Future Trends & Key Issues

9.8 Surrey has a diverse heritage, in terms of buildings, archaeology and landscapes. There is scope for the development and use of new infrastructure to adversely affect the historic environment, through landtake, through the effects of construction works on structural integrity, and the impacts that the deposition of chemicals can have on the fabric of buildings.

9.9 Surrey is densely populated and the trend of population growth is expected to continue, which will result in increased demands for housing, employment space and supporting social and community infrastructure (e.g. schools, hospitals and health centres, retail provision, etc.). The demand for development land will place the county's heritage assets at increased risk of disturbance, damage and loss.

9.10 In the event of projected changes in the UK's climate being realised, the effects that those changes (i.e. long periods of hot dry weather during the summer months and the potential for increasingly wet winters) could have on archaeological, built heritage and historic landscape assets could be severe.

9.D Impact Assessment

9.D.1 Impact pathways

9.11 There are three pathways by which implementation of the revised Surrey LFRMS could give rise to impacts and effects on the historic environment and archaeology receptor.

9.12 Impact Pathway HEA1: Impacts on archaeological assets
The pathway focuses on the extent to which the proposed course(s) of action may give rise to impacts on known and unknown archaeological assets.

9.13 Impact Pathway HEA2: Impacts on built heritage or historic landscapes
The pathway focuses on the extent to which the proposed course(s) of action may give rise to impacts on built heritage or historic landscape assets.

9.D.2 Assessment findings & discussion

9.14 Assessment of Objectives: Four (objectives two, four, six and seven) of the eight objectives for the Surrey LFRMS were considered to be likely to give rise to the implementation of infrastructure works and schemes that could result in changes to the physical environment. The extent to which such works could result in impacts or effects on heritage or archaeological assets would be dependent on the scale and type of scheme proposed, and the sensitivity of the area of land in which it would be constructed or installed. There is therefore potential for the implementation of the strategy to give rise to a range of impacts, from beneficial (e.g. the protection of historic buildings and features from flood damage), to adverse (e.g. archaeology being damaged as a consequence of groundworks).

9.15 Assessment of Infrastructure Schemes (2016/17 Action Plan): Of the twenty-seven schemes listed under the action plan for 2016/17, only one was classed as having the potential to give rise to significant beneficial effects with reference to impact pathway HEA2. The primary reason for that scheme having been assessed as having the potential to give rise to beneficial impacts on the built heritage was that the works could help to safeguard a number of Listed Buildings from flooding and associated damage.

9.E Recommendations for Impact Management

9.16 There is potential for flood management schemes to give rise to adverse impacts in respect of the historic environment and archaeology during the construction phase, and to beneficial effects during the operational phase as a resulted of reductions in flood risk exposure.

9.17 During the construction phase of a flood management scheme the key impacts on the historic environment and archaeology that need to be considered are those of:

- Destruction of features or assets that are of heritage value, including the risk to unknown areas of archaeological importance (e.g. as a consequence of excavations to provide areas such as wetlands, ponds or detention basins).
- Physical damage to or disturbance of heritage assets and archaeology, including changes in the character and setting of the historic landscape, particularly as a consequence of excavation or construction.
- Changes in the patterns of exposure to sources of pollution that may damage heritage assets and features as a consequence of chemical effects

9.18 Where schemes are being developed for areas that fall within, or are in close proximity to, known heritage assets, or areas of archaeological importance or potential, the advice of the English Heritage, and of the County Council's archaeology specialists should be sought. Early consultation with the relevant experts will help to ensure that the scheme is designed and implemented in a way that minimises the risks of adverse impacts, and maximises the opportunities for beneficial effects to be delivered.

Section 10 The Natural Environment & Biodiversity Receptor

10.A Definition

10.1 The **natural environment and biodiversity** receptor covers effects on the natural environment in terms of plants, animals and geological assets and biodiversity in terms of habitats and species. The receptor covers the topic of 'fauna, flora & biodiversity' as required by the EU Directive and the UK Regulations on the environmental assessment of plans and programmes.

10.B Baseline Conditions

10.B.1 Designated Nature Conservation & Earth Heritage Sites

10.2 The natural heritage and biodiversity of Surrey is rich, with the county containing diverse habitats that support a wide range of species. Numerous sites within the county have been designated for protection on the grounds of nature conservation and earth heritage interest at the local, national and international levels (see Table 10-A – note that some designations extend across multiple administrative areas).

Table 10-A: Overview of Natural Environment Designations in Surrey

Borough/ District	SPA	SAC	Ramsar Site	SSSI	NNR	LNR	SNCI	RIGS
Elmbridge	2	0	1	4	0	7	21	-
Epsom & Ewell	0	0	0	2	0	3	12	-
Guildford	1	1	0	16	0	8	157	9
Mole Valley	0	1		11	1	5	67	7
Reigate & Banstead	0	1	0	4	0	2	40	3
Runnymede	1	1	1	4	0	2	35	-
Spelthorne	1		1	4	0	-	29	-
Surrey Heath	1	1	0	5	1	1	55	-
Tandridge	0	0	0	8	0	6	90	2
Waverley	3	1	1	15	1	5	172	9
Woking	1	1	0	4	0	2	44	-
Surrey	**4**	**3**	**2**	**63**	**3**	**38**	**722**	**30**

10.3 There are a number of sites within Surrey that have been designated as requiring protection under the terms of the European Union's Wild Bird's Directive (Special Protection Areas or SPAs) or Habitats Directive (Special Areas of Conservation or SACs), or under the Ramsar Convention on Wetlands of International Importance (Ramsar Sites). Details of the reasons for the designation of the SPAs, SACs and Ramsar Sites can be accessed from the Joint Nature Conservation Committee website (http://jncc.defra.gov.uk/Default.aspx). The location and extent of the SPAs, SACs and Ramsar Sites can be viewed on the Multi-Agency Geographic Information for the Countryside (Magic) website (http://www.magic.gov.uk/).

10.3.1 Mole Gap to Reigate Escarpment SAC: Located in the Mole Valley district and Reigate & Banstead borough areas, and covering most of the Mole Gap to Reigate Escarpment Site of Special Scientific Interest (SSSI). The SAC is designated for its chalk grassland, orchid populations, yew woodland, box scrub, beech woodlands, and populations of Bechsteins bat, and great crested newts.

10.3.2 South West London Waterbodies SPA & Ramsar Site: Located partly in the Elmbridge, Spelthorne and Runnymede borough areas of Surrey, and composed of all or parts of the Kempton Park Reservoirs SSSI, the Knight & Bessborough Reservoirs SSSI, the Staines Moor SSSI, the Thorpe Park No.1 Gravel Pit SSSI, the Wraysbury & Hythe End Gravel Pits SSSI, the Wraysbury No.1 Gravel Pit SSSI, and the Wraysbury Reservoir SSSI. The SPA and Ramsar Site are designated for the presence of over-wintering populations of two species of dabbling ducks, the gadwall and the Northern shoveler.

10.3.3 Thames Basin Heath SPA: Located partly in the Elmbridge, Guildford, Surrey Heath, Waverley and Woking borough areas of Surrey, and composed of all or parts of the Ash to Brookwood Heaths SSSI, the Bourley & Long Valley SSSI, the Bramshill SSSI, the Broadmoor to Bagshot Woods & Heaths SSSI, the Castle Bottom to Yateley & Hawley Commons SSSI, the Chobham Common SSSI, the Colony Bog & Bagshot Heath SSSI, the Eelmoor Marsh SSSI, the Hazeley Heath SSSI, the Horsell Common SSSI, the Ockham & Wisley Commons SSSI, the Sandhurst to Owlsmoor Bogs & Heaths SSSI, and the Whitmoor Common SSSI. The SPA is designated for the presence of three species of breeding birds that favour lowland heath habitats, the Dartford warbler, the nightjar, and the woodlark.

10.3.4 Thursley, Ash, Pirbright & Chobham SAC: Located in the Guildford, Surrey Heath and Waverley borough areas of Surrey, and composed of all or parts of the Ash to Brookwood Heaths SSSI, the Chobham Common SSSI, the Colony Bog & Bagshot Heath SSSI, and the Thursley, Hankley & Frensham Commons SSSI. The SAC is designated for its wet and dry heathland habitats, and for bog habitats.

10.3.5 Thursley, Hankley & Frensham Commons (Wealden Heaths Phase I) SPA: Located in the Waverley borough area of Surrey, and composed of most of the Thursley, Hankley & Frensham Commons SSSI. The SPA is designated for the presence of three species of breeding birds that favour lowland heath habitats, the Dartford warbler, the nightjar, and the woodlark.

10.3.6 Thursley & Ockley Bog Ramsar Site: Located in the Waverley borough area of Surrey, and composed of part of the Thursley, Hankley & Frensham Commons SSSI. The Ramsar Site is designated for its assemblages of reptile species, and dragonfly and damselfly species.

10.3.7 Wealden Heaths Phase II SPA: Located partly in the Waverley borough area of Surrey, and composed of all or parts of the Devil's Punch Bowl SSSI, the Bramshott & Ludshott Commons SSSI, the Broxhead & Kingsley Commons SSSI, and the Woolmer Forest SSSI. The SPA is designated for the presence of three species of breeding birds that favour lowland heath habitats, the Dartford warbler, the nightjar, and the woodlark.

10.3.8 Windsor Forest & Great Park SAC: Located partly in the Runnymede borough area of Surrey, and composed of most of the Windsor Forest & Great Park SSSI. The SAC is designated for its ancient oak woodlands, and its population of the violet click beetle.

10.4 At the national level, a total of 63 SSSIs are located wholly or partly within the county of Surrey, of which nine are wholly or partly designated for their geological interest. Three of the SSSIs, at Ashtead Common, at Chobham Common, and at Thursley, Hankley & Frensham Commons, are also wholly or partly covered by National Nature Reserve (NNR) designations,. Natural England undertakes regular monitoring of the condition of SSSIs, which is published on their website. The condition summary for SSSIs in the county of Surrey, compiled by Natural England in 2016, reported that 98.07% of the area of land covered by SSSI designations within the county was in either 'favourable' or 'recovering' condition. Only 0.98% of the land designated as SSSI in Surrey had exhibited 'no change' in its condition, and only 0.95% of the area covered by SSSI designations was found to be in declining condition. Details of the reasons for the designation of the SSSIs, and information about their condition, can be obtained from Natural England's designated sites website (https://designatedsites.naturalengland.org.uk/). The location and extent of the SSSIs can be viewed on the Magic website (http://www.magic.gov.uk/).

10.5 There are numerous sites that are designated as being of nature conservation importance at the local level located across Surrey. Those include, 38 statutorily designated Local Nature Reserves (LNRs), 722 locally designated Sites of Nature Conservation Importance (SNCIs), 172 potential SNCIs (pSNCIs), and 30 Regionally Important Geological/Geomorphological Sites (RIGS). Information on the reasons for the

designation of the SNCIs is held by the Biological Records Centre at the Surrey Wildlife Trust. The location and extent of the NNRS and LNRs can be viewed on the Magic website (http://www.magic.gov.uk/).

