

Statement of environmental particulars for the Lower Tidal River Arun Flood Risk Management Strategy

Introduction This statement of particulars indicates how environmental and consultee considerations were taken into account during the preparation of the plan and how the Environment Agency selected the approach adopted in the final plan. The statement goes on to set out the monitoring procedures that have been set in place to monitor the significant environmental effects of the implementation of the plan/programme.

The environment during the development of the plan

Integration of environmental considerations

Environmental considerations were integrated throughout the development of this plan by following the Environment Agency’s Strategic Environmental Assessment (SEA) operational instruction. This document ensures the potential significant effects of the plan on the environment are considered throughout its development.

Influence of the environmental report

The environmental report that was open to public consultation influenced the development of the plan by identifying environmental enhancements and setting out requirements for mitigation, where significant negative effects were identified.

Environmental Topic	Agreed Mitigation/Enhancement activity	Responsibility for implementation
Population & Human Health	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. 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.	Environment Agency.
Flora & Fauna	Mitigation (e.g. in the form of translocation programmes) for losses of any particularly important species from the Arundel Park Site of Special Scientific Interest (SSSI) due to future increases in higher-salinity flooding.	Environment Agency
Material Assets	Provision of additional erosion protection through Arundel if there is an increase in the tidal prism that results in erosion or undermining of the river defences.	Environment Agency.
Landscape and Visual Amenit	Design and implementation of any improved or replacement of failed defences to be sensitive to the local landscape and visual environment.	Environment Agency.

	Potential for minor enhancement to the visual environment in Arundel through the replacement and improvement of the current defences (sheet piles and hard revetment designs).	
Opportunities for further enhancement will be further investigated at the scheme stage.		
Environmental Topic	Requirement for further studies or information	Responsibility for delivery
Flora & Fauna	Provision of regular updates to Natural England regarding the condition of the defences close to Arundel Park SSSI. Development of further mitigation measures in consultation with Natural England to protect the designated interests of the site.	Environment Agency
	Completion of further detailed studies into the implications of potential future changes to the Arun Valley Specially Protected Area (SPA) to help determine the best long term options for the site.	Environment Agency
Cultural, Architectural and Archaeological Heritage	Provision of further information to owners of Listed Buildings at risk of flooding to discuss options for flood proofing or flood resilience that are compatible with the historic setting and fabric of the buildings.	Environment Agency

Consultation responses

Responses to consultation period (10 December 2012 - 15 March 2013)

115 consultation responses were received during the three month period of consultation on the draft plan and its accompanying environmental report. The majority of consultation responses related to the proposed withdrawal of maintenance in certain Strategy Units (SU), although a number of other queries were raised regarding how specific items or issues had been considered in formulating the draft Strategy (e.g. the railway line, other sections of main river, local footpaths and access roads). The table below indicates how these comments were addressed. The options presented in the draft Strategy were supported by the majority of consultees, and as a result it was decided not to change the strategic options that were recommended.

Consultee	Summary of comments	Action taken to finalise Plan
Various consultees	Queries regarding how the railway line has been considered in formulating the Strategy.	Further consultation has been undertaken with Network Rail to discuss the possible changes in flood risk. Network Rail has not raised any specific concerns about the proposals and has not made any further comments in relation to the Strategy. No revisions to the Strategy have been necessary as a result.
Various consultees	Some consultees expressed disappointment that not all areas had been included within the Strategy.	There are some small sections of Main River watercourse in the Angmering area of SU7 that have not been included in our modelling. The runoff from these watercourses has been included in modelling work in assessing flood risk at a catchment level. These watercourses remain as Main Rivers and the Environment Agency will continue to undertake appropriate works in the public interest, subject to funding being available. No revisions to the Strategy have been made as a result.

