

## ***Medway Flood Storage Areas***



River Medway in flood, December 2013

## **Strategic Outline Business Case**

**Version No:** Final

***Date:*** January 2017



## FINANCIAL SCHEME OF DELEGATION (FSoD) APPROVALS

1. 

<b>Project name</b>	Medway Flood Storage Areas				
<b>Project ref.</b>	SOC003E/001A/020A	<b>Project Code</b>	ENVIMSE100377	<b>Start date</b>	2014
<b>Programme</b>	National FCERM Capital Programme			<b>End date</b>	2021
<b>Hub or Head Office</b>	South	For FSOD use only			
<b>Area name</b>	Kent and South London	<b>FSoD reference</b>	<b>F/1617/1007</b>		
<b>Function</b>	FCRM	<b>FSoD Date</b>	16/12/2016		
  
2. 

Role	Name	Post Title	% time allocated to project
<b>Project Sponsor</b>	Mark Douch	Area FCRM Manager	5
<b>Project Executive</b>	James Kennedy	NCPMS Project Executive	15
<b>Project Manager</b>	Sam Box	NCPMS Project Manager	25
  
3. 

<b>Risk Potential Assessment (RPA) Category</b>	Low	<input checked="" type="checkbox"/>	Medium	<input type="checkbox"/>	High	<input type="checkbox"/>
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4. 

FSoD schedule		Description	Delegation	
			National – up to	Area – up to
<b>A1</b>	<input type="checkbox"/>	Projects (includes FCRM revenue)	£5m	£5m
<b>A2</b>	<input checked="" type="checkbox"/>	FCRM capital project within approved strategy	£100m WLC Defra	£10m
<b>A3</b>	<input type="checkbox"/>	FCRM capital project outside of approved strategy	£100m WLC Defra	£5m
<b>A5</b>	<input type="checkbox"/>	Consultancy project	£500k	£500k
<b>T2</b>	<input type="checkbox"/>	Corporate Property Projects /acquisitions	£5m	£5m
  
5. 

<b>FSoD value</b>	<b>£k</b>
<b>Strategic Outline Case (SOC)</b>	<b>FSoD reference</b>
	1801
<b>Full Business Case (FBC)</b>	<b>FSoD reference</b>
<b>Whole Life Costs (WLC) of Project (if applicable)</b>	
<b>Financial benefits</b>	
<b>Non-financial benefits</b>	
	<b>Yes or No</b>
  
6. 

<b>Required level of Environmental Impact Assessment (EIA)</b>	N/A	<input type="checkbox"/>	Low	<input checked="" type="checkbox"/>	Medium	<input type="checkbox"/>	High	<input type="checkbox"/>
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7. 

NPAS/LPRG chair	Post title	Assurance confirmation			Date
Richard Nunn	LPRG Chair/FCRM Manager	RED <input type="checkbox"/>	AMBER <input type="checkbox"/>	GREEN <input type="checkbox"/>	09/12/16
  
8. 

FSoD approver(s) name	Post title	Emailed approval	Date
Julie Foley	Area Manager	See below	08/02/2017
  
9. 

Form G	Form G value (£k)	FSoD ref.	Latest FSoD authorised cost (£k)
1			
2			
3			

10.

**For FSoD Coordinator use only:**

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**Subject:** Medway Flood Storage Areas Strategic Outline Case (SOC)

Anna

I can now confirm that all matters relating to Medway Flood Storage Areas (SOC) are now satisfied and can be recommended for approval.

Regards  
Richard Nunn

FCRM Manager  
LPRG-Investment Assurance  
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**Subject:** RE: For approval - Medway Flood Storage Area (F/1617/1007)

Kathryn

Yes, to confirm, all the outstanding issues are resolved and I confirm support for the Medway SOC.

Regards  
Julie

**Julie Foley**  
**Kent, South London & East Sussex**  
**Area Manager**  
**Environment Agency**

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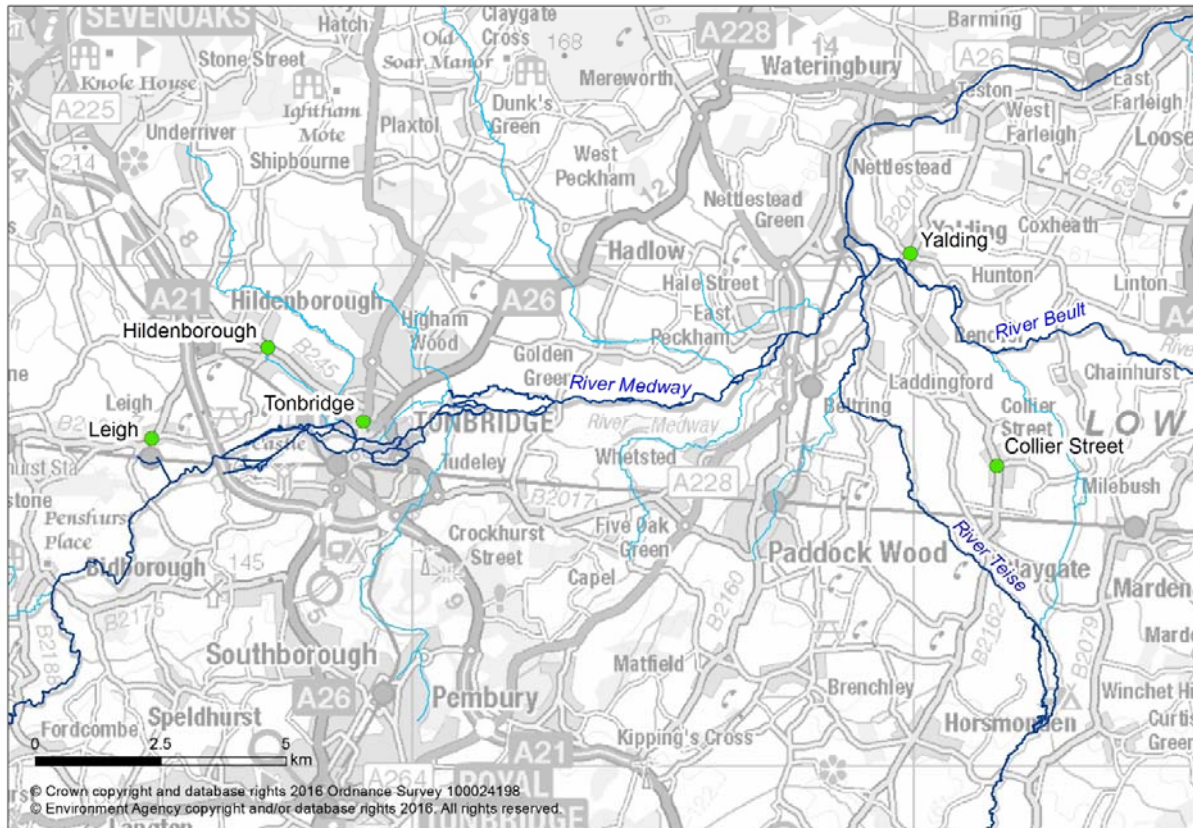
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# 1. Executive Summary

## 1.1. The Executive Summary

The Medway Flood Storage Area (FSA) project is a partnership project led by the Environment Agency to address flood risk in the Medway catchment in Tonbridge and Hildenborough and in the communities in and around Yalding and Collier Street.

This Strategic Outline Case (SOC) supports the request for Financial Scheme of Delegation (FSdD) approval to spend up to £1.801million (including £416k contingency) to prepare an Outline Business Case (OBC) and Full Business Case (FBC) for the Medway FSA project. Communities in these areas have been affected by flooding in 1960, 1963, 1968, 1974, 1979, 2000-01 and 2013-14. A total of 965 homes were flooded during the Winter 2013 to 2014 floods during a less than 1 in 100 year event.



**Figure 1: Overview map of the Medway Flood Storage Areas study area**

The flooding and flood risk in the urban area of Tonbridge is reduced by the Environment Agency built and managed Leigh FSA. This FSA, upstream of Tonbridge on the River Medway controls the flow of water by storing excess water and releasing a controlled flow up to the design event maximum. The Leigh FSA primarily reduces flood risk to Tonbridge but also to a much reduced extent further downstream.