10.B.2 Ancient Woodland

10.6 Surrey is an extensively wooded county, with approximately 22.5% (or 37,700 hectares) of its land area under some form of woodland cover, either ancient (i.e. areas continuously wooded since at least 1600 AD), or recent, of greater than 0.1 hectare. The 2011 Ancient Woodland Inventory for Surrey notes that the county has the highest density of woodland of the nine counties in the south east of England, and that almost one-third of that woodland is designated as ancient, covering some 12,031 hectares. The majority of Surrey's ancient woodland (some 74%) is located in the south of the county, within the Wealden Greensand and Low Weald landscape areas. The location and extent of Ancient Woodland can be viewed on the Magic website (http://www.magic.gov.uk/).

10.7 The majority of the ancient woodlands identified by the Ancient Woodland Inventory are between 0.25 and 2.0 hectares in size (some 1,615 woodlands), with the next largest size grouping being the woodlands of between 2.0 hectares and 5.0 hectares (some 550 woodlands). The Ancient Woodland Inventory reports that there are 229 ancient woodland of between 5 and 10 hectares in size, and 220 ancient woodlands of between 10 and 50 hectares in size. The smallest group of ancient woodlands, both in terms of size and number are those of less than 0.25 hectares, of which the Ancient Woodland Inventory reports there to be 115.

10.B.3 Habitats of Principal Importance & Biodiversity Opportunity Areas

10.8 There are a range of Priority habitats, as identified by the UK Biodiversity Action Plan (BAP) distributed throughout Surrey, found both within and outside designated sites (see the Surrey Nature Partnership website for further details – https://surreynaturepartnership.org.uk/our-work/). These habitats are not subject to statutory protection, but correspond with those habitats identified under Section 41 of the Natural Environment & Rural Communities Act as 'Habitats of principal importance for the conservation of biodiversity in England' and are, therefore, protected by planning policy.

- Lowland Heath – of which Surrey has 13% of the national resource.
- Grasslands – including lowland dry acid grassland, lowland calcareous grassland, and lowland meadows (neutral grassland).

- Woodlands – including wood pasture and parkland, lowland beech and yew woodland, lowland mixed deciduous woodland, wet woodland, and traditional orchards.
- Wetlands – including floodplain grazing marsh, lowland fens, eutrophic standing waters, ponds, reedbeds, and rivers.
- Other habitat types – including hedgerows, open mosaic habitats, and arable field margins

10.9 A total of 50 Biodiversity Opportunity Areas (BOAs) have been identified within Surrey, covering 39% of the county, and encompassing the most important areas for wildlife conservation, where targeted action will have the greatest benefit. The main aim within BOAs is to restore biodiversity at a landscape scale through the maintenance, restoration and creation of Priority habitats. The Surrey Nature Partnership has developed detailed policy statements for each of the BOAs identified within the county, which provide information about the habitat and offer guidance on improved management. The policy statements for the BOAs can be accessed from the Surrey Nature Partnership website https://surreynaturepartnership.org.uk/our-work/.

- Thames Basin Heaths Area – for which 7 BOAs have been identified which are distributed across the boroughs of Elmbridge (1 BOA), Guildford (3 BOAs), Runnymede (3 BOAs), Surrey Heath (5 BOAs), and Woking (3 BOAs).
- Thames Basin Lowlands Area – for which 4 BOAs have been identified which are distributed across the boroughs of Elmbridge (2 BOAs), Epsom & Ewell (1 BOA), Guildford (2 BOAs), and the district of Mole Valley (2 BOAs).
- Thames Valley Area – for which 5 BOAs have been identified which are distributed across the boroughs of Elmbridge (2 BOAs), Runnymede (3 BOAs), and Spelthorne (2 BOAs).
- North Downs Area – for which 7 BOAs have been identified which are distributed across the boroughs of Epsom & Ewell (1 BOA), Guildford (2 BOAs), Reigate & Banstead (4 BOAs), and Waverley (1 BOA), and the districts of Mole Valley (3 BOAs) and Tandridge (2 BOAs).
- Wealden Greensand Area – for which 11 BOAs have been identified which are distributed across the boroughs of Guildford (3 BOAs), Reigate & Banstead (2 BOAs), and Waverley (7 BOAs), and the districts of Mole Valley (1 BOA), and Tandridge (2 BOAs).
- Low Weald Area – for which 7 BOAs have been identified which are distributed across the district of Mole Valley (4 BOAs), and the boroughs of Reigate & Banstead (1 BOA), and Waverley (3 BOAs).

- River Valley Area – for which 6 BOAs have been identified which are distributed across the borough of Elmbridge (3 BOAs), Epsom & Ewell (1 BOA), Guildford (2 BOAs), Reigate & Banstead (1 BOA), Runnymede (2 BOAs), Spelthorne (1 BOA), Surrey Heath (2 BOAs), Waverley (2 BOAs),and Woking (1 BOA), and the districts of Mole Valley (1 BOA) and Tandridge (2 BOAs).

10.B.4 Protected Species

10.10 A number of species of animals and plants receive strict protection under European Union's Habitats Directive. These species are typically referred to as 'European Protected Species' (or EPSs), and are protected by law under a licensing regime regulated by Natural England. The EPS most likely to be encountered in Surrey are the great crested newt, various species of bats, the hazel (or common) dormouse. Other EPSs that are known to occur within Surrey include the otter, the sand lizard, the smooth snake and the natterjack toad. The only EPS plant that is known to occur in Surrey is the early gentian.

10.11 Species of animals that are protected under the provisions of the Wildlife & Countryside Act, and that are known to occur in Surrey, include the water vole, common lizard, slow-worm, adder, grass snake and roman snail. All of those species are protected by law from killing and injury, sale and advertisement for sale, and it is also illegal to catch and retain a Roman snail or a White-clawed crayfish, or to obstruct access to, or destroy a water vole burrow, or to disturb a water vole in its burrow. The Wildlife & Countryside Act makes it illegal to pick, uproot or destroy certain rare plants and fungi, 20 species of which have been recorded as occurring in Surrey.

10.C Future Trends & Key issues

10.12 The natural environment of Surrey has, as has been the case for the country as a whole, been subject to change as a result of the demands that a developing and expanding society places upon it. The rate of population growth and pace of development has increased since the Second World War, placing direct and indirect pressures on the natural environment. The creation of designated sites, protected by law, has ameliorated those pressures to some extent, for a small part of the county's total land area, and has provided sensitive habitats and species with some degree of safeguard. Going forward the natural environment is likely to be subject to sustained pressure as a result of the need for development associated with a growing population.

10.13 The Climate Change Risk Assessment (CCRA) for the UK was published in 2012, and included analysis of key risks for eleven different 'sectors', one of which was biodiversity and ecosystem services. The purpose of the CCRA was to provide an

overview of the latest evidence available on the risks and opportunities that climate change presents to the UK, and in particular to identify those that require early action, up to the year 2100. The CCRA analysis is based primarily on the UK Climate Projections, which were published in 2009. The main findings of the CCRA for the biodiversity and ecosystem services sector are reproduced below (*CCRA Biodiversity Sector Report*, Executive Summary, p.vii):

- Many aspects of biodiversity are vulnerable to climate change but this is particularly evident in the coastal zone, uplands and wetlands which are generally high-value areas that are particularly sensitive to change.
- Direct effects of climate change are already apparent and would be further exacerbated by increased water stress, changes in species 'climate space', the timing of natural seasonal events, migration patterns and sea level rise.
- Indirect effects are expected to further compound direct effects including increases in invasive non-native species, impacts on soil and water quality, and increases in wildfire risk.
- Indirect effects from actions in other sectors, such as climate mitigation strategies, have the potential if poorly implemented to endanger biodiversity or if properly implemented to enhance biodiversity.
- Ecosystems' processes can naturally adapt to change but anthropogenic pressures (habitat fragmentation, land use change, pollution, water abstraction and fixed flood or erosion defences), are currently acting to restrict this adaptation.
- The complexity of ecosystems means it is difficult to project future risks with certainty. The evidence suggests that further changes seem inevitable, but rates of change are less certain. If the natural resilience of ecosystems is degraded and the rate of change is high, an abrupt step change in ecosystem processes can occur. Integrated responses across sectors are therefore required to enhance the resilience and adaptive capacity of the 'ecosystem services' that sustain human wellbeing.

10.D Impact Assessment

10.D.1 Impact pathways

10.14 There are two pathways by which implementation of the revised Surrey LFRMS could give rise to impacts and effects on the natural environment and biodiversity receptor.

10.15 Impact Pathway NEB1: Direct impacts on habitats & species

The pathway focuses on the extent to which the proposed course(s) of action may give rise to direct impacts on habitats and species.

10.16 Impact Pathway NEB2: Indirect impacts on habitats & species

The pathway focuses on the extent to which the proposed course(s) of action may give rise to impacts on habitats and species, for example from pollution or disturbance.

10.D.2 Assessment findings & discussion

10.17 Assessment of Objectives: Four (objectives two, four, six and seven) of the eight objectives for the Surrey LFRMS were considered to be likely to give rise to the implementation of infrastructure works and schemes that could result in changes to the physical environment. The extent to which such works could result in impacts or effects on habitats or species would be dependent on the scale and type of scheme proposed, and the sensitivity of the area of land in which it would be constructed or installed. There is therefore potential for the implementation of the strategy to give rise to a range of impacts, from beneficial (e.g. through the creation of new aquatic and wetland habitats), to adverse (e.g. physical disturbance or changes in land use within designated sites).

10.18 Assessment of Infrastructure Schemes (2016/17 Action Plan): Of the twenty-seven schemes listed under the action plan for 2016/17, a total of two were classed as having the potential to give rise to significant beneficial effects with reference to impact pathway NEB1, and one was found to presents risks of significant adverse impacts to impact pathways NEB1 and NEB2. The primary reason for schemes having been assessed as having the potential to give rise to beneficial impacts on the natural environment and biodiversity receptor was the scope for the construction of new flood management facilities to create new areas of aquatic or wetland habitat. Careful design and siting of features such as ponds and swales could, subject to the use of appropriate planting, contribute to the biodiversity of the affected area. For the scheme that was assessed as presenting risks of significant adverse impacts, that conclusion was reached on the basis of the affected areas proximity to a SSSI, SPA and SAC, where it had been indicated that the drainage improvement works may be undertaken within the boundaries of the designated site. For that scheme early consultation will need to be carried out with Natural England and the County Ecologist to ensure that the flood management solution does not adversely affect the integrity of the SSSI, SAC and SPA designations.

10.E Recommendations for impact management

10.19 The greatest potential for flood management schemes to give rise to impacts in respect of natural environment and biodiversity arise during the construction phase, although depending on the nature of the scheme there may be opportunities for biodiversity benefits to be delivered in the form or new or enhanced areas of habitat.

10.20 During the construction phase of a flood management scheme the key impacts on the natural environment and biodiversity that need to be considered are those of:

- Destruction of existing habitats, particularly if excavation (e.g. to create detention basins, ponds or drainage channels) or the deposition of large volumes of material (e.g. to create dams) is required.
- Damage of existing habitats as a consequence of contamination arising from the construction works (e.g. spills of oils or chemicals, increased levels of sediment in waters, etc.)
- Disturbance of species, and in particular European Protected Species and other protected species, especially from vehicle movements and construction works.
- Potential for individual members of species, and in particular European Protected Species and other protected species, to be injured, killed or otherwise damaged during the construction works.

