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# Lower Tidal River Arun Strategy Environmental Report

FINAL Draft – for external consultation  
December 2012

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## Document History

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# Non Technical Summary

## Introduction

This Environmental Report (ER) has been produced to document the Strategic Environmental Assessment (SEA) undertaken for the development of the Lower Tidal River Arun Flood Risk Management Strategy (referred to as LTRAS and / or 'the Strategy'). The Strategy area covers the section of the Lower Tidal River Arun between Pallingham Weir (north of Pulborough) down to the Ford railway bridge on the west bank and the A259 road bridge on the east bank, upstream of the river mouth at Littlehampton. The Black Ditch, a tributary at the southern end of the Strategy area, is also included from immediately upstream of Angmering to the confluence with the River Arun.

## Context of the Strategy and Objectives

The aim of the Strategy is to manage flood risk for the lower tidal River Arun catchment for the next 100 years. The time frame of 100 years has been used in line with Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM-AG) (Defra, 2010). The Strategy seeks to implement the flood management policies identified at a higher level by the Arun and Western Streams Catchment Flood Management Plan (CFMP, Environment Agency, 2008). This plan has guided the development of the Strategy.

The overall Strategy objectives are to:

- To develop a strategic approach to sustainably manage flood risk to people, property and other assets over the next 100 years.
- To involve and consult with communities, organisations and interested parties to ensure that all views are considered as the strategy is developed.
- To raise awareness of the flood risk management works recommended with the strategy area and the external contributions required allowing these works to proceed.
- To secure continued compliance with International Environmental Legislation in relation to the Arun Valley Special Protection Area, Ramsar site and candidate Special Area of Conservation (Arun Valley SPA/Ramsar/cSAC).
- To comply with our statutory obligations under the Water Framework Directive (WFD) and national and local conservation designations relevant to the Strategy.

## The Need for SEA

SEA is a process for assessing the impacts of a plan or programme on the environment. The SEA ER is the main written output of the SEA process, and documents the environmental effects of the preferred options within the plan or programme. The ER also records how environmental considerations have been taken into consideration and influenced decision-making in selecting the preferred plan. The requirement to undertake SEA in the European Union (EU) came about when the European Community Directive (2001/42/EC) 'on the assessment of the effects of certain plans and programmes on the environment', known as the 'SEA Directive', came into force in 2004. The 'SEA Directive' is transposed into UK law by the Environmental Assessment of Plans and Programmes Regulations, SI 1633/2004

(‘the SEA Regulations’). The ‘SEA Directive’ and associated regulations make SEA a mandatory requirement for certain plans and programmes which are likely to have significant effects on the environment.

In a position statement published in 2004, the Department for the Environment, Food and Rural Affairs (Defra) determined that there is no legal requirement to apply the ‘SEA Directive’ to flood risk management strategies. However, it was noted that strategies clearly help to set the framework for future planning, have significant environmental implications and require extensive consultation. Defra believes that adopting SEA for flood risk management strategies is appropriate and strongly encourages its use. It is also internal Environment Agency policy to carry out some form of environmental assessment for all of its activities. This SEA has therefore been conducted for the Strategy on the basis of these recommendations and policies.

## **The Strategy Area**

The extent of the Strategy area is illustrated on Map 1 in **Appendix A**. The Strategy area falls within the jurisdiction of three local authorities; Chichester District Council, Arun District Council and Horsham District Council. The catchment is predominantly rural in nature with large areas of agricultural grazing land. The two main urban centres are the towns of Arundel in the south and Pulborough in the north.

Within the Strategy area there are a large number of sites of nature conservation importance, including the internationally designated Arun Valley Special Protection Area, Ramsar site and candidate Special Area of Conservation (Arun Valley SPA/Ramsar/cSAC). There are also a significant number of sites designated for their cultural heritage importance. The majority of the Strategy area is within the boundary of the South Downs National Park.

The Strategy area has been divided into seven Strategy Units (SUs) based on similarities relating to the natural and human environment and the morphology and hydraulic processes of the river. These are as follows:

- ◆ SU1: Pallingham to Pulborough
- ◆ SU2: Pulborough
- ◆ SU3: Pulborough to Houghton
- ◆ SU4: Houghton to Arundel
- ◆ SU5: Arundel
- ◆ SU6: Arundel to Littlehampton
- ◆ SU7: Black Ditch

For the purpose of the technical and economic appraisal, SU7 was sub-divided into SU7a (Angmering) and SU7b (Lyminster), to enable consideration of the hydraulic links of SU7b with SU6. For the purpose of SEA, the Black Ditch has been appraised as a single SU and specific opportunities/impacts associated with a particular sub unit highlighted.

## **Key Environmental Issues in the Strategy Area**

Existing environmental data relating to the Strategy area has been collected and reviewed during the SEA process. Data has been collected at a strategic level, commensurate with the detail required to identify the environmental effects of the options under consideration. The relevant data is presented as the environmental baseline for the SEA, and a summary of the key environmental issues is given below.

## Population and Human Health

- ◆ The population of the Strategy area is expected to increase by an average of 15% by 2026 from the 2001 census count, with an increasingly ageing population.
- ◆ Local businesses and agriculture provide employment within the Strategy area and there are large areas of agricultural land located within areas at risk of flooding.
- ◆ The risk of flooding and perceptions regarding existing flood risk management can cause anxiety to local residents and business owners as well as cause injury during flood events. Stress can also be caused through loss of possessions, a decrease in property prices as well as insurance liability claims.
- ◆ The lower River Arun is a popular area for walking, cycling and enjoying the landscape and wildlife. A number of public rights of way are located alongside the river, and there are recreation grounds located within the floodplain as well as two golf courses along the Black Ditch. The river is also popular for leisure craft, small private fishing boats, angling and enjoying wildlife.
- ◆ The river is not a key area for navigation, but there are navigation rights from the coast upstream to Arundel, and this stretch is used by leisure craft for fishing and boating. There are also moorings present along the lower River Arun.

## Biodiversity, Flora and Fauna

- ◆ The Strategy area contains the internationally protected Arun Valley SPA/Ramsar/cSAC, as well as several nationally and locally important sites designated for their importance for wildlife conservation.
- ◆ There are several Biodiversity Action Plan (BAP) habitats and species present in the Strategy area.
- ◆ A large proportion of the land in the Strategy area is managed under the High Level Stewardship (HLS) scheme administered by Natural England.
- ◆ A range of coarse fish species are present in the Strategy area. There are no designated salmonid or cyprinid waters, but the tributaries of the lower River Arun provide important salmonid spawning grounds and a number of BAP species. The current WFD fish status ranges between poor and moderate. The WFD objective is to achieve good status for fish by 2027.

## Soils and Land Quality

- ◆ Agricultural land in the Strategy area is predominantly classified as 'moderate-poor' and 'poor'. There is some 'excellent' and 'very good' land along the Black Ditch.
- ◆ There are several historic landfill sites in the south of the Strategy area close to the lower River Arun and the Black Ditch, one of which may contain hazardous waste. There are also two active landfill sites along the Black Ditch.

## Water

- ◆ The Strategy area contains a number of surface water bodies including the River Arun itself and its tributaries. There are also a number of groundwater bodies.
- ◆ Both the rivers and groundwaters in the Strategy area provide an important source of water for supporting public consumption (drinking water), surface water flows (River Arun) and wetland ecosystems. Current baseline data indicates that these water resources have been classified as either over licensed or over abstracted with adverse impacts not only on the users, but also on wetland habitats and species.
- ◆ Objectives have been set for all of the ground and surface water bodies within the Strategy area (under the WFD) in order to protect and improve their environmental condition. The aim is for all of these waters to be classified as having 'Good' ecological status or potential by 2027.

- ◆ None of the existing surface water bodies in the Strategy area are currently at good status or potential. Key reasons for this include; the localised impacts on water quality caused by sewage treatment works and other specific, direct pollution sources, as well as wider (diffuse) pollution associated with agricultural activity. With respect to the Arun Transitional water body, the key water body in the Strategy area in terms of scale, hydromorphological alterations (i.e. channelisation) are a key reason for failure to achieve good potential.

### Material Assets

- ◆ There are a number of assets and infrastructure of importance to the Strategy area which are at risk of flooding. In particular, there are the important road links of the A27 and the A29, and the London to Littlehampton railway line.
- ◆ There are a number of areas identified in local planning policies for future development. This includes the A27 bypass and possible development areas at Bury.

### Cultural Heritage

- ◆ Sixteen nationally important Scheduled Monuments and 64 Listed Buildings are found in or close to the floodplain in the Strategy area. There are also several Conservation Areas and one Registered Park and Garden (the latter in Arundel).

### Landscape

- ◆ A majority of the Strategy area falls within the South Downs National Park and is covered by four National Character Areas; Low Weald, Wealden Greensand, South Downs, and South Coast Plain.
- ◆ The landscape character of the Strategy area varies from high quality rural, tranquil and un-spoilt in the upper parts of the Strategy area, to a predominantly undeveloped rural landscape character with a 'medium' overall quality from Arundel to Littlehampton.
- ◆ Generally the landscape character is considered to be sensitive to change.

## **Strategic Options Considered**

In its simplest form there are two underlying approaches to flood risk management:

- ◆ Manage flood risk ('Do Something'), or
- ◆ Do not manage flood risk ('Do Nothing').

'Doing Something' to manage flood risk can take a number of forms and it is important that all approaches to managing flood risk are considered. A list of strategic options were developed, revised and refined over the course of the Strategy. The process has involved developing a 'long list' of options to address the flood risks present in each SU, and then eliminating those options that, based on currently available information, are not practical and/or feasible from a technical, environmental and/or economic perspective. For each SU the feasible options available under the following categories have been considered and assessed by the SEA:

- ◆ **Do Minimum:** This assumes reactive patch and repair of the channel and existing defences. No action would be taken to maintain or reduce the existing risk of flooding and once defences fail, they will not be replaced.
- ◆ **Maintain:** Defences are regularly maintained to reduce the risk of failure. Should defences fail, they will be replaced like-for-like with no allowance for raising. Over time, the risk of flooding will increase because of the effects of climate change and sea level rise.

- ◆ **Sustain:** This option will maintain the existing level of flood risk now and in the future by improving defences to address sea level rise and climate change. Maintenance and repair would continue as present and defences replaced where necessary.
- ◆ **Improve:** Under this option, improvements would be made to defences to reduce the risk of flooding where adequate standards are not currently provided. An improvement would also take into account predicted sea levels and climate change. This option would therefore represent a long term improvement on the current situation.
- ◆ **Managed Realignment:** Managed realignment of the existing defence line at key locations to reconnect the river to the natural floodplain and increase floodplain storage.

In reality, simply walking away and 'Doing Nothing' is not a real option as there would need to be some form of planning to enable a reduction in current flood risk management activities. Where all options for 'Doing Something' cannot be justified on a technical, environmental or economic basis, a '**Withdrawal of Maintenance**' (WoM) option is considered. Under this option, the Environment Agency would "phase out" maintenance over a prescribed period of time, in parallel with public engagement to ensure those affected are prepared for the change. The existing situation would continue for a limited period; however, assuming that landowners do not undertake works to maintain or repair defences, the condition of the existing defences would deteriorate and a breach or failure would occur. In areas with no defences, banks would become overgrown, reducing channel capacity and leading to an increase in flooding.

'WoM' also has potential environmental implications, and therefore for the purposes of the SEA, this option has been considered for assessment alongside the above 'Do Something' options.

In line with the current FCERM-AG (Defra, 2010), the Strategy timeframe of 100 years has been divided into three time epochs:

- ◆ Short term: 0 to 10 years
- ◆ Medium term: 10 - 50 years
- ◆ Long term: 50 – 100 years

Dividing the appraisal period into time epochs allows the Strategy to consider how the catchment may change over time and how climate change may affect flood risk in the catchment in the future.

### **Assessment of Alternative Options & Environmentally Preferred Options**

Each shortlisted option was assessed against a series of predetermined environmental criteria to identify its likely environmental effects at a strategic level. Effects were identified over the short term (0-10 years), medium term (10-50 years) and long term (50-100 years). Where significant adverse environmental effects were identified, any practical mitigation measures were considered in order to avoid, reduce or off-set them. Opportunities for improvements or enhancements to the natural or built environment were also considered throughout the development of the Strategy and through the SEA process.

The environmental appraisal process was used to compare the relative level of environmental impact (both positive and negative) between the alternative options. This allowed the identification of the 'environmentally preferred' Strategy options. These may be either the option with the highest relative environmental benefits, the least environmentally damaging, or the best option on balance of consideration of both positive and negative impacts. The environmentally preferred options for each SU are shown in the table below. It is important to note that the environmentally preferred option is not necessarily the preferred option for the Strategy as whole, as other factors such as economics and technical feasibility must also be considered.



| Strategy Unit                 | Environmentally Preferred Option<br>(Selected by SEA)   |
|-------------------------------|---|
| SU1: Pallingham to Pulborough | <b>Maintain</b> channel   |
| SU2: Pulborough               | <b>Maintain</b> defences  |
| SU3: Pulborough to Houghton   | <b>Sustain</b> defences to protect the Arun Valley SPA/Ramsar/cSAC, but<br><b>Sustain</b> away from the designated areas. |
| SU4: Houghton to Arundel      | <b>Managed Realignment</b>  |
| SU5: Arundel                  | <b>Improve</b> the defences   |
| SU6: Arundel to Littlehampton | <b>Sustain</b> the defences   |
| SU7: Black Ditch              | <b>Improve</b> flood risk management  |

### The Preferred Strategy

The preferred Strategy has been identified through analysis of the options against environmental, technical and economic criteria. In deriving the preferred option the Strategy has therefore considered the following for each option:

- ◆ Whether it will have an adverse or beneficial impact on the environment and whether it could provide opportunities to protect or improve the built or natural environment;
- ◆ How it would address the specific flood risk to people and property in the catchment, now and in the future;
- ◆ Whether it is technically feasible; and
- ◆ What the economic costs are versus the benefit in terms of reducing damages to property and the risk to the population.

The overall objective of the Strategy is to manage flood risk within the Strategy area, within environmental, economic and technical constraints. In this case the Strategy preferred options represent the best available approach to achieve all the aims of the Strategy within the existing constraints, even though some options may not be preferred on environmental grounds. Further information on the Strategy preferred options is provided in the remainder of this section. For comparison, the environmentally preferred and subsequently selected Strategy preferred options are listed in the table below.

| Strategy Unit | Environmentally Preferred Option   | Strategy Preferred Option  | Rationale for Option Selection   |
|---------------|--|--|--|
| SU1           | Maintain   | Withdrawal of Maintenance  | There are very few receptors at risk of flooding in this SU and no justification on economic grounds for continuing the existing maintenance regime. There is also no significant environmental justification for the additional expenditure, as only very minor environmental benefits would result from continued maintenance.   |
| SU2           | Maintain   | Do Minimum for the pumping station and wall,<br><br>Sustain the southern embankment for 10 years to protect the Arun Valley SPA/Ramsar/cSAC after which Withdrawal of Maintenance, and<br><br>Withdrawal of Maintenance elsewhere. | There are very few receptors at risk of flooding in this SU and for the majority of the existing defences, there is no justification on economic grounds for continuing the maintenance regime. There is also no significant environmental justification for the additional expenditure, as only very minor environmental benefits would result from continued maintenance.<br><br>The exception to this is the pumping station and wall in Pulborough which provides some benefit for up to 8 properties and the southern embankment which forms part of the preferred option under the Habitats Regulations, to protect the Arun Valley SPA/Ramsar/cSAC. |
| SU3           | Sustain until year 10, pending completion of technical studies to determine the best long-term option for the Arun Valley SPA/Ramsar/cSAC. | Sustain until year 10, pending completion of technical studies to determine the best long-term option for the Arun Valley SPA/Ramsar/cSAC.   | The key driver for this option is the need for compliance with the Habitats Regulations.   |
| SU4           | Managed Realignment  | Meet Legal Obligation to Maintain South Stoke Bridge.<br><br>Withdrawal of Maintenance elsewhere   | Although there are identified conflicts with the SEA assessment, there are no legal drivers or significant additional environmental benefits that would provide additional justification for the increased costs of taking forward the environmentally preferred option in this SU.  |

| Strategy Unit | Environmentally Preferred Option | Strategy Preferred Option  | Rationale for Option Selection  |
|---------------|----------------------------------|--|---|
| SU5           | Improve                          | Sustain 1 in 75  | The environmentally preferred and Strategy preferred option have similar environmental benefits, but these are generally greater under Improve. The economic assessment has shown that these additional benefits are not economically justified, and Sustain is considered to be the best balance between flood risk management and environmental considerations.   |
| SU6           | Sustain                          | Maintain for 50 years, followed by Withdrawal of Maintenance                             | <p>This option has been selected because maintaining the defences in SU6 for 50 years provides a cost effective approach to protecting properties and assets in SU5 and SU7.</p> <p>There are no significant environmental benefits in SU6 that would justify the additional costs of the Sustain option.</p> <p>After year 50 the investment required to Maintain the defences in SU6, is more than the cost of providing flanking defences for SU5 and SU7. At this point any secondary benefits are lost and the option for SU6 will then change to Withdrawal of Maintenance.</p> |
| SU7           | Improve                          | Maintain with a new flanking defence constructed by year 50 to correspond to WoM in SU6. | There is limited benefit to selecting the environmentally preferred option over and above the economically preferred option. On balance it was considered that Maintain offered the best compromise between environment and economics.  |

### Environmental Effects of the Preferred Strategy

The significant environmental effects (both positive and negative) of implementing the preferred Strategy within each SU have been evaluated against each of the key environmental receptors/topics described in the baseline data above. A summary of the identified impacts is given in the sections below. Where possible, mitigation measures have been suggested in order to avoid, reduce or offset any significant effects of the Strategy.

#### SEA Assessment Criteria: Human Health and Population.

The key impacts of the Strategy against Human Health and Population receptors are associated with an increase in flood risk over the next 100 years. For SU1, SU4 and parts of SU2, the increase in flood risk is associated initially with the failure of existing defences following the cessation of maintenance activity in the medium term, and then with future

climate change in the longer term. In SU2, flood risk to properties in Pulborough will also increase in the medium term when the pumping station reaches the end of its residual life, which is estimated around year 30. In SU6 and SU7, where defences will be maintained, the impacts are associated with climate change. The timescales for impact vary, but in most locations these effects will occur from the medium term. Generally the magnitude of impacts is minor adverse, as there are few properties and recreational assets at risk. In SU6 a moderate adverse impact has been identified due to the potential for defence failure to increase the tidal prism of the estuary, resulting in possible secondary effects on flood and erosion risk in Littlehampton and Climping (outside of the Strategy area). In SU7 a moderate adverse effect has been recorded due to the effects of tidal flooding as a result of overtopping of the defences in SU6 in the long term due to sea level rise.

In terms of impacts on recreation, there is potential for reduced access along footpaths such as the Wey-South Path and South Downs Way during flood events, particularly at river crossings under 'WoM'. This would also be the case in the long term under the 'Maintain' option due to increased frequency of defence overtopping as a result of climate change which would also affect assets such as golf courses in SU7. The preferred Strategy will not reduce in-channel flow rates and therefore impacts on navigation through increased silting are not anticipated.

Mitigation measures proposed for the above impacts include:

- ◆ Development control, avoiding future development in the floodplain;
- ◆ Flood warning systems;
- ◆ Emergency response plans;
- ◆ Evacuation plans;
- ◆ Advising residents on flood proofing properties or flood resilience measures; and
- ◆ Consultation with and feedback to relevant authorities regarding likely impacts on public rights of way and other recreation assets over the lifetime of the Strategy to allow planning for changing flood and erosion risks, access and health and safety.

The residual impact of the Strategy against this receptor is considered to be **Minor adverse**.

#### SEA Assessment Criteria: Biodiversity, Flora and Fauna

For most SUs, the SEA has identified neutral effects on biodiversity as a result of the Strategy options. Neutral effects are associated with limited changes in flood risk to habitats within SUs (generally from 'Maintain' or 'Sustain' options), and uncertain impacts are associated with uncontrolled breaching and flooding following the failure of the defences under 'WoM' (except for the Arun Valley SPA/Ramsar/cSAC).

In SU4, potential minor adverse impacts on two SSSIs have been identified as a result of the 'WoM' option. As river defences fail, the Arun Banks SSSI, and Unit 2 of Arundel Park SSSI will be subject to an increase in flood risk or regular inundation from the river. The Arun Banks SSSI is designated primarily for more typically freshwater habitats, and increased ingress of saline water from the main river is likely to alter the species present at the SSSI. This may also be true for Unit 2 of Arundel Park SSSI, the remainder of the site should not be affected as it extends up into high ground away from the floodplain. Preliminary discussions have been held with Natural England regarding the potential changes to the SSSIs. The potential changes to the SSSI are not considered to be unacceptable, but mitigation would be required for any impacts or losses of any species of particular importance or rarity within these SSSIs, which could be achieved, for example, through translocation programmes. These mitigation measures will need to be developed in liaison with Natural England, and in the meantime regular updates on the condition of the riverbanks (at least once per year) would need to be provided to Natural England by the Environment Agency. The 'WoM' option does not preclude the landowners of either site from privately maintaining defences on their own land, subject to obtaining all the necessary consents.

In SU3, the impacts on Biodiversity are uncertain at this stage. The key concern is the future management of flood risk to the Arun Valley SPA/Ramsar/cSAC and their component SSSIs in this area. The option selected ('Sustain' for 10 years) will continue to ensure that site integrity is maintained, whilst studies are carried out to determine the best longer term option to manage the site. As the outcomes of these are unknown at this stage, the assessment for this SU is uncertain, but it is assumed that site integrity will be maintained into the long term as a result, with a positive outcome for the designated sites.

Overall the performance of the Strategy against Biodiversity, Flora and Fauna receptors is considered to be **Minor positive**. Largely the effects are neutral, but there is a major positive effect associated with the protection of the SPA. However this is not considered sufficient to judge the impacts of the draft preferred Strategy as major positive overall.

#### SEA Assessment Criteria: Soil

The assessments for each SU against these receptors have shown a combination of neutral, minor or moderate adverse impacts on soils. The adverse impacts are associated with increased flooding (frequency and/or extent) of agricultural land due to failure of defences following 'WoM', or from reducing SoP over time with climate change. No mitigation is available for these impacts.

Overall, given the multiple effects identified across the Strategy area, the performance of the selected Strategy against this receptor is considered to be **Moderate adverse**.

#### SEA Assessment Criteria: Water (surface water and groundwater/hydrogeology)

The SEA has generally identified neutral or minor positive effects on the water environment as a result of the Strategy options. The minor positive impacts relate to the reduction in flood risk management activities associated with WoM to help deliver RBMP objectives.

No specific SEA mitigation measures have been identified for this receptor, and the overall performance of the Strategy against the water receptor is considered to be **Minor positive**.

#### SEA Assessment Criteria: Material Assets

Similar to the Human Health and Population receptors, the key impacts of the Strategy against Material Assets are associated with an increase in flood risk over the next 100 years. For SU4 and parts of SU2, the increase in flood risk is associated initially with the failure of existing defences following the cessation of maintenance activity, and then with future climate change. In SUs 3, 6 (in the long term) and 7, where defences will be maintained, the impacts are associated with climate change. The timescales for impact vary, but in most locations these effects will occur from the medium term.

Generally the magnitude of impacts is minor adverse, as the assets affected are of local importance. However in SU2 the risk of flooding to part of the A29 (a regionally important road) would increase, therefore a moderate adverse impact has been identified. No mitigation would be provided as this is a 'WoM' option, and the residual impact remains moderate adverse.

In SU4 there is the potential for long term flood risk to the railway line both from overtopping and erosion of the railway embankment from increasingly frequent flood events. No mitigation is available as part of this Strategy, but instead mitigation would be the responsibility of the asset owner. There is also the potential to increase the tidal prism of the estuary, resulting in possible secondary effects on flood and erosion risk in Arundel (SU5). Mitigation would be provided within this Strategy, and therefore the impact is reduced to minor adverse.

In SU6 a minor adverse impact has been identified due to the potential for a long term increase in flood risk to the railway line (see comment for SU4 above). This is also the potential for an increase in the tidal prism, resulting in possible secondary effects on flood and erosion risk in Littlehampton. Impacts on Littlehampton could be mitigated, but this would have to be delivered outside of the Strategy, and as this is not guaranteed at this stage, the impact remains minor adverse.

Overall, the performance of the Strategy against this receptor is considered to be **Minor adverse**.

#### SEA Assessment Criteria: Cultural, Architectural & Archaeological Heritage

As described for Human Health and Population and Material Assets above, impacts on this receptor are associated with increasing flood risk and flood frequency over time, due to either 'WoM' or climate change effects. Generally the overall number of heritage assets at risk of flooding in each SU remains the same, but the frequency of flooding tends to increase. In SU3 and Arundel (SU5), there are minor positive benefits associated with sustaining the level of flood risk over the life of the Strategy, as in the short term there will be a reduction in flood risk, due to raising of isolated low spots in the defences to provide a consistent 1 in 200 SoP.

Possible mitigation measures for impacts on listed buildings could include flood proofing or flood resilience measures, where these are compatible with the fabric and setting of historic buildings and structures. This mitigation would not be provided for within the Strategy and would be the responsibility of the building owner. The range of available measures would be discussed with English Heritage and/or owners of heritage assets.

Overall the performance of the selected Strategy against this receptor is considered to be **Moderate adverse**.

#### SEA Assessment Criteria: Landscape

Effects on the landscape within the Strategy area are associated primarily with 'WoM' options. For the SUs where 'WoM' is proposed there is the potential for adverse impacts on landscape character as defences fail and degrade over time. Although the overall landscape character, which is of a generally undeveloped, rural nature, will largely remain the same, some adverse impacts are still anticipated as flood regimes change, which may consequently result in changes to habitats behind the flood defences. Below the saline limit (SU4 - SU6) this may result in changes from freshwater to saline habitats, or changes in agricultural land use, with the possibility of vegetation dying back in the initial stages of the change. However in the longer term these impacts will diminish as the changes become established within the landscape.

Where defences will be maintained or sustained there is limited scope for change to landscape character, given the works will primarily involve ongoing repairs to existing structures. It is assumed that any improvements or replacements of failed defences will be designed and implemented in a way that is sensitive to landscape character and visual amenity.

Local landscape and visual amenity may alter slightly as the footprint of defences increase in SU5 and SU7 following construction of the flanking defences in intermittent locations. It is anticipated that mitigation through integration and good design can be used to limit any significant effects on the landscape.

Overall the performance of the selected Strategy against this receptor is considered to be **Minor adverse**.

## Summary

The preferred Strategy, chosen taking into account environmental, technical and economic criteria, is a combination of 'WoM', 'Maintain', and 'Sustain' options. The preferred Strategy will not improve standards of defence within the Strategy area, as it is not economically justified to do so. As a result, the SEA process has identified a number of significant adverse effects relating to eventual embankment failure and decreasing standards of protection due to climate change effects across the majority of the Strategy area.

The exception is at Arundel (SU5), where a relatively high number of people/properties and other assets are at risk of flooding, and it is economically justified to 'Sustain' the current level of flood risk management to provide a 1 in 75 SoP for the life time of the Strategy.

In SU6, the defences will be maintained until year 50, after which maintenance will be withdrawn. Maintaining the defences for the medium term directly affects flooding in the adjacent SUs (5 and 7), as floodwater would otherwise flow into these SUs and potentially cause flooding to properties behind the defences.

In SU7, the Black Ditch and associated structures will be maintained, which will manage flood risk for the medium term. In the long term the risk of tidal flooding will increase, and maintenance activities and the new flanking defence will not be sufficient to manage this risk.

The SEA process has identified the potential environmental effects of implementing the proposed Strategy. Where appropriate mitigation measures have been identified in the assessment to avoid, reduce or offset the likely effects of implementation, these will be incorporated into schemes and operational management plans. Opportunities to contribute to the objectives of the RBMP have been sought throughout and while there may be some WFD benefits achievable under the Strategy prior to 2027, parallel work focussed on this may be required in order to achieve significant early results. This is discussed in more detail in the accompanying WFD assessment. The Strategy will provide an important contribution to maintaining the integrity of the Arun Valley SPA/Ramsar/cSAC. Overall, and with appropriate mitigation in place, the Strategy is anticipated to have minor to moderate adverse environmental effects.

| Receptor                      | Overall performance of Strategy |
|-------------------------------|---------------------------------|
| Human health and population   | Minor conflict                  |
| Biodiversity, flora and fauna | Minor contribution              |
| Soil and Land Quality         | Moderate conflict               |
| Water                         | Minor contribution              |
| Material Assets               | Minor conflict                  |
| Cultural Heritage             | Moderate conflict               |
| Landscape                     | Minor conflict                  |

## Implementation and Monitoring

The SEA Regulations state that the significant environmental effects of the implementation of plans and programmes should be monitored, to identify at an early stage unforeseen adverse effects, and to be able to undertake appropriate remedial action. An implementation and monitoring plan has been developed to set out the tasks required to monitor the significant environmental effects of the preferred Strategy.