Flooding in Yalding and the surrounding communities can occur from the River Medway, River Teise, River Beult or a combination of these watercourses. The differing catchment characteristics between these watercourses mean that the timing of peak flow, in addition to the flow volume can be a contributory factor in flooding in this area. The community of Yalding has experienced multiple incidents of flooding in previous years. Sited at the confluence of the three rivers in a flat floodplain with very little formal or natural flood protection, flood risk management in this area is extremely challenging. The Middle Medway Strategy (MMS) concluded that there was no viable economic solution to address the flood risk around Yalding and Collier Street.

The flooding in December 2013 was widely reported in the media, on the 27<sup>th</sup> December, Yalding was visited by the Prime Minister, David Cameron. Against this background of calls to address the

flood risk, Paul Carter, the leader of Kent County Council (KCC) pledged to find £17m to boost the economic case for flood risk management in the area. The remainder of the estimated £35m was expected to be funded by the treasury in the form of flood and coastal erosion risk management (FCERM) Grant in Aid (GiA) funding.

At the time of the Christmas 2013 flood event the Environment Agency was engaged in a project to refurbish the Leigh FSA outflow control structure. The aim of this project was to maintain the current standard of protection to 2030. This sustain project was put on hold (it has now been closed). The promise of £17m of partnership funding gave the Environment Agency an opportunity to revisit the options rejected as economically unviable in the MMS. In 2014, The Environment Agency commissioned a new, more detailed hydraulic model of the River Medway.

In 2014 The Environment Agency, Kent Council Council, Maidstone Borough Council (MBC) and Tonbridge and Malling Borough Council (TMBC) signed a legal agreement to fund this project to investigate flood risk management options in the area mentioned above. An Initial Assessment (IA) contract was let to the WEM lot 4 framework contractor, VBA in early 2015. The IA objectives were:

- To assess the technical and economic viability of a solution to reduce flood risk in the communities of Yalding and Collier Street utilising a single or cascade of FSAs or other solution on the lower reaches of the River Beult and / or the River Teise;
- To assess the technical and economic viability of an increase in the operational storage volume of the Leigh FSA to further reduce the risk of flooding to Tonbridge and downstream communities;

This SOC uses the conclusions of the IA to populate the 5 business cases. The IA and associated technical documents are included in the appendices.

From a long list of possible sites, two FSA on the River Teise and one on the River Beult were taken forward to a short list for detailed assessment. For the Leigh FSA, maintain, and increased storage options were taken to assessment. A separate IA to consider flood risk management at Hildenborough has been brought into this Medway FSA project. The Leigh FSA and Hildenborough project are hydraulically and economically linked and can be considered together.

In order to maintain the current standard of protection (SoP) at the Leigh FSA, significant investment is needed. The structure was constructed in 1981 and a lot of the infrastructure is at the end of its operational life. A Safety Integrity Level (SIL) study was undertaken to provide an independent assessment of the true operational resilience of the site. The study found a number of potential single points of failure; the majority within the mechanical and electrical controls and the power supply. The Present Value (PV) cost for maintaining the SoP at the Leigh FSA is £10million, this would require a £0.6million of partnership funding. Maintaining Leigh FSA reduces flood risk (no longer at risk of internal flooding) to over 1,200 properties.

Improving the flood risk benefit provided by the Leigh FSA can be achieved by raising the normal maximum operating water level (NMOWL). This raising reduces flood risk to an additional 213 residential properties, and with a benefit cost ratio (BCR) of 11.3 and an incremental benefit cost ratio (iBCR) of 7.1 can be selected under the FCERM-Appraisal Guidance (AG) decision rule. The PV (Present Value) cost for the duration of benefits for increasing storage at the Leigh FSA is £13.8million. This option would require £2.9million of partnership funding. The local authority partners in the project team have stated that this funding can be made available and that they support this option.

The increased storage would improve the standard of protection at Hildenborough and reduce the size of flood defence required at this location. Increasing the volume of storage at the Leigh FSA is the preferred option and will be taken forward to the Outline Business Case (OBC). The local defence scheme at Hildenborough downstream of the FSA would protect an additional 62 properties not benefitting from the increased storage. The Hildenborough local defence will be taken forward to the OBC. The local authority partners in the project team have stated that they support this option.

The only technically viable FSA location on the River Beult (at Chainhurst) reduces flood risk (no longer at risk of internal flooding) to 32 properties in a 1 in 75 flood event. The PV (Present Value) cost for the duration of benefits for this FSA is £9.1million. This option would require £8.6million of partnership funding. The local authority partners in the project team have stated that this funding is

not available and they would not be willing to contribute to this scheme. This option is not achievable or realistic therefore it is not being taken forward to the OBC.

There are two technically viable FSA locations on the River Teise that could operate in series, Cottage Wood and Stonebridge. These FSA reduce flood risk (no longer at risk of internal flooding) to 96 properties in a 1 in 75 flood event. The PV (Present Value) cost for the duration of benefits for these FSA is £7.5million. This option would require £6.7million of partnership funding. The local authority partners in the project team have stated that this funding is not available and they would not be willing to contribute to this scheme. This option is not achievable or realistic therefore it is not being taken forward to the OBC.

From a technical perspective, the flood defence standard offered by a FSA results in extremely variable residential benefits within a single community. An FSA works to lower the level of flooding in the benefitting area, the protection offered to a household is entirely dependent on the threshold level of that particular property. The communities in this study area are historic and varied and the incidents of internal flooding shown by the flood model likewise. Unlike a linear defence that offers a level of protection behind said defence, the net result of a functional FSA can result in near neighbours being alternately flooded or dry.

In addition to the variable benefits outlined above, the communities in and around Yalding and Collier Street face a further challenge. The three rivers that meet at this point have differing reaction times to rainfall events. Depending on the passage of a particular event within the catchment area, any or all of the FSA may not provide the intended SoP to the benefitting area. It would be entirely feasible for a particular weather pattern to flood the properties that would be expecting to be beneficiaries of the upstream FSA investment.

The IA assessed the economic case for FSA on the Teise and Beult against the partnership funding rules introduced by Defra. The partner local authorities have considered the potential benefits and risks of the schemes against the contribution required. They do not consider either of these FSA options as viable. They have indicated that they will find the partnership funding required to progress the increased storage at the Leigh FSA and the local defences in Hildenborough but not the FSA on the Beult and Teise. It is the intention of the Environment Agency and local authority partners to investigate local and property level resilience projects in Yalding, Collier Street and the surrounding communities as part of a separate project.

In addition to the FSA options three further means of reducing flood risk were considered:

- Local walls surrounding the community of Yalding;
- Debris removal local to Yalding within the Medway;
- Conveyance improvements downstream of Yalding to Maidstone.

The Yalding local walls scheme was modelled and the model run indicated that this option served to both throttle the flow and displace floodwater. This option would increase the depth of flooding to properties not benefitting from the scheme and flood otherwise dry properties. For these reasons this option will not be taken forward to OBC.

The debris removal in channel at Yalding was included in a model run, the benefits were found to be negligible and no properties benefitted. This option will not be taken forward to OBC.

A model run was carried out with the River Medway widened by 5m for 11.7km downstream of Yalding to assess the impact of conveyance improvement. This model run showed a reduction in flood depth in the centre of Yalding of 200mm. The cost to achieve such an improvement is estimated to be in excess of £95million. The reason for this high value is the amount of infrastructure adjacent to the river that would need to be moved or otherwise worked upon. This high cost means that the conveyance improvement option will not be taken forward to OBC as no economic case can be made.

It is recommended that this SOC is approved so that the Environment Agency and local authority partners can progress to the OBC stage. This project is fully funded in the published Flood and Coastal Risk Management Grant in Aid (FCRM GiA) 6 year plan. The Environment Agency have the internal resources ready to deliver the project and a detailed procurement strategy has been developed to manage the external resource required. The project has strong partnership funding

support with £405k already received by the Environment Agency and commitment by the project partners to secure the full outstanding amounts.

## 2. Strategic case

### 2.1. Introduction

Flood risk is currently managed by low walls in Tonbridge and the operation of the Leigh FSA. The FSA is a category A (high risk) online flood storage reservoir located 3km upstream of Tonbridge. The impounding structure consists of a 1.3km long embankment up to 5.7m high, and a flow control structure with 3 gates to provide active flow control. With a NMOWL of 28.05m AOD, it has a current storage capacity of around 5.5 Million m<sup>3</sup>, which is used to reduce flood risk to over 1200 properties, principally in Tonbridge and Hildenborough.

Yalding and Collier Street do not have formal flood defences. Flood Risk in these areas is very high, many homeowners experience difficulties obtaining insurance and flooding of property is expected to occur on average once every 5 to 10 years. In the area of the confluence of the Rivers Beult, Medway and Teise 1220 properties are considered to be at risk of flooding in a 1% or 1 in 100 year event and 729 properties are considered to be at very significant risk of flooding. Average annual damages arising from flooding are estimated at £2.5 million.

The Environment Agency, Kent County Council, Tonbridge and Malling Borough Council and Maidstone Borough Council have formed a partnership project team to develop options to reduce the flood risk to the communities at risk of flooding. All of the partner organisations have committed funding to develop the business case.

The options to reduce the risk of flooding in this area were presented in the Middle Medway Strategy (MMS) (approved by the Environment Agency Chair in 2007 and reviewed in 2010). The strategy considered a number of flood risk management solutions. Recommendations were made based on the option benefits and the likelihood of each option gaining funding at the time. This SOC has been prepared using evidence from the Medway FSA Initial Assessment (IA) completed in 2016. This IA reconsidered the options in the strategy against the background of an updated River Medway flood model and the current Defra partnership funding rules.

The IA has considered two means to reduce flood risk in the study area:

- To assess the viability of an increase in the operational storage volume of the Leigh FSA to further reduce the risk of flooding to Tonbridge and downstream communities;
- To assess the viability of a solution to reduce flood risk in the communities of Yalding and Collier Street utilising a single or cascade of FSAs or other solution on the lower reaches of the River Beult and / or the River Teise.

(The Do-Nothing option has been assessed as part of the IA and will provide an assessment baseline for the OBC.)

### 2.2. Business strategies

The scheme is included in the published FCERM GiA 6 year plan and is supported as a priority by KSL Area's Flood and Coastal Risk Manager and Area Portfolio Board.

The Medway FSA project will evolve in a manner to ensure that it aligns with the business strategies of the organisations involved and all relevant national and functional strategies. A list of other relevant studies is also provided in the following section.

#### 2.2.1 Project partners

In addition to the Environment Agency, the Medway FSA partnership project team includes:

**Kent County Council:** Contributed £205k toward developing the appraisal and design. Agreed to contribute £2.5million toward the capital construction cost. Lead authority in securing Local Enterprise Partnership (LEP) funding of £4.54million which is expected to be confirmed in Autumn 2016, this funding is shared between this scheme and another FCRM scheme on the Medway at East Peckham;

**Tonbridge and Malling Borough Council:** Contributed £100k toward developing the appraisal and design. Agreed to contribute £0.5million toward the capital construction cost;

**Maidstone Borough Council:** Contributed £100k toward developing the appraisal and design.

Other potential partners have been identified but not all have been approached to date. This includes the following organisations:

**Hildenborough School:** Landowner at the likely Hildenborough flood wall location. They have agreed in principle to support the scheme and to contribute in kind. This contribution will be in the form of land;

**Southern Water:** Southern Water are key stakeholders as they own and operate infrastructure within the Leigh FSA. They have been informally contacted at this stage and will be formally engaged in the OBC development;

**Network Rail:** No direct contact has been made yet regarding this Scheme. Network Rail have a memorandum of understanding with the Environment Agency. This formal document will be used to draft a set of objectives at OBC phase.

### 2.2.2 National or functional strategies

#### DEFRA Policy

This scheme will help deliver Defra Strategy objectives: A nation better-protected against floods; and efficient, value for public money delivery.

#### Environment Agency Corporate Plan

The Environment Agency's corporate plan (2014-16) is structured around 3 main business areas: flood and coastal risk management; water, land and biodiversity; and regulated business. This project will help towards achieving the priorities of the Corporate Plan in the study area.

#### National Flood and Coastal Erosion Risk Management Strategy

The National FCERM Strategy (September 2011), sets out a national framework for managing the risk of flooding. It helps organisations and communities to understand their different roles and responsibilities and is particularly relevant to Lead Local Flood Authorities (LLFAs) and Regional Flood and Coastal Committees (RFCCs), which have new duties under the Act. It promotes local decision-making and engagement, and encourages beneficiaries to invest in flood risk management. The partnership nature of this project aligns it with the FCERM Risk Management Strategy.

#### Medway Catchment Flood Management Plan (CFMP)

The Project follows the recommendations of the Medway CFMP to implement the outcomes of the Middle Medway strategy, including an option to increase storage at Leigh FSA and to undertake feasibility studies to investigate further storage options at upstream locations, benefiting locations on or around the confluence of the Medway and its tributaries.

The CFMP Policy for Tonbridge and Collier Street / Yalding and East Peckham is P5 – Areas of moderate to high flood risk where we can generally take further action to reduce flood risk. The CFMP summary report (December 2009) states:

*'In Tonbridge....Damages are expected to approximately double in the future as a result of climate change. It is recommended that management should improve and be carried out to more than its current level to minimise this increase in risk. The Collier Street / Yalding / East Peckham area constitutes the highest level of flood risk... and the importance of maintenance or reducing the risk to this area is therefore very high.'*

#### Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services

This strategy, published by DEFRA in 2011, builds on the Natural Environment White Paper. It sets out the government's ambition to halt overall loss of England's biodiversity by 2020, support healthy well-functioning ecosystems and establish ecological networks to benefit wildlife and people. Environmental and landscape enhancement is a fundamental part of this Scheme. The biodiversity strategy will inform the appraisal and where appropriate shape the preferred option.

## Thames River Basin Management Plan (RBMP)

The RBMP has been prepared under the EU's Water Framework Directive, 2000, which requires all countries throughout the European Union to manage water environments to consistent standards. This Scheme will support the local delivery of the plan.

### 2.2.3 Previous studies and other relevant initiatives

The project takes into account various Flood Risk Management and other relevant studies. These provide a comprehensive source of information in terms of the range of options considered (large to local scale) for the project area.

### Middle Medway Strategy

The Middle Medway Strategy (MMS), sets out the overarching framework for future action by all risk management authorities to manage the risk of flooding from the River Medway, the River Beult, and the River Teise. The Strategy recommended two strategic options (including additional storage at Leigh FSA), 3 local options (including floodwalls in Yalding and floodwalls and stream diversion in Collier Street) and a range of non-structural options (e.g. flood warning and resistance / resilience). The MMS recommended investigations in to the feasibility of a flood storage reservoir on the lower reaches of the River Beult to benefit Yalding, Collier Street and Maidstone, the economic appraisal concluded that this scheme was unlikely to progress (given the economic rules in place at the time of publication). An option to develop a property level protection scheme for the area was submitted for consideration after consultation with local parish representatives. This required substantial external contributions and was not scheduled to commence until 2016 – 2017.

### Middle Medway Strategy Review

The Middle Medway Strategy Review, carried out in 2010, included a high level assessment (including hydraulic modelling) of additional options (including Yalding bridge arch debris removal, Upper Teise storage, Upper Beult storage, Lower Beult storage and River Teise flow diversion).

## 2.3. Environmental and other considerations

There are no statutory designated sites within the study area. There are a small number of nature conservation designated sites close to the study area. The 'River Medway South of Leigh' Site of Nature Conservation Importance (SNCI) is located just south of the Leigh FSA and the 'East Tonbridge Copses and Dykes' SNCI is located 1.8km east of Hildenborough. The River Beult is designated as a SSSI and is currently in unfavourable condition. This is due to a decline in water quality and change in habitat structure.

Protected species and habitats in the catchment include the water vole, otter, great crested newt, depressed mussel, rivers and streams, standing water and neutral and marshy grassland. A phase 1 habitat survey, conducted in June 2015, identified a single pond that could support great crested newts adjacent to the Hildenborough embankment option site. A follow-up survey using environmental DNA determined the presence of great crested newts. A terrestrial trapping exercise indicated the likely presence of a viable breeding population of great crested newts. Under the Habitat Regulations 2010, a European Protected Species Mitigation Licence may be required from Natural England for potential impact on great crested newts.

The 'Hilden Brook' and 'Mid Medway from Eden Confluence to Yalding' are both Water Framework Directive (WFD) waterbodies. The Hilden Brook is currently at poor status and the Mid Medway from Eden Confluence to Yalding is at moderate status. Both are predicted to reach good ecological status by 2027. A full preliminary WFD compliance assessment will be undertaken to examine the potential impacts and opportunities associated with all of the options. The assessment will ensure that options;

- Cause no deterioration in waterbody status;
- Do not prevent the implementation of mitigation measure or any work relating to the WFD;
- Identify opportunities for contributing towards the RBMP waterbody objectives.

Much of the catchment is covered by two Areas of Outstanding Natural Beauty (AONB), the High Weald and the Kent Downs AONBs.

There are no statutory heritage sites, historical assets or statutory designated nature conservation sites within the study area. There are a number of Scheduled Monuments (E.g. Yalding Bridge SM),

listed buildings and cultural heritage interest in the wider study area. The next appraisal stage will need to consider the implications of this and mitigate accordingly. This stage will include desk based archaeological and geophysical assessment to further define and refine the relevant risks.

Future appraisal work at OBC stage should include an assessment of the likely environmental impacts of each option to ensure that the chosen approach, methods of construction, operation and maintenance will maximise environmental gain and eliminate or reduce negative environmental impacts.

The design of the preferred option will be developed to maximise positive environmental outcomes and eliminate or minimise negative environmental outcomes. This process must be documented clearly in the Environmental Impact Assessment (EIA).

## 2.4. Investment objectives

The objectives of the Medway FSA project are:

- Promote a partnership funded project led by the Environment Agency to reduce flood risk to people and property;
- Promote a project which provides the economically optimal means of reducing flood risk that is resilient and adaptive to climate change;
- Deliver an option which helps create a better place, maximise environmental outcomes for people and wildlife, and contribute to WFD objectives;
- Minimise and mitigate for adverse impacts and safety and environmental risks that may result from any works undertaken;
- Identify opportunities to deliver Government objectives for efficiencies.

## 2.5. Current arrangements

There are measures in place both to manage the probability of flood risk and to manage the consequences of flooding.

### 2.5.1 Measures to manage the probability of flood risk

The operation of the Leigh FSA to manage flood risk downstream of the structure is the main active operation in the study area. The operation of the FSA during the 13/14 floods has recently been the subject of a detailed review by HR Wallingford and will not be further explored in this SOC. As part of the OBC the operation of the barrier will be considered; the change in storage volume may mean that the operation can be further optimised to best manage flood risk.

The Environment Agency is responsible for maintaining the Leigh Barrier and existing flood defences and structures along open channel reaches of the River Medway. With respect to management and maintenance for flood risk management assets, activity is prioritised on a risk basis in accordance with national guidance. Routine maintenance costs in the last three years average £400K pa but expenditure in previous years had been on average £250k pa. Priority activities are; blockage clearance, tree management and weed cutting. De-silting is confined to a few locations predominantly to ensure effective operation of gauging stations. From time to time capital maintenance is carried out, predominantly at the Leigh FSA. Lead screws and mechanical and electrical components are changed according to a routine maintenance plan totalling £150 - 250k per annum.

### 2.5.2 Measures to manage the consequences of flood risk

The Environment Agency's Flood Warning system covers the project area. Flood forecasting and warnings are currently sent to around 2,900 properties in the catchment, with the aim to give at least two hours lead time ahead of river flooding.

Tonbridge and Malling Civil Emergency Plan and