10.21 Where the flood management scheme involves the provision of areas such as wetlands, ponds or detention basins the design of the facilities, and the arrangements for their long term management and maintenance, should ensure that the opportunities for the creation of new areas of ecological interest are maximised. Advice on the creation of areas of habitat appropriate to the wider ecological context should be sought at an early stage of the design process from relevant experts, including Natural England, the Environment Agency, the Surrey Wildlife Trust and the County Council's ecologist.

10.22 Where schemes are being developed for areas that fall within, or are in close proximity to, designated SPAs, SACs, Ramsar Sites, SSSIs or SNCIs, the advice of the relevant expert bodies should be sought at the earliest opportunity – for SPAs, SACs, Ramsar Sites and SSSIs Natural England must be consulted, and for SNCIs the County Council's ecologist and Surrey Wildlife Trust must be consulted (their views should also be sought on the likely effects on sites of national and international importance). Early consultation with the relevant experts will help to ensure that the scheme is designed and implemented in a way that minimises the risks of adverse impacts, and maximises the opportunities for beneficial effects to be delivered, and will also identify where licences and consents are required under nature conservation legislation (i.e. the Wildlife & Countryside Act 1981 (as amended), the Conservation of Habitats & Species Regulations 2010).

Section 11 The Landscape & Visual Amenity Receptor

11.A Definition

11.1 The **landscape and visual amenity** receptor covers effects on the character and integrity of the landscape (e.g. areas designated as warranting protection on the grounds of their natural beauty). The receptor covers the topic of 'landscape' as required by the EU Directive and UK Regulations on the environmental assessment of plans and programmes.

11.B Baseline Conditions

11.2 The countryside of Surrey includes landscapes of great beauty and diversity. Just over a quarter of the county (some 44,800 hectares), is designated as Areas of Outstanding Natural Beauty (ANB), with the majority of which is comprised of the Surrey Hills AONB, with a small area of the High Weald AONB extending into the south eastern corner of the county. Other parts of the countryside are designated as Areas of Great Landscape Value (AGLV), which helps to safeguard the landscape setting of a number of towns and to act as a buffer to the AONBs. To the south west the county adjoins part of the northern boundary of the South Downs National Park, which extends across Hampshire, West Sussex and East Sussex.

11.3 The National Character Areas (NCAs) have been defined by Natural England, and divide England into 159 distinct natural areas. Each is defined by a unique combination of landscape, biodiversity, geodiversity, history, and cultural and economic activity. Their boundaries follow natural lines in the landscape rather than administrative boundaries. The landscape of Surrey encompasses parts of eight of the NCAs that cover the south east of England.

11.3.1 NCA 114 (Thames Basin Lowlands), which stretches from stretches from the London suburbs of South Norwood in the east to Hale on the Surrey/Hampshire border in the west, characterised by a flat or gently undulating landscape that changes from urbanised in the east to farmland in the west. Further details of the NCA can be obtained from the Natural England website (http://publications.naturalengland.org.uk/publication/5682232412864512?category=587130).

11.3.2 NCA 115 (Thames Valley), which stretches from Reading in the west, through Slough, Windsor and the Colne Valley, to Kingston-upon-Thames and Richmond-upon-Thames in the east. The character of the area is dominated by the floodplains of the River Thames, and extensive urban development.

Further details of the NCA can be obtained from the Natural England website (http://publications.naturalengland.org.uk/publication/3865943?category=587130).

11.3.3 NCA 119 (North Downs), which forms a chain of chalk hills extending from the Hog's Back in Surrey to the White Cliffs of Dover in Kent. Further details of the NCA can be obtained from the Natural England website (http://publications.naturalengland.org.uk/publication/7036466?category=587130).

11.3.4 NCA 120 (Wealden Greensand), runs across Kent, parallel to the North Downs, through Surrey and then swings south, alongside the Hampshire Downs, before curving back eastwards to run parallel with the South Downs in West Sussex. Further details of the NCA can be obtained from the Natural England website (http://publications.naturalengland.org.uk/publication/5331490007154688?category=587130).

11.3.5 NCA 121 (Low Weald), a broad, low-lying clay vale which wraps around the northern, western and southern edges of the High Weald. The Low Weald starts in the east at Ashford in Kent, passing west to the north of Royal Tunbridge Wells, and then between Reigate and Redhill in the north and Crawley in the south, curving around Horsham, encompassing Cranleigh, Chiddingfold and Billingshurst and stretching toward Haslemere in the west, before swinging back east through West Sussex, encompassing Henfield, Hurstpierpoint and Burgess Hill to end in East Sussex just west of Hailsham and north east of Lewes. Further details of the NCA can be obtained from the Natural England website (http://publications.naturalengland.org.uk/publication/12332031?category=587130).

11.3.6 NCA 122 (High Weald), which stretches from Bexhill and Hastings on the south coast, and Tenterden in Kent, through to Horsham and Crawley in West Sussex, encompassing the ridged and faulted sandstone core of the Sussex and Kent Weald, an area of ancient countryside that is one of the best surviving Medieval landscapes in Europe. Further details of the NCA can be obtained from the Natural England website (http://publications.naturalengland.org.uk/publication/4706903212949504?category=587130).

11.3.7 National NCA 129 (Thames Basin Heaths), which stretches from Weybridge in Surrey in the east, to Newbury in Berkshire to the west, and on the raised plateaux of sands and gravels is characterised by heathland and woodland. Further details of the NCA can be obtained from the Natural England website (http://publications.naturalengland.org.uk/publication/4685559624630272? category=587130).

11.3.8 NCA 130 (Hampshire Downs), which stretch from Farnham in the east to beyond Andover in the west, and from Basingstoke in the north to Winchester in the south, and comprise part of the central southern England belt of chalk. A steep scarp face delineates the Downs to the north, overlooking the Thames

Basin, and to the east, overlooking the Weald. Further details of the NCA can be obtained from the Natural England website (http://publications.naturalengland.org.uk/publication/6738147345956864?category=587130).

11.4 The 2015 Landscape Character Assessment for the county of Surrey provides a systematic review and evaluation of the landscape character of the county, identifying a total of twenty-three different landscape character types, which sub-divide into numerous landscape character areas. The Surrey Landscape Character Assessment can be accessed in full on the Surrey County Council website (http://www.surreycc.gov.uk/environment-housing-and-planning/countryside/countryside-strategies-action-plans-and-guidance/landscape-character-assessment)

11.4.1 The Chalk Down with Woodland (CD) character type is composed of seven distinct character areas, which are distributed across the boroughs and districts of: Epsom & Ewell (character area CD1); Mole Valley (character areas CD1 and CD2); Reigate & Banstead (character areas CD2 and CD3); and, Tandridge (character areas CD4, CD5, CD6 and CD7).

11.4.2 The Open Chalk Farmland (CF) character type is composed of seven distinct character areas, which are distributed across the boroughs and districts of: Epsom & Ewell (character areas CF3 and CF4); Guildford (character area CF1); Mole Valley (character areas CF2 and CF3); Reigate & Banstead (character areas CF3 and CF5); and, Tandridge (character areas CF5, CF6 and CF7).

11.4.3 The Chalk Ridge (CR) character type is composed of three distinct character areas, which are distributed across the boroughs and districts of: Guildford (character areas CR1 and CR2); Mole Valley (character areas CR2 and CR3); Reigate & Banstead (character area CR3); and, Tandridge (character area CR3).

11.4.4 The Wooded North Down (CW) character type is composed of eight distinct character areas, which are distributed across the boroughs and districts of: Guildford (character areas CW1 and CW2); Mole Valley (character areas CW3, CW4 and CW5); Reigate & Banstead (character areas CW6 and CW7); and, Tandridge (character area CW8).

11.4.5 The Open Greensand Hills (GO) character type is composed of eight distinct character areas, which are distributed across the boroughs and districts of: Guildford (character areas GO1 and GO2); Mole Valley (character areas GO2 and GO8); and, Waverley (character areas GO1, GO2, GO3, GO4, GO5, GO6 and GO7).

11.4.6 The Wooded Greensand Plateau (GP) character type is composed of one character area (GP1), which is located within the borough of Waverley.

11.4.7 The Greensand Valley (GV) character type is composed of four distinct character areas, which are distributed across the boroughs and districts of: Guildford (character area GV1); Mole Valley (character areas GV1 and GV2); Reigate & Banstead (character areas GV2, GV3 and GV4); Tandridge (character area GV4); and, Waverley (character area GV1).

11.4.8 The Wooded Greensand Hills (GW) character type is composed of thirteen distinct character areas, which are distributed across the boroughs and districts of: Guildford (character areas GW1, GW2 and GW3); Mole Valley (character areas GW9, GW10 and GW11); Reigate & Banstead (character areas GW11 and GW12); Tandridge (character areas GW12 and GW13); and, Waverley (character areas GW1, GW2, GW4, GW5, GW6, GW7 and GW8).

11.4.9 The Rolling Clay Farmland (LF) character type is composed of six distinct character areas, which are distributed across the boroughs and districts of: Elmbridge (character areas LF1 and LF2); Epsom & Ewell (character areas LF4 and LF5); Mole Valley (character areas LF1, LF3 and LF5); and, Waverley (character area LF6).

11.4.10 The Wooded Rolling Claylands (LR) character type is composed of two distinct character areas, which are distributed across the boroughs and districts of: Elmbridge (character area LR2); Guildford (character areas LR1 and LR2); Mole Valley (character area LR2); and, Waverley (character area LR1).

11.4.11 The Clay Woodland (LW) character type is composed of three distinct character areas, which are distributed across the boroughs and districts of: Elmbridge (character area LW2); Epsom & Ewell (character area LW3); and, Mole Valley (character areas LW1, LW2 and LW3).

11.4.12 The Mudstone Plateau (MP) character type is composed of one character area (MP1), which is located within the boroughs of Guildford and Waverley.

11.4.13 The River Floodplain (RF) character type is composed of eleven distinct character areas, which are distributed across the boroughs and districts of Elmbridge (character areas RF3, RF7 and RF10); Guildford (character areas RF6, RF7 and RF8); Mole Valley (character areas RF10 and RF11); Reigate & Banstead (character area RF11); Runnymede (character areas RF3, RF4 and RF7); Spelthorne (character areas RF1, RF2 and RF3); Surrey Heath (character areas RF5 and RF6); Waverley (character areas RF6, RF8 and RF9); and, Woking (character areas RF5 and RF7).

11.4.14 The Reservoirs (RS) character type is composed of one character area (RS1), which is distributed across the boroughs of Elmbridge and Spelthorne.

11.4.15 The River Valley Floor (RV) character type is composed of eight distinct character areas, which are distributed across the boroughs and districts of: Guildford (character areas RV5, RV6, RV7 and RV8); Runnymede (character areas RV2); Spelthorne (character areas RV1 and RV3); Waverley (character areas RV6, RV7 and RV8); and, Woking (character area RV4).

11.4.16 The Sandy Heath & Common (SH) character type is composed of five distinct character areas, which are distributed across the boroughs and districts of: Guildford (character areas SH3, SH4 and SH5); and, Surrey Heath (character areas SH1, SH2 and SH3).

11.4.17 The Settled & Wooded Sandy Farmland (SS) character type is composed of twelve distinct character areas, which are distributed across the boroughs and districts of: Elmbridge (character area SS9); Guildford (character areas SS11 and SS12); Runnymede (character areas SS1, SS2, SS3, SS4 and SS8); Surrey Heath (character areas SS4, SS5, SS6, SS7 and SS8); and, Woking (character areas SS4, SS7, SS8, SS10, SS11 and SS12).

11.4.18 The Sandy Woodland (SW) character type is composed of eight distinct character areas, which are distributed across the boroughs and districts of: Elmbridge (character areas SW5 and SW6); Guildford (character areas SW5 and SW7); Runnymede (character areas SW1 and SW3); Surrey Heath (character areas SW2, SW4 and SW7); Waverley (character area SW8); and, Woking (character area SW4).

11.4.19 The Low Weald Farmland (WF) character type is composed of three distinct character areas, which are distributed across the boroughs and districts of: Mole Valley (character area WF1); Reigate & Banstead (character areas WF1, WF2 and WF3); and, Tandridge (character area WF3).

11.4.20 The Wooded High Weald (WH) character type is composed of two distinct character areas (WH1 and WH2), which are located within the district of Tandridge.

11.4.21 The Wooded Low Weald (WW) character type is composed of ten distinct character areas, which are distributed across the boroughs and districts of: Mole Valley (character areas WW8, WW9 and WW10); and, Waverley (character areas WW1, WW2, WW3, WW4, WW5, WW6, WW7, WW8 and WW9).

11.4.22 The Distinct Areas on the edge of Urban Areas (UE) character type is composed of nine distinct character areas, which are distributed across the boroughs and districts of: Elmbridge (character areas UE1 and UE2); Epsom & Ewell (character area UE3); Reigate & Banstead (character areas UE4, UE5, UE6, UE7, UE8 and UE9); and, Tandridge (character area UE9).

11.4.23 The Significant Greenspaces within Urban Areas (UW) character type is composed of eight distinct character areas, which are distributed across the boroughs and districts of: Elmbridge (character areas UW4, UW5 and UW6); Epsom & Ewell (character areas UW7 and UW8); Guildford (character area UW1); Spelthorne (character areas UW2 andUW3).

11.C Future Trends & Key issues

11.5 In 2010, the Government Office for Science published a study entitled 'Land Use Futures', which identified six major factors driving change in land use in the UK over the next 50 years.

11.5.1 Demographic change – The Office of National Statistics indicates that the UK population is likely to increase by about 9 million by 2031 and by15 million by 2051, concentrated in England and Northern Ireland between 2008 and 2031. The number of people living alone is also rising, with an estimated 18% of the population living alone by 2031, of which 42% will be people over the age of 65 years. These trends translate into increased demand for land for housing, transport, water, food, recreation and energy, and may concentrate pressure in areas already under strain (e.g. the south east of England).

11.5.2 Economic growth and changing global economic conditions – Increased economic growth in the UK could imply a continuing increase in demand for land for development and services, particularly in the south east of England. Future land use will be affected by global economic forces, including rising demand for food as the world's population grows and fluctuations in commodity prices influencing the types of crops grown and the production regimes employed, and the role of land as a stable and attractive investment opportunity irrespective of the uses to which it is put.

11.5.3 Climate change – A significant increase in renewable energy capacity is required for climate change mitigation, as are changes in the ways in which land is used and developed, and the ways in which settlements are designed. This may lead to greater competition for land and changes in landscape character. Climate change may affect water levels with more frequent and intense storms and drier summers. The agricultural and forestry sectors, and

the management of the semi-natural environment have potentially important contributions to make to the mitigation of climate change, but will also have to adapt to changes in temperature and precipitation patterns.

11.5.4 New technologies – New products, processes and ways of working will enable the productivity of available land to be improved, potentially relieving some of the pressures that arise from the intensive use of land. Different approaches to living and working, and particularly the need for travel, will be facilitated by advances in information and communications technology. Technological and data management advances will also benefit the agricultural sector, enabling more efficient and targeted use of interventions such as fertilisers and medicines, and better soil management.

11.5.5 Societal preferences and attitudes – The desires of society to protect the natural environment, and to have access to decent housing and a decent living environment, the ability to travel, and to access goods and services by a variety of means, are changing the ways in which land is viewed and used.

11.D Impact Assessment

11.D.1 Impact pathways

11.6 There are two pathways by which implementation of the revised Surrey LFRMS could give rise to impacts and effects on the landscape and visual amenity receptor.

11.7 Impact Pathway LVA1: Impacts on landscape character

The pathway focuses on the extent to which the proposed course(s) of action may give rise to impacts on landscape character.

11.8 Impact Pathway LVA2: Impacts on visual amenity

The pathway focuses on the extent to which the proposed course(s) of action may give rise to impacts on visual amenity.

11.D.2 Assessment findings & discussion

11.9 Assessment of Objectives: Four (objectives two, four, six and seven) of the eight objectives for the Surrey LFRMS were considered to be likely to give rise to the implementation of infrastructure works and schemes that could result in changes to the physical environment. The extent to which such works could result in impacts or effects on landscape character or visual amenity would be dependent on the scale and type of scheme proposed, and the sensitivity of the area of land in which it would be

constructed or installed. There is therefore potential for the implementation of the strategy to give rise to a range of impacts, from beneficial (e.g. through the use of appropriate planting and materials, and careful siting, in the design and implementation of swales and ponds), to adverse (e.g. disruption of the local visual environment during the construction of new flood management infrastructure, particularly where groundworks are required).

11.10 Assessment of Infrastructure Schemes (2016/17 Action Plan): Of the twenty-seven schemes listed under the action plan for 2016/17, a total of two were classed as having the potential to give rise to significant beneficial effects with reference to impact pathway LVA1 and to impact pathway LVA2. The primary reason for schemes having been assessed as having the potential to give rise to beneficial impacts on the landscape and visual amenity receptor was the scope for the construction of new flood management facilities to create new features within the local landscape. Careful design and siting of features such as ponds and swales could, subject to the use of appropriate materials and planting, contribute to the landscape character and visual amenity of the affected area.

11.D Recommendations for Impact Management

11.11 The potential for flood management infrastructure schemes to give rise to impacts in respect of landscape character and visual amenity arises during the construction and the operational phases. Short to medium term effects during the construction phase, and in the early stages of the operational phase, are more likely to be adverse with respect to the character of the area, due to the creation of new landscape features such as detention basins, swales, channels or bunds, and the absence or immaturity of new planting. Over the longer term, as new features become more established in the landscape, and subject to their being appropriately managed, any initial adverse impact may be ameliorated.

11.12 During the construction phase, and the initial operational phase of a flood management scheme the key impacts on the landscape and visual amenity that need to be considered are those of:

- The scale, location and form of any new features that will be created in the landscape, such as ponds and detention basins, channels, and bunds or dams. New features should be designed to be as much in keeping with the natural or near-natural character of the area as is possible. Where features are being introduced in landscapes that have been historically altered by development, they should be designed so as to reinstate the pre-development characteristics of the area so far as possible.

- The types of vegetation used to integrate any new features into the wider landscape should reflect the established semi-natural habitats of the area, and local provenance species and stock should be used wherever possible. Where a scheme will help to reinstate a landscape previously lost to development, the planting should reflect the mix of habitats and species that would be considered characteristic of the type of environment being recreated.
- Visual intrusion associated with the storage of plant, equipment, vehicles and construction materials should be minimised for the duration of the construction works.

11.13 All flood management schemes should be appropriately managed over the longer term, to ensure their continued functioning with respect to both the control of flooding, and the safeguarding or enhancement of the visual character of the area affected, and the wider landscape in which it sits.

11.14 In all cases where flood management schemes that would involve the creation of new features in the landscape are being developed the advice of the County Council's landscape officer should be sought. Where schemes would be delivered in locations that lie within, or within the visual envelope, of designated landscapes (e.g. AONB, National Parks), the advice of the relevant authority should be sought (i.e. Natural England in all cases, the Surrey Hills AONB Partnership for the Surrey Hills AONB, the South Downs National Park Authority for the South Downs National Park, the High Weald AONB Unit for the High Weald AONB). Early consultation with the relevant experts will help to ensure that the scheme is designed and implemented in a way that minimises the risks of adverse impacts, and maximises the opportunities for beneficial effects to be delivered.

Section 12 The Welfare, Health & Well-being Receptor

12.A Definition

12.1 The **welfare, health and well-being** receptor covers effects on the welfare, health and well being of the local population, including perceived risks to people's health and wellbeing (e.g. noise, odour, light pollution, etc.) or of ill-health or injury (e.g. increased traffic movements), and the capacity to create opportunities for people to engage in activities that could give rise to health benefits. The receptor covers the topic of 'population' and 'human health' as required by the EU Directive and the UK Regulations on the environmental assessment of plans and programmes.

12.B Baseline Conditions

12.B.1 Health & Well-being Indicators

12.2 The county of Surrey had an estimated resident population of 1,152,000 people in mid-2013. In terms of age structure, the largest segment of Surrey's population is made up of people aged between 25 years and 64 years. The 2011 Census indicated that the proportion of the population made up by children (from new born to 15 years) at 18.1% had fallen slightly compared with the 2001 census (19.4%), and the proportion of older people (aged 75 years and above) had risen to 8.5%, a slight increase when compared with the 2001 Census (8.0%)[8].

12.3 The 2015 Health Profile for the county of Surrey, produced by the Association of Public Health Observatories, provides the following summary.

12.3.1 The health of people in Surrey is generally better than the England average. Deprivation is lower than average, however about 22,400 children live in poverty. Life expectancy for both men and women is higher than the England average. Life expectancy is 6.4 years lower for men and 4.8 years lower for women in the most deprived areas of Surrey than in the least deprived areas.

12.3.2 In 2012, 20.4% of adults in Surrey were classified as obese, better than the average for England. The rate of hospital stays for alcohol related harm was 5,410 a year, and for self-harm was 1,783 stays a year, both better than the average for England. The rate of smoking related deaths was 1,450 a year, better than the average for England. The rate of people killed and seriously injured on roads, and of new cases of malignant melanoma, are worse than

[8] Census 2011, National Statistics: London.

average. Rates of statutory homelessness, violent crime, long term unemployment, drug misuse, early deaths from cardiovascular diseases or cancer are better than average.

12.3.3 About 13.5% of Year 6 children are classified as obese, lower than the average for England. Levels of alcohol related hospital stays among those under 18 are better than the England average. The incidence of teenage pregnancy and smoking, and of GCSE attainment are better than the England average.

12.4 The key findings of the 2015 Health Profiles for each of the boroughs and districts in Surrey, measured against thirty-two separate indicators of health and well being are detailed below.

12.4.1 For the borough of Elmbridge, the 2015 Health Profile reports performance that is significantly worse than the average for England in the incidence of malignant melanoma. There is no significant difference between the borough's population and the England average for adult obesity, hip fractures in the over 65s, winter deaths, infant mortality, and deaths and injuries from road accidents. For the other twenty-six indicators the borough of Elmbridge performs significantly better than the England average.

12.4.2 For the borough of Epsom & Ewell, the 2015 Health Profile reports that there is no significant difference between the borough's population and the England average for statutory homelessness, alcohol specific hospital stays in the under-18s, smoking, adult physical activity, the incidence of malignant melanoma, the incidence of tuberculosis, hip fractures in the over 65s, winter deaths, infant mortality, and deaths and injuries from road accidents. For the other twenty-two indicators the borough of Epsom & Ewell performs significantly better than the England average.

12.4.3 For the borough of Guildford, the 2015 Health Profile reports performance that is significantly worse than the average for England in the incidence of deaths and injuries from road accidents. There is no significant difference between the borough's population and the England average for alcohol specific hospital stays in the under-18s, adult obesity, the incidence of malignant melanoma, hip fractures in the over 65's, winter deaths, and infant mortality. For the other twenty-five indicators the borough of Guildford performs significantly better than the England average.

12.4.4 For the district of Mole Valley, the 2015 Health Profile reports performance that is significantly worse than the average for England in the incidence of malignant melanoma, and deaths and injuries from road accidents. There is no significant difference between the borough's population and the England average for alcohol specific hospital stays in the under-18s, smoking, adult

obesity, adults with excess weight, hip fractures in the over 65s, and winter deaths. For the other twenty-four indicators the district of Mole Valley performs significantly better than the England average.

12.4.5 For the borough of Reigate & Banstead, the 2015 Health Profile reports that there is no significant difference between the borough's population and the England average for the number of GCSEs achieved at key stage 4, alcohol specific hospital stays in the under-18s, smoking, adult obesity, adults with excess weight, the incidence of malignant melanoma, hospital stays for self-harm, hip fractures in the over 65's, winter deaths, infant mortality, and deaths and injuries from road accidents. For the other twenty-one indicators the borough of Reigate & Banstead performs significantly better than the England average.

12.4.6 For the borough of Runnymede, the 2015 Health Profile reports performance that is significantly worse than the average for England for the number of GCSEs achieved at key stage 4, and for deaths and injuries from road accidents. There is no significant difference between the borough's population and the England average for statutory homelessness, alcohol specific hospital stays in the under-18s, under 18 conceptions, smoking, adult obesity, adults with excess weight, the incidence of malignant melanoma, hip fractures in the over 65's, winter deaths, and cancer deaths in the under 75s. For the other twenty indicators the borough of Runnymede performs significantly better than the England average.

12.4.7 For the borough of Spelthorne, the 2015 Health Profile reports performance that there is no significant difference between the borough's population and the England average for statutory homelessness, the number of GCSEs achieved at key stage 4, childhood obesity, alcohol specific hospital stays in the under-18s, under 18 conceptions, smoking, adult physical activity, adult obesity, adults with excess weight, the incidence of malignant melanoma, hip fractures in the over 65's, winter deaths, female life expectancy at birth, infant mortality, cardiovascular related deaths in the under 75s, and deaths and injuries from road accidents. For the other fifteen indicators the borough of Spelthorne performs significantly better than the England average.

12.4.8 For the borough of Surrey Heath, the 2015 Health Profile reports performance that there is no significant difference between the borough's population and the England average for statutory homelessness, alcohol specific hospital stays in the under-18s, adult physical activity, adult obesity, adults with excess weight, the incidence of malignant melanoma, hospital stays for self-harm, hip fractures in the over 65's, winter deaths, infant mortality, and deaths and

injuries from road accidents. For the other twenty-one indicators the borough of Surrey Heath performs significantly better than the England average.

12.x.9 For the district of Tandridge, the 2015 Health Profile reports performance that is significantly worse than the average for England in the incidence of deaths and injuries from road accidents. There is no significant difference between the borough's population and the England average for alcohol specific hospital stays in the under-18s, under 18 conceptions, smoking, adults with excess weight, the incidence of malignant melanoma, hospital stays for self-harm, hip fractures in the over 65's, winter deaths, and infant mortality. For the other twenty-two indicators the district of Tandridge performs significantly better than the England average.

12.4.10 For the borough of Waverley, the 2015 Health Profile reports performance that is significantly worse than the average for England in the incidence of malignant melanoma. There is no significant difference between the borough's population and the England average for alcohol specific hospital stays in the under-18s, smoking, adult physical activity, adults with excess weight, hip fractures in the over 65's, winter deaths, infant mortality, and deaths and injuries from road accidents. For the other twenty-three indicators the borough of Waverley performs significantly better than the England average.

12.4.11 For the borough of Woking, the 2015 Health Profile reports performance that there is no significant difference between the borough's population and the England average for alcohol specific hospital stays in the under-18s, smoking, adult physical activity, adult obesity, adults with excess weight, the incidence of malignant melanoma, the incidence of tuberculosis, hip fractures in the over 65's, winter deaths, infant mortality, and deaths and injuries from road accidents. For the other twenty-one indicators the borough of Woking performs significantly better than the England average.

12.B.2 Exposure to Flood Risk

12.5 The majority of the land located within the county of Surrey falls within the area covered by the Thames CFMP, published by the Environment Agency in 2009. Approximately 6% of the total population within the CFMP area are at risk of fluvial flooding, and up to 13% are at risk from tidal flooding (Thames CFMP, Chapter 3, section 3.3.2, p.128). The Thames CFMP policy units that cover parts of the county of Surrey include:

- Addlestone Bourne, Cut & Emm Brook
- Byfleet & Weybridge
- Colne
- Guildford
- Lower Thames
- Middle Mole
- Rural Wey
- Upper & Middle Blackwater

- Hoe Stream
- Hogsmill
- Lower Mole
- Upper Mole
- Wandle

12.6 The Thames CFMP estimates the numbers of people at risk of flooding within the different policy units. Those figures were calculated by multiplying the number of properties at risk in each policy unit by a figure of 2.25 (Thames CFMP, Chapter 3, section 3.3.2, p.128 and Table 3.3). The figures for the policy units that coincide with areas within Surrey are set out in Table 12B.

Table 12B: People at risk of flooding for Thames CFMP policy units that cover Surrey

Thames CFMP Policy Unit	Number of people in Flood Zone 3 (1 in 100 year risk)	Number of people in Flood Zone 2 (1 in 1,000 year risk)
Addlestone Bourne, Cut & Emm Brook	3,202	5,148
Byfleet & Weybridge	2,831	9,875
Colne	8,017	16,137
Guildford	1,114	2,223
Hoe Stream	585	1,114
Hogsmill	8,192	12,807
Lower Mole	4,435	20,151
Lower Thames	73,769	100,496
Middle Mole	1,586	5,333
Rural Wey	6,723	9,929
Upper & Middle Blackwater	3,087	8,998
Upper Mole	6,201	11,579
Wandle	26,321	27,837

12.7 The Thames CFMP (Chapter 3, section 3.3.2, p.132) advises that certain groups within society are more vulnerable to the impacts of flood events than others. The Social Flood Vulnerability Index (SFVI) value is compiled by the Flood Hazard Research Centre, based on three social groups (long-term sick, lone parents and the elderly) and four financial deprivation indicators (unemployed, overcrowding, non-car ownership and non-home ownership). Each enumeration district within an area can be given an SFVI value of between 1 (least vulnerable) and 5 (most vulnerable). The SFVI indicates where the social impacts of flooding could be most severe and where the health impacts for the population, including stress and trauma, could be greatest. Across the area covered by the Thames CFMP, approximately 136,000 people who live within flood zone 3 are also within an enumeration district with an SFVI of 4 or 5.

12.8 Certain areas of land within Surrey fall within either the Arun & Western Streams CFMP, in the south of the county around the intersection of the borders between Mole Valley DC and Waverley BC in Surrey and Horsham DC in West Sussex, or the River Medway CFMP, where the Upper Medway policy unit covers areas in the south and east of Surrey. The risk assessment for people affected by flooding in the Upper Arun policy unit of the Arun & Western Streams CFMP focuses on the settlements of Billingshurst and Horsham, both of which are located in West Sussex, and consequently does not provide any data that is relevant to Surrey. The risk assessment for people within the Upper Medway policy unit of the River Medway CFMP does not differentiate between areas located in Kent and those that fall within Surrey.

12.9 For surface water flooding, data provided by the Environment Agency to inform the development of the PFRA for Surrey indicated that approximately 46,500 properties within the county could be at risk of flooding as a consequence of surface water events. Applying the Environment Agency's assumption of an average occupancy rate of 2.25 persons per property, there may be in the region of 104,625 people in Surrey who are at risk of being affected by surface water flooding. Those floods, it is estimated, could reach depths in excess of 0.3 metres during a 1 in 200 year rainfall event.

12.C Future Trends & Key issues

12.10 The 2015 Health Profiles for the districts and boroughs and for the county of Surrey identify a range of key issues and challenges that need to be addressed with respect to the overall health and wellbeing of the population. At the level of the county, Surrey performs poorly in comparison with the rest of England in respect of the incidence of malignant melanoma, and the incidence or injuries and death resulting from road accidents, and is on a par with the rest of England in respect of the incidence of hip fractures in people aged 65 years and over, the incidence of increasing and higher risk drinking in adults. For all other indicators, at the level of the county, Surrey performs better than the average for England.

12.11 There are instances where one or more of the boroughs and districts within Surrey perform poorly in comparison with the rest of England for a number of indicators of health.

- The incidence of **malignant melanoma** is higher than the England average in the borough of Epsom & Ewell, the district of Mole Valley, and the borough of Waverley, and on a par with the England average in the other eight boroughs and districts.

- The incidence of **road injuries and deaths** is higher than the England average in the borough of Guildford, the district of Mole Valley, the borough of Runnymede, and the district of Tandridge, and on a par with the England average in the other seven boroughs and districts.
- The incidence of hip fractures in people aged 65 and over, and of excess winter deaths is on a par with the England average across the whole of the county.
- Infant mortality rates are on a par with the England average in nine of the eleven districts and boroughs, the exceptions being Mole Valley and Runnymede where the rate is lower than average.
- The incidence of hospital stays necessitated by over-consumption of alcohol in people under the age of 18 is on a par with the England average in ten of the eleven boroughs and districts, the exception being Elmbridge.
- The incidence of obesity and excess weight in adults is on a par with the England average in eight of the eleven boroughs and districts.

12.12 The Thames CFMP reports that future increases in flood risk associated with climate change are expected to result in a greater number of people being placed at risk than is currently the case. The Thames CFMP notes that:

- In Thames region as a whole, the number of people at risk increases by 16% for a 1% AEP [1 in 100 year or Flood Zone 3] event as a result of climate change. The largest increases in people at risk for the 1% AEP event are in the Lower Mole, Lower Lee tributaries and Luton policy units.
- There will also be an increase in the numbers of properties at risk in enumeration districts with an SFVI of 4 or 5. It is a particularly important issue in London where the lead-time is shorter and flash flooding is more common.

12.D Impact Assessment

12.D.1 Impact pathways

12.13 There are two pathways by which implementation of the revised Surrey LFRMS could give rise to impacts and effects on the welfare, health and well-being receptor.

12.14 Impact Pathway WHWB1: Changes in exposure to risks to physical health & well-being

The pathway focuses on the extent to which the proposed course(s) of action may give rise to changes in the extent to which people are exposed to risks to their physical health and well being.

12.15 Impact Pathway WHWB2: Changes in exposure to risks to mental health & well-being

The pathway focuses on the extent to which the proposed course(s) of action may give rise to changes in the extent to which people are exposed to risks to their mental health and well being.

12.D.2 Assessment findings & discussion

12.16 Assessment of Objectives: Four (objectives two, four, six and seven) of the eight objectives for the Surrey LFRMS were considered to be likely to give rise to the implementation of infrastructure works and schemes that could result in changes to the physical environment. Given that the purpose of such works and schemes would be to deliver improved management of surface water flooding, which would help to safeguard the population from the physical and mental health effects of flood incidents and flood risk, it is concluded that pursuit of the objectives would be expected to result in significant beneficial effects with reference to impact pathway WHWB1 and to impact pathway WHWB2.

12.17 Assessment of Infrastructure Schemes (2016/17 Action Plan): Of the twenty-seven schemes listed under the action plan for 2016/17, a total of sixteen were classed as having the potential for give rise to significant beneficial effects with reference to impact pathway WHWB1 and to impact pathway WHWB2. The primary reason for schemes having been assessed as having the potential to give rise to impacts or effects on the welfare, health and well-being receptor was the scope for the construction of new flood management facilities to contribute to reductions in the risks to which people are exposed as a consequence of flooding. There is some potential for the development of new or improved flood management infrastructure to give rise to temporary and short-term adverse impacts during the construction phase, such as noise nuisance, and traffic disruption.

12.E Recommendations for Impact Management

12.18 The greatest potential for flood management schemes to give rise to impacts and effects in respect of welfare, health and well-being arises during the operational phase. Depending on the nature of the flood management infrastructure delivered, there may be short term and temporary causes of nuisance associated with the construction phase (e.g. noise, traffic, etc.).

12.19 During the construction phase of a scheme the temporary and short-term impacts on welfare health and well-being that might arise need to be considered. Early consultation with the relevant experts will help to ensure that the scheme is designed and implemented in a way that minimises the risks of adverse impacts, and maximises the opportunities for beneficial effects to be delivered.

- Emissions of dust arising from construction, particularly if excavation (e.g. to create detention basins, ponds or drainage channels) or the deposition of large volumes of material (e.g. to create dams) is required. Where schemes are being developed for areas that fall within, or are in close proximity to, designated AQMAs, the advice of the air quality specialists within the Environmental Health departments of the relevant district or borough council should be sought.
- Traffic movements generated by the scheme, particularly of heavy goods vehicles required to transport construction materials. Where appropriate the advice of the county council's Transport Development Management team should be sought.
- Noise generated by the construction of the scheme, particularly where the works are being undertaken in areas that are heavily populated or are in close proximity to residential properties or buildings in other sensitive uses (e.g. schools, care homes, hospitals, etc.). Where appropriate the advice of the noise specialists within the Environmental Health departments of the relevant district or borough council should be sought.

Section 13 Performance Management & Monitoring

13.A Introduction

13.1 A framework for monitoring and reporting on the environmental performance of the Surrey LFRMS with respect to the recommendations made in this Environmental Report is set out in this section of the environmental report.

13.2 For each of the environmental receptors covered by the assessment framework the key findings of the LFRMS assessment have been summarised, and a series of recommendations are made as to the steps that could be taken to address adverse impacts, to enhance beneficial effects, and to monitor and report on performance.

13.B Air Quality

13.3 Section 3 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to short term, temporary adverse impacts on air quality, as a consequence of emissions from vehicles , plant and machinery used to construct new flood management infrastructure (impact pathway AQ1), and emissions of nuisance dust during construction works (impact pathway AQ2). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
AQ1 – Emissions from the burning of fossil fuels	Adverse	×
Suggested Actions	Ascertain whether potential site is located within, or close to, an Air Quality Management Area (AQMA). Consult relevant LPA on the need for EIA in respect of the air quality impacts of traffic. Traffic management plan / method statement in place for all schemes where traffic is likely to be an issue.	

Impact Pathway	Strategy Impact	
AQ2 – Emissions of nuisance dust or nuisance odours	Adverse	×
Suggested Actions	Consult with Environmental Health Office (EHO) at District Council (DC) or Borough Council (BC) on dust management. Dust management plan / method statement in place for all schemes where dust is likely to be an issue.	

13.C Climate Change

13.4 Section 4 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to small scale impacts on climate change, as a consequence of emissions from vehicles, plant and machinery used to construct new flood management infrastructure (impact pathway CC1). The LFRMs was assessed as having no impact on climate change as a consequence of changes in land use (impact pathway CC2). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
CC1 – Emissions from the burning of fossil fuels	Adverse	✗
Suggested Actions	Investigate the feasibility of using alternatives to fossil fuels to meet direct energy demands associated with the construction of new flood risk management facilities (e.g. replacing diesel vehicles with LPG vehicles, etc.). Maximise the use of locally produced materials, & of recycled & recovered materials to reduce indirect energy consumption (especially embodied energy). Investigate the feasibility of using renewables to meet operational energy demands for flood management equipment (e.g. photovoltaics for electricity requirements).	

Impact Pathway	Strategy Impact	
CC2 – Emissions from changes in land use	No impact	○
Suggested Actions	None recommended.	

13.D Land, Soil & Geology

13.5 Section 5 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to small scale impact as a consequence of the demand for mineral resources that could be expected to arise from the construction of new flood management infrastructure (impact pathway LSG2). The LFRMs was assessed as having no impact on the receptor as a consequence of changes in land use (impact pathway LSG1). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
LSG1 – Changes in land use & associated impacts on soil	No impact	○
Suggested Actions	None recommended.	

Impact Pathway	Strategy Impact	
LSG2 – Demand for mineral resources	Adverse	×
Suggested Actions	Maximise the use of recycled & secondary mineral resources in the construction & maintenance of the new flood risk management facilities, to off-set demand for primary resources. Consult the Minerals Planning Authority (MPA) on the need for minerals planning permission, where schemes would involve the extraction & re-deposit of inert material (e.g. bund or dam creation).	

13.E Materials Efficiency & Waste

13.6 Section 6 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to adverse impacts as a consequence of the use of material resources during construction works (impact pathway MEW1), and the generation of wastes during construction and ongoing maintenance of flood management infrastructure (impact pathway MEW2). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
MEW1 – Consumption of material resources	Adverse	×
Suggested Actions	Maximise the use of recycled & secondary mineral resources in the construction & maintenance of the new flood risk management facilities, to off-set demand for primary resources.	

Impact Pathway	Strategy Impact	
MEW2 – Generation of wastes	Adverse	×
Suggested Actions	Consult the Waste Planning Authority (WPA) on the need for waste planning permission, & the Environment Agency on the need for an Environmental Permit where schemes would involve the deposit of inert material imported from elsewhere (e.g. bund or dam creation). Waste management plan / method statement in place for all schemes where waste is likely to be an issue.	

13.F Water Resources & Management

13.7 Section 7 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to significant beneficial impacts on the management of flood risk (impact pathway WRM1), and to beneficial impacts on water quality as a consequence of improved management of highways runoff (impact pathway WRM2). The LFRMs was assessed as having no impact on demand for water resources (impact pathway WRM3). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
WRM1 – Impacts on flow paths & floodplains	Significant Beneficial	✓
Suggested Actions	Maximise the scale & extent of flood risk reduction that can be delivered by the provision of the new flood risk management infrastructure. Consult LLFA on the need for relevant consents (e.g. Ordinary Watercourse Consent, SuDS approval, etc.).	

Impact Pathway	Strategy Impact	
WRM2 – Impacts on water quality	Beneficial	✓
Suggested Actions	Maximise the scale & extent of flood risk reduction that can be delivered by the provision of the new flood risk management infrastructure. Consult LLFA on the need for relevant consents (e.g. Ordinary Watercourse Consent, SuDS approval, etc.).	

Impact Pathway	Strategy Impact	
WRM3 – Demand for water resources	No impact	○
Suggested Actions	None recommended.	

13.G Built Environment

13.8 Section 8 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to significant beneficial impacts on existing buildings and built structures through improved flood risk management (impact pathway BE2), and to short term, temporary adverse impacts on townscape character, as a consequence of construction works (impact pathway BE1). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
BE1 – Impacts on townscape character	Adverse	×
Suggested Actions	Require that contractors be members of the 'Considerate Contractors' scheme. Ensure that contractors compounds & associated facilities are located sensitively, and for the shortest period of time feasible. Ensure that traffic, noise & dust is minimised through the implementation of appropriate management plans.	

Impact Pathway	Strategy Impact	
BE2 – Impacts on built structures	Significant Beneficial	✓
Suggested Actions	Maximise the number of properties benefiting from an improved level of flood protection as a consequence of the delivery of the new flood management scheme. Consult the Environment Agency, LLFA & relevant LPAs to ensure the design of the scheme is fit for purpose & capable of adapting to the impacts of future development on the behaviour of the catchment.	

13.H Historic Environment & Archaeology

13.9 Section 9 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to adverse impacts on known and unknown archaeological assets as a consequence of the construction of new flood management infrastructure (impact pathway HEA1), and to significant beneficial impacts on built heritage through improved flood risk management (impact pathway HEA2). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
HEA1 – Impacts on archaeological assets	Adverse	✗
Suggested Actions	Minimise the amount of land permanently altered as a consequence of the development of new flood management infrastructure. Where a Scheduled Monument, County Site of Archaeological Importance (CSAI), or Area of High Archaeological Potential (AHAP) could be affected by a scheme consult Historic England & the County Archaeologist. Management plan / method statement in place for all schemes where there is potential for impacts on heritage assets.	

Impact Pathway	Strategy Impact	
HEA2 – Impacts on built heritage or historic landscape	Significant Beneficial	✓
Suggested Actions	Maximise the number of properties benefiting from an improved level of flood protection as a consequence of the delivery of the new flood management scheme. Consult the Environment Agency, LLFA & relevant LPAs to ensure the design of the scheme is fit for purpose & capable of adapting to the impacts of future development on the behaviour of the catchment. Where a Listed Building, Conservation Area, Registered Park & Garden, AONB or National Park could be affected by a scheme consult the relevant authorities (e.g. Historic England, DC or BC Conservation Officers, the Surrey Hills AONB Partnership, the High Weald AONB Unit, or the South Downs National Park Authority). Management plan / method statement in place for all schemes where there is potential for impacts on heritage assets.	

13.I Natural Environment & Biodiversity

13.10 Section 10 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to a combination of beneficial and significant adverse impacts on the natural environment, as a consequence of the construction of new flood management infrastructure (impact pathway NEB1). The LFRMs was assessed as having no indirect impacts on the natural environment (impact pathway NEB2). Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway		Strategy Impact	
NEB1 – Direct impacts on habitats & species		Beneficial	✓
		Significant Adverse	×
Suggested Actions	Minimise the amount of land permanently altered as a consequence of the development of the new flood risk management facilities. Maximise the amount of ecological enhancement (i.e. new high quality habitat created) delivered through the creation of new flood risk management facilities Consult relevant LPA & Natural England on the need for EIA, & Habitat Regulations Assessment (HRA) where relevant, in respect of impacts on ecology. Consult Natural England on the need for species licensing, & approvals under Section 28 (SSSIs) of the Wildlife & Countryside Act (W&CA) 1981 (as amended). Consult the County Ecologist, & the Surrey Wildlife Trust. Management plan / method statement in place for all schemes where there is potential for impacts on ecology.		

Impact Pathway		Strategy Impact	
NEB2 – Indirect impacts on habitats & species		No impact	○
Suggested Actions	None recommended.		

13.J Landscape & Visual Amenity

13.11 Section 11 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to beneficial impacts on landscape character (impact pathway LVA1) and visual amenity (LVA2) through the design and implementation of new flood management infrastructure. Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
LVA1 – Impacts on landscape character	Beneficial	✓
Suggested Actions	Maximise the amount of landscape enhancement delivered through the creation of new flood risk management facilities Consult Natural England, the LPA, the County Landscape Architect, the Surrey Hills AONB partnership, the High Weald AONB Unit, or the South Downs NPA as appropriate, to ensure the design of the scheme is appropriate to the context in which it would be delivered. Management plan / method statement in place for all schemes where there	

Impact Pathway	Strategy Impact	
LVA2 – Impacts on visual amenity	Beneficial	✓
Suggested Actions	Ensure that new structures or features created as part of flood risk management schemes are in keeping with the character of the area affected, in terms of the visual amenity. Consult Natural England, the LPA, the County Landscape Architect, the Surrey Hills AONB partnership, the High Weald AONB Unit, or the South Downs NPA as appropriate, to ensure the design of the scheme is appropriate to the context in which it would be delivered. Management plan / method statement in place for all schemes where there is potential for impacts on the visual amenity.	

13.K Welfare, Health & Wellbeing

13.12 Section 12 of the environmental report concluded that the refreshed LFRMS had the potential to give rise to significant beneficial impacts in terms of physical health (impact pathway WHWB1), and mental wellbeing (impact pathway WHWB2), as a consequence of improved flood risk management. Actions that could be taken to address the identified impacts are suggested below.

Impact Pathway	Strategy Impact	
WHWB1 – Changes in exposure to risks to physical health & well-being	Significant Beneficial	✓
WHWB2 – Changes in exposure to risks to mental health & well-being	Significant Beneficial	✓
Suggested Actions	Maximise the number of people benefiting from an improved level of flood protection as a consequence of the delivery of the new flood risk management scheme. Consult the Environment Agency, LLFA & relevant LPAs to ensure the design of the scheme is fit for purpose & capable of adapting to the impacts of future development on the behaviour of the catchment.	

Bibliography

Brown, I., Ridder, B., Alumbaugh, P., Barnett, C., Brooks, A., Duffy, L., Webbon, C., Nash, E., Townend, I., Black, H. & Hough R., 2012. *Climate Change Risk Assessment for the Biodiversity & Ecosystems Services Sector*. H R Wallingford *et al* for Defra, London.

Commission of the European Communities (CEC), 1998. Directive 98/83/EC on the quality of water intended for human consumption. *Official Journal of the European Communities, L 330, 05/12/1998, pp.32-54.*

CEC, 2001. Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. *Official Journal of the European Communities, L 197, 21/07/2001, pp.30-37.*

Elmbridge Borough Council, 2011. *Core Strategy DPD.* Elmbridge BC; Esher.

Epsom & Ewell Borough Council, 2011. *Surface Water Management Plan*, Epsom & Ewell BC; Epsom.

Epsom & Ewell Borough Council, 2007. *Core Strategy DPD.* Epsom & Ewell BC; Epsom.

Environment Agency, 2008. *Thames Catchment Flood Management Plan*.

Environment Agency, 2008. *Arun & Western Streams Catchment Flood Management Plan*.

Environment Agency, 2008. *River Medway Catchment Flood Management Plan*.

Environment Agency, 2009. *River Basin Management Plan – Thames River Basin District*.

Environment Agency, 2009. *River Basin Management Plan – South East River Basin District*.

Guildford Borough Council, 2009. Core Strategy *DPD*: *Consultation Draft.* Guildford BC; Guildford.

Her Majesty's Government, 2012. *National Planning Policy Framework*. The Stationery Office, London.

HM Government, 2011. *Town & Country Planning (Environmental Impact Assessment) Regulations 2011* (Statutory Instrument 2011 No.1824). The Stationery Office, London.

HM Government, 2010. *Flood & Water Management Act 2010*. The Stationery Office, London.

HM Government, 2010. *Conservation of Habitats & Species Regulations 2010* (Statutory Instrument 2010 No.490). The Stationery Office, London.

HM Government, 2004. *The Environmental Assessment of Plans & Programmes Regulations 2004*, Statutory Instrument 2004 No. 1633. The Stationery Office, London.

HM Government, 2000. *Air Quality Strategy for England, Scotland, Wales & Northern Ireland*. HMSO; London.

Mole Valley District Council, 2009. *Core Strategy DPD.* Mole Valley DC; Dorking.

Office of the Deputy Prime Minister, 2003. *The Strategic Environmental Assessment Directive: Guidance for Planning Authorities.* Office of the Deputy Prime Minister: London.

Reigate & Banstead Borough Council, 2012. *Core Strategy DPD – Proposed Submission Document.* Reigate & Banstead BC; Reigate.

Runnymede Borough Council, 2009. *Core Strategy DPD:* Preferred Approaches. Runnymede BC; Addlestone.

Spelthorne Borough Council, 2009. *Core Strategy & Policies DPD.* Spelthorne BC; Staines.

Surrey Heath Borough Council, 2012. *Local Development Framework Core Strategy & Development Management Policies DPD.* Surrey Heath BC; Camberley.

Tandridge District Council, 2008. *Core Strategy DPD.* Tandridge DC; Oxted.

Waverley Borough Council, 2012. *Waverley Core Strategy: Revised Preferred Options*. Waverley BC; Godalming.

Woking Borough Council, 2011. *Core Strategy – Publication Document*. Woking BC; Woking.

Surrey Local Flood Risk Management Strategy 2016

Appendix 1 to the Environmental Report

Screening Assessment for the LFRMS Objectives

July 2016

Contents

This page is left intentionally blank

Part 1 Screening Assessment Method Statement

1.1 The purpose of the assessment set out in this appendix to the Environmental Report for the Surrey Local Flood Risk Management Strategy (LFRMS) 2016 is to ascertain the extent to which the strategy's objectives could give rise to significant environmental effects.

1.2 The assessment method is based on two of the criteria that are used to determine whether a plan or programme needs to undergo strategic environmental assessment (SEA) during its preparation. Those criteria are:

- Does the strategy set the context for the future development consent of projects listed in Annex I and Annex II of the Environmental Impact Assessment (EIA) Directive (2011/92/EU)?
- Does the strategy require assessment under Articles 6 or 7 of the Habitats Directive (92/43/EC), in view of the likely effects of its implementation on designated Special Protection Areas (SPAs), designated Special Areas of Conservation (SACs), proposed SPAs, or candidate SACs?

1.3 The primary purpose of the LFRMS is to provide a framework within which the Lead Local Flood Authority (LLFA) (Surrey County Council) and partners can identify, investigate and address the causes of flooding from surface water and groundwater sources. In pursuing that purpose, the strategy would be expected to deliver significant benefits in respect of the management of flood risk, the protection of communities, and the safeguarding of the built environment. The types of schemes that would be brought forward under the auspices of the strategy would be unlikely to include any of the categories of development listed in Annex I to the EIA Directive, but could include schemes that fall within some of the categories listed in Annex II of the EIA Directive.

- 1(c) Water management projects for agriculture, including irrigation and land drainage projects. (Paragraph 1(b) in Schedule 2 of the EIA Regulations 2011).
- 10(f) Inland-waterway construction not included in Annex I, canalisation and flood-relief works. (Paragraph 10(h) in Schedule 2 of the EIA Regulations 2011).
- 10(g) Dams and other installations designed to hold water or store it on a long-term basis (projects not included in Annex I). (Paragraph 10(i) in Schedule 2 of the EIA Regulations 2011).
- 13(a) Changes or extensions to projects of the types listed in Annex II, already authorised, executed or in the process of being executed. (Paragraph 13(b) in Schedule 2 of the EIA Regulations 2011).

1.4 The EIA Directive has been transposed into UK law through a raft of statutory instruments, the most commonly encountered of which is the Town & Country Planning (Environmental Impact Assessment) Regulations 2011 (SI 2011 No.1824) (as amended). Also of relevance to the work of the LLFA are the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999 (SI 1999 No.1783) (as amended

by SI 2005 No.1399 and SI 2006 No.618). Of particular relevance to the work of the LLFA and its partners will be the EIA Regulations power to revoke permitted development rights, in the event that the development concerned would be 'EIA development'. In practice it would be advisable for all schemes to be subject to formal EIA screening as part of the project development process, to answer the question of whether EIA is required, and to clarify the position in respect of the need for planning permission.

1.5 There are a number of nature conservation sites of European importance distributed around Surrey, the ecological integrity of which is protected under the provisions of the Habitats Directive (92/43/EC). Dependent on location, it is therefore theoretically possible that schemes brought forward to implement the objectives of the Surrey LFRMS could have some level of impact on the features of interest of an SPA or SAC. Whilst it is unlikely that the ecological integrity of an SPA or SAC would be significantly compromised by drainage or flood alleviation works of the scale and type likely to be brought forward under the strategy, the potential for such affects needs to be acknowledged and addressed over the course of the scheme or project design and development process. In practice, the question of impacts on the integrity of a SPA or SAC can be addressed as part of any EIA screening process, as a likely significant effect would be sufficient to trigger the requirement for EIA.

1.6 For each of the objectives that have been defined for the Surrey LFRMS, and its supporting actions, the analysis recorded in this report considers the extent to which the criteria listed under paragraph 1.2 would be likely to be met.

Part 2 Screening Assessment for Objective 1 of the Surrey LFRMS 2016

2.1 The first objective that has been defined for the Surrey LFRMS is presented below, along with the actions that would be undertaken to implement it.

Objective 1:	**Our understanding of local & strategic flood risk will be improved through clear data management & sharing between risk management authorities**
Action 1(a):	**Improving current modelling & data management processes**
Action 1(b):	**Modelling & data analysis including assessment of risk & assessment of data accuracy, & using the resulting score to drive improvement plans & scheme prioritisation**
Action 1(c):	**Communicating, gathering & sharing data with risk management authorities & the public**
Action 1(d):	**Exploring opportunities for data improvement through the planning process**

2.2 Implementation of the objective is focused on the provision of information and the facilitation of information sharing. The actions could be expected to contribute to improved understanding of the county's hydrological and hydrogeological cycles, and consequently of the risks of flooding to which communities may be exposed, and may lead to improved and more effective flood risk management over the longer term.

2.3 None of the actions proposed under Objective 1 would involve the development and implementation of any physical works that would fall within the descriptions listed under paragraph 1.3 of this report. It is therefore concluded that Objective 1 of the strategy would not result in the future implementation of projects of the types listed in paragraphs 1(c), 10(f), 10(g) or 13(a) of Annex II of the EIA Directive, and would not affect the integrity of any designated SPAs or SACs.

Part 3 Screening Assessment for Objective 2 of the Surrey LFRMS 2016

3.1 The second objective that has been defined for the Surrey LFRMS is presented below, along with the actions that would be undertaken to implement it.

Objective 2:	**Risk management authorities will reduce flood risk by delivering an effective maintenance regime for drainage assets & managing of our estates across the county in an environmentally sustainable manner**
Action 2(a):	**Preparing best practice material for internal officer & engineer use**
Action 2(b):	**Promoting best practice & statutory duties through a programme of briefings & worked examples with partner risk management authorities**
Action 2(c):	**Writing design works standards for Surrey County Council highways & developers**
Action 2(d):	**Improving and updating records of our drainage assets**
Action 2(e):	**Retro-fitting SuDS on our own drainage assets where appropriate**

3.2 Implementation of the objective is primarily focused on the effective maintenance of the County Council's drainage assets and estates, and would include the development and implementation of good practice standards, procedures and guidance, and the delivery of programmes of physical works.

3.3 Some of the actions proposed under Objective 2 would involve the development and implementation of physical works, which could fall within one or more of the descriptions listed under paragraph 1.3 of this report. It is therefore concluded that Objective 2 of the strategy may result in the future implementation of projects of the types listed in paragraphs 1(c), 10(f), 10(g) or 13(a) of Annex II of the EIA Directive. Dependent on the location of any works undertaken, implementation of Objective 2 could result in activities being carried out that could affect the integrity of designated SPAs or SACs.

Part 4 Screening Assessment for Objective 3 of the Surrey LFRMS 2016

4.1 The third objective that has been defined for the Surrey LFRMS is presented below, along with the actions that would be undertaken to implement it.

Objective 3:	**We will agree with partners who the risk management authorities in Surrey are, jointly define their responsibilities & establish clear lines of communication with them to support the delivery of partnership-based flood alleviation projects**
Action 3(a):	**Defining the roles of risk management authorities with our partners**
Action 3(b):	**Refining the partnership roles of the Surrey Flood Risk Partnership Board & working group**
Action 3(c):	**Developing a plan for strategic & operational communications between internal & external partners**
Action 3(d):	**Reviewing opportunities for future devolution of powers & budget to risk management authorities, & updating the strategy to exploit these opportunities**

4.2 Implementation of the objective is focused on the development and ongoing facilitation of partnerships. No capital works would be involved and therefore no significant environmental impacts would be expected to arise. The actions could be expected to contribute to improved understanding of the county's hydrological and hydrogeological cycles, and consequently of the risks of flooding to which communities may be exposed, and may lead to improved and more effective flood risk management over the longer term.

4.3 None of the actions proposed under Objective 3 would involve the development and implementation of any physical works that would fall within the descriptions listed under paragraph 1.3 of this report. It is therefore concluded that Objective 3 of the strategy would not result in the future implementation of projects of the types listed in paragraphs 1(c), 10(f), 10(g) or 13(a) of Annex II of the EIA Directive, and would not affect the integrity of any designated SPAs or SACs.

Part 5 Screening Assessment for Objective 4 of the Surrey LFRMS 2016

5.1 The fourth objective that has been defined for the Surrey LFRMS is presented below, along with the actions that would be undertaken to implement it.

Objective 4:	**Private owners will be made aware of their riparian responsibilities to maintain drainage assets & watercourses. We will support, promote & enforce these responsibilities**
Action 4(a):	**Establishing enforcement principles, policy & processes**
Action 4(b):	**Developing & maintaining a riparian asset register & an associated maintenance & improvement policy for this register**
Action 4(c):	**Promoting standards & enforcement processes to the public, Members & risk management authorities, & encouraging implementation of this on a community-wide basis**
Action 4(d):	**Preparing public facing materials that state & explain these policies & processes**
Action 4(e):	**Implementing internal promotion of standards & policies across risk management authorities**

5.2 Implementation of the objective is concerned with raising the awareness of private owners of drainage assets and watercourses of their responsibilities for ongoing management and maintenance. The focus of the work to be pursued under the auspices of the strategy would be on the dissemination of information, although some capital works could be delivered under this objective, particularly in instances where enforcement action has to be taken.

5.3 Some of the actions proposed under Objective 4 could involve the development and implementation of physical works, which could fall within one or more of the descriptions listed under paragraph 1.3 of this report. It is therefore concluded that Objective 4 of the strategy may result in the future implementation of projects of the types listed in paragraphs 1(c), 10(f), 10(g) or 13(a) of Annex II of the EIA Directive. Dependent on the location of any works undertaken, implementation of Objective 4 could result in activities being carried out that could affect the integrity of designated SPAs or SACs.

Part 6 Screening Assessment for Objective 5 of the Surrey LFRMS 2016

6.1 The fifth objective that has been defined for the Surrey LFRMS is presented below, along with the actions that would be undertaken to implement it.

Objective 5:	**The residents of Surrey will be supported to improve community resilience. Local people will be empowered to reduce the risk of flooding on both an individual & community level on a long term basis**
Action 5(a):	**Assessing & prioritising local flood action groups on the basis of available data**

Action 5(b):	**Using the local knowledge of community groups to inform the priorities of the Surrey Flood Risk Partnership Board**
Action 5(c):	**Encouraging communities to set up Flood Action Groups**
Action 5(d):	**Developing engagement methods & material to include training of staff & improvement of public facing materials**
Action 5(e):	**Promoting resilience planning as a core tool for community groups & supporting them with response & recovery following a flood event**

6.2 Implementation of the objective is concerned with supporting communities to enable them to address flood risks and develop improved resilience at the local level. The focus of the work would be the dissemination of information and enabling the formation of community action groups, with no capital works would be delivered under this objective.

6.3 None of the actions proposed under Objective 5 would involve the development and implementation of any physical works that would fall within the descriptions listed under paragraph 1.3 of this report. It is therefore concluded that Objective 5 of the strategy would not result in the future implementation of projects of the types listed in paragraphs 1(c), 10(f), 10(g) or 13(a) of Annex II of the EIA Directive, and would not affect the integrity of any designated SPAs or SACs.

Part 7 Screening Assessment for Objective 6 of the Surrey LFRMS 2016

7.1 The sixth objective that has been defined for the Surrey LFRMS is presented below, along with the actions that would be undertaken to implement it.

Objective 6:	**We will reduce the risk of flooding from new & existing development through local planning policy & processes**
Action 6(a):	**Using our statutory consultee role on surface water drainage to advise local planning authorities if new major developments are following national standards, local planning policy & current best practice**
Action 6(b):	**Clearly setting out the expectations of Surrey County Council in sustainable drainage systems (SuDS) consultations & providing pre-application advice when requested**
Action 6(c):	**Using development opportunities to reduce flood risk where appropriate**
Action 6(d):	**Influencing local planning policies on flood risk & drainage**
Action 6(e):	**Establishing a programme of advising & briefing planning officers, Members & developers on the benefits of SuDS**

Action 6(f):	**Investigating & introducing the use of SuDS across Surrey County Council schemes, including highways, & on our own estate**
Action 6(g)	**Identifying opportunities for retrofitting SuDS across Surrey, targeting high priority areas in partnership with other authorities**

7.2 Implementation of the objective is focused on the provision of information and the promotion of best practice in land use planning with reference to the management of the flood risks that can arise from new development. The actions could be expected to contribute to improved understanding of the county's hydrological and hydrogeological cycles, and consequently of the risks of flooding to which communities may be exposed, and may lead to improved and more effective flood risk management over the longer term. The focus of the work would be on the dissemination and sharing of information, although some capital works could be delivered under this objective.

7.3 Some of the actions proposed under Objective 4 could involve the development and implementation of physical works, which could fall within one or more of the descriptions listed under paragraph 1.3 of this report. It is therefore concluded that Objective 4 of the strategy may result in the future implementation of projects of the types listed in paragraphs 1(c), 10(f), 10(g) or 13(a) of Annex II of the EIA Directive. Dependent on the location of any works undertaken, implementation of Objective 4 could result in activities being carried out that could affect the integrity of designated SPAs or SACs.

Part 8 Screening Assessment for Objective 7 of the Surrey LFRMS 2016

8.1 The seventh objective that has been defined for the Surrey LFRMS is presented below, along with the actions that would be undertaken to implement it.

Objective 7:	**We will reduce flood risk from local sources via a programme of capital works, which will be integrated with the activities of other Risk Management Authorities**
Action 7(a):	**Aligning Surrey County Council's programme with Regional Flood & Coastal Committee/Environment Agency/Local Enterprise Partnership programmes of work & having the programme scrutinised by the Surrey Flood Risk Partnership Board**
Action 7(b):	**Identifying & recording funding opportunities & limitations/risks for projects**
Action 7(c):	**Establishing best practice for risk management authorities for integrating flood risk reduction into capital schemes on the highway & other infrastructure**

Action 7(d):	**Identifying new & innovative delivery methods for flood alleviation schemes & exploring opportunities with other sectors to enhance economic growth & wellbeing**
Action 7(e):	**Ensuring all flood alleviation schemes have an agreed maintenance plan on completion to better ensure the long-term effectiveness of the asset.**

8.2 Implementation of the objective is primarily focused on the management of flood risk through a programme of capital works, to be funded and delivered by a range of different partners.

8.3 The actions proposed under Objective 7 would involve the development and implementation of physical works, which could fall within one or more of the descriptions listed under paragraph 1.3 of this report. It is therefore concluded that Objective 7 of the strategy may result in the future implementation of projects of the types listed in paragraphs 1(c), 10(f), 10(g) or 13(a) Annex II of the EIA Directive. Dependent on the location of any works undertaken, implementation of Objective 7 could result in activities being carried out that could affect the integrity of designated SPAs or SACs.

Part 9 Screening Assessment for Objective 8 of the Surrey LFRMS 2016

9.1 The eighth objective that has been defined for the Surrey LFRMS is presented below, along with the actions that would be undertaken to implement it.

Objective 8:	**We will investigate significant flooding incidents in order to feedback recommendations to reduce flood risk**
Action 8(a):	**Reviewing our Section 19 investigation procedures to set direction & influence work programmes resulting from these investigations' recommendations**
Action 8(b):	**Using new evidence & data obtained from Section 19 investigations to support wider infrastructure & community projects**
Action 8(c):	**Establishing a clear set of goals & deliverables for Section 19 investigations & using these as an opportunity to learn lessons & collate feedback on the effectiveness of flood mitigation methods**

9.2 Implementation of the objective is concerned with the investigation of flooding incidents, and the use of the intelligence gained from those investigations. The focus of the work would be on the acquisition and use of knowledge, and no capital works would be delivered under this objective. The actions could be expected to contribute to improved understanding of the county's hydrological and hydrogeological cycles, and consequently of the risks of flooding to which communities may be exposed, and may lead to improved and more effective flood risk management over the longer term.

9.3 None of the actions proposed under Objective 8 would involve the development and implementation of any physical works that would fall within the descriptions listed under paragraph 1.3 of this report. It is therefore concluded that Objective 8 of the strategy would not result in the future implementation of projects of the types listed in paragraphs 1(c), 10(f), 10(g) or 13(a) of Annex II of the EIA Directive, and would not affect the integrity of any designated SPAs or SACs.