Consultee	Summary of comments	Action taken to finalise Plan
Various consultees	Comments raised about how the Arun Internal Drainage Board (IDB) project has been considered in relation to the Strategy, and in the SEA.	<p>The Strategy and the Arun IDB project have been undertaken on different timescales. The Strategy has taken account of the works and associated costs that the Arun IDB currently undertakes, but the Strategy has not in any way driven discussions regarding the future of the Arun IDB.</p> <p>The Arun IDB project is about changes in the way maintenance is administered to land drainage watercourses and associated structures, rather than actual changes 'on the ground'. Decision-making on the future management of the Arun Internal Drainage District has been accompanied by an assessment of impacts and benefits that was independent to the LTRAS SEA.</p>
Various consultees	A number of concerns were expressed regarding the process of withdrawing maintenance, including but not limited to: How does this process work? What happens to structures? Will riparian owners undertake maintenance works?	Upon approval of the Strategy, the Environment Agency will continue to support and talk to people, land and business owners in these areas about what will happen, how they might be affected and when maintenance work will stop. Riparian owners (owners of property/land alongside a natural watercourse) will also be supported in how they can protect their land and property from flooding and help adapt to changes. The precise approach adopted to the withdrawal of maintenance will vary for individual assets.
Various consultees	How has the impact of local access roads possibly being cut off by flood water been considered in the Strategy?	Additional work has been undertaken to examine the potential impacts of flooding on local access roads (all located within SU4). The costs of protecting affected roads was included in the economic appraisal to see if this altered the benefit cost ratio and would justify continuing expenditure on maintenance. The findings of the additional work were that including the effects of flooding on local access roads in SU4 does not change the outcome of the economic appraisal, and the selected policy for SU4 has remained unchanged.
Various consultees	Concerns regarding how footpaths have been included in the assessment, the impact our draft recommendations may have on footpaths, and how this is viewed in a National Park area.	Footpaths within the Strategy area are recognised as local valuable assets and have therefore been considered as part of our environmental assessment in the SEA. However, we have not put an economic value on them as there are alternative recreational footpaths that could be used within the area, and the Arun floodplain is already subject to seasonal flooding affecting public rights of way. This approach is in accordance with our guidance.
Various consultees	Desire for a flood storage area or alternative options for SU7A.	<p>While this option was considered and assessed as being economically viable (having a benefit cost ratio of greater than 1), it didn't provide the best value for public money when compared to the 'Maintain' option that was selected for SU7A.</p> <p>The Environment Agency would be happy to support the wider local community if they wish to fund a flood storage area but a significant contribution would be needed.</p>
Various consultees	Desire for a flood barrier in the River Arun	The option of building a flood barrier across the River Arun was considered at an early stage of the Strategy. However, it was rejected for two main reasons: firstly although it would be economically viable (having a benefit cost ratio of greater than 1), it would not provide the best value for public money when compared to other options for protecting Arundel; and secondly because this option moves away from a naturally functioning system.

Consultee	Summary of comments	Action taken to finalise Plan
Various consultees	Concern that work undertaken for the Strategy has not adequately considered climate change impacts or weather extremes.	The Environment Agency has developed guidance on how climate change should be considered within flood risk management projects. This is based on the findings and conclusions of research undertaken by the Intergovernmental Panel on Climate Change. The Strategy has considered the implications of climate change in line with the adaptive approach recommended in the new guidance and applied an appropriate allowance for climate change.

Trans-boundary consultation responses

The SEA did not identify any significant environmental effects that required trans-boundary consultation on this plan. Due to this, no consultation responses were received via this consultation route.

Reasons for selecting the adopted plan in light of reasonable alternatives

The approach adopted in the final plan was considered against a number of reasonable alternatives during its development. The major reasons for selecting the adopted plan over the reasonable alternatives were:

- 'Improve' options were considered for SU5 and SU7a. However these options were discounted, as the additional reduction in flood risk in comparison to the number of people and properties that would benefit was not economically justified.
- Managed Realignment was considered for one area, SU4. However this option was discounted because there are no legal drivers or significant additional environmental benefits that would provide sufficient justification for the increased costs of the option.
- In SU1, Withdrawal of Maintenance was selected due to the limited number of receptors within the SU, and the limited impacts of flood risk. Environmentally there were only marginal differences between this option and the maintain option. Withdrawal of maintenance has therefore been proposed on balance of the considerations of economics versus the limited minor environmental benefits that would be gained from selecting one of the alternative options.
- In SU2, the majority of the population of Pulborough is located on a hill above the floodplain. Economic justification to maintain the defences is low, as only 1 additional property is at risk of flooding if the defences were not maintained. On balance of the environmental and economic considerations, Withdrawal of Maintenance was selected as the preferred Strategy option for the majority of defences within SU2. The southern embankment will be maintained for 20 years in order to protect the designated sites in SU3, after which maintenance will be withdrawn here as well. An additional allowance for Do Minimum maintenance for an existing pumping station and wall has been made until the end of their residual life (approximately year 30).
- The requirement to protect the internationally important habitats of the Arun Valley SPA/Ramsar/candidate Special Area of Conservation cSAC in SU3 meant that it was possible to dismiss all options other than 'Sustain' for this frontage. However this option may not continue indefinitely; and it is proposed to carry out further studies to determine

what the best long term option for the designated sites is.

- In SU4, Withdrawal of Maintenance was selected for the majority of the defences on economic grounds. Further expenditure does not provide sufficient benefits to justify the additional cost of maintaining the defences.
- Sustain was selected as the preferred option for SU5. This option will provide a consistent level of flood risk management for Arundel into the future, and balances the likely benefits of the flood risk management works against their costs.
- In SU6, the defences will be maintained for 50 years, after which maintenance will be withdrawn. This option has been selected because by maintaining the defences in SU6, there are secondary economic benefits to the adjacent SU5 (Arundel) and SU7 (Black Ditch), by delaying the need for constructing flanking defences. However in the long term, climate change and sea level rise will result in increased flooding to SU6, regardless of the maintenance of defences here, and any benefits are lost after year 50. At this point flanking defences will be in place to protect the adjoining SU.
- In SU7, the selected option is to maintain the defences, with a new flanking defence to be constructed in 50 years time to maintain the same level flood risk along the Black Ditch. With continuing maintenance in the short to medium term there will be no significant increase in the risk of flooding, however in the long term there will still be a significant increase in the risk of tidal flooding as a result of climate change. This would occur even if the defences were improved. There is therefore limited benefit to improving the defences in the short term, and on balance it was considered that maintaining the defences offered the best compromise between environment and economics.

Further details on the selection of the preferred option, which was developed into the adopted plan, are presented in its environmental report. Information on how to access a copy of the environmental report can be found in the post-adoption statement, which can be found at <http://www.environment-agency.gov.uk/homeandleisure/floods/122196.aspx>.

Environmental monitoring measures during Plan implementation

The table below sets out the indicators that will be monitored to ensure that unforeseen significant environmental effects are not generated during implementation. These indicators will also monitor the success of mitigation measures and environmental enhancements in the adopted plan. Developments implemented as a result of the plan will be assessed for environmental impacts at a project level using the Environment Agency's internal Environmental Impact Assessment (EIA) operational instruction.

Environmental effect/mitigation/enhancement	Indicator	Monitoring method	Responsibility
<p>Flooding is likely to increase the risk of injury and loss of life, while the perceived risk of flooding may cause anxiety or stress related illness. Eventual failure of defences will lead to the loss of assets, such as public rights of way, and access to the river, e.g. for angling. Increased flooding of recreational facilities and amenities is likely to result in damages and periodic loss of use. Required mitigation is to reduce the significance of impact associated with flooding to people and property.</p>	<p>Number of properties protected. Standard of flood protection taking into account predicted sea level rise and climate change. Indicative floodplains Injuries due to flooding. Area of recreational and amenity facilities. Number of users of recreational and amenity facilities. Change in area and quantity of public open space.</p>	<p>Maintenance of a 'Flood Risk Register' with an indication of the Standard of Protection afforded to residential and commercial properties, critical infrastructure and built heritage. Review of climate change and sea level rise predictions. Maintain a register of viable recreation and amenity features.</p>	<p>Environment Agency</p>
<p>Withdrawal of maintenance option in SU4 will result in saline flooding to Arun Banks and SU2 of Arundel Park SSSIs (currently freshwater), which may adversely affect conservation objectives for the sites. Flooding of currently defended BAP (now referred to as Habitats of Principal Importance for Biodiversity (HPIB)) coastal and floodplain grazing marsh with saline water following withdrawal of maintenance. Impacts uncertain – may be positive or negative. No mitigation measures are available under the</p>	<p>Frequency of flooding to SSSIs. Reported condition of international and national sites. Area of BAP habitat (HPIB) changes recorded.</p>	<p>Long term monitoring of habitat area and condition by means of: Review of condition assessments (e.g. Natural England) to understand changes in quality and quantity of relevant habitats within the flood risk zones. Maintain a balance sheet for protected sites and BAP habitats (HPIB), accounting for scheme losses/gains.</p>	<p>Environment Agency</p>

Environmental effect/mitigation/enhancement	Indicator	Monitoring method	Responsibility
Withdrawal of Maintenance scenario.			
<p>The risk of flooding is expected to increase and therefore the risk of flooding to agricultural land will increase. May result in reduction in quality of agricultural land due to waterlogging or increases in saline flooding (areas south of Houghton Bridge). Potential exposure of landfill sites following flooding.</p> <p>No mitigation measures are available under the withdrawal of maintenance scenario.</p>	<p>Area of land under agricultural production and type of production.</p> <p>Change in Agricultural Land Classification Grade (Defra).</p> <p>% change in the proportion of different Land Cover typologies (Cranfield University).</p> <p>Reported changes to historic landfill sites</p>	<p>Periodic review of Agricultural Land Classifications represented in each SU.</p> <p>Maintain a balance sheet for changes in Agricultural Land Classification in each Strategy Unit.</p> <p>Flood Risk Register described above.</p>	Environment Agency
<p>Reconnection of river and natural floodplain following withdrawal of maintenance.</p> <p>Replacement of defences (at end of design life) with ecologically beneficial designs – for WFD benefits.</p> <p>No mitigation is required for these impacts.</p>	<p>Area of floodplain reconnected following breach of defences.</p> <p>Length or proportion of defences replaced.</p>	Maintain a balance sheet of gains	Environment Agency
<p>The risk of flooding is expected to increase and therefore the risk of damages or periodic loss of use to transport infrastructure (A29, railway lines) will increase.</p> <p>Increased risk of erosion/impacts on material assets in Arundel and Littlehampton due to increase in tidal prism.</p> <p>No specific mitigation is available for the impacts of increased flood risk, as the standard of protection will not be improved.</p>	<p>Reported damage or disruption to transportation infrastructure from flooding.</p> <p>Recorded condition of assets on National Flood and Coastal Defence Database (NFCDD).</p>	<p>Monitoring of change to channel morphology and provision of additional scour protection if required.</p> <p>Use of information from the Flood Risk Register.</p> <p>Inspections and reviews of asset conditions.</p>	Environment Agency
<p>Increased risk of flooding is likely to result in damages to cultural heritage features, where withdrawal of maintenance occurs or standard of protection decrease over time with climate change.</p>	<p>Number of Scheduled Monuments and listed buildings at risk.</p> <p>Frequency of flooding to Scheduled Monuments and listed buildings.</p> <p>Reported damage to</p>	<p>Use information from the Flood Risk Register.</p> <p>New designated features must be reviewed and added to the register on each review cycle.</p> <p>Monitoring plan to record number of archaeological studies carried out for each stage of</p>	Environment Agency

Environmental effect/mitigation/enhancement	Indicator	Monitoring method	Responsibility
Environment Agency to provide advice on flood proofing or flood resilience measures if these are appropriate to the historic value of the receptors affected.	designated sites. Number of archaeological evaluations and other studies that are produced as a result of implementing the Strategy.	implementation.	
Potential for localised visual impact through deterioration or upgrading of defences. Design of new defences is to be sympathetic to the local landscape and visual environment. No mitigation is available for impacts associated with deterioration of defences following withdrawal of maintenance.	Landscape character assessment (qualitative indicator).	No monitoring planned. Objective must be subject to review at the next cycle. Potential effects on landscape need to be investigated at scheme level.	Environment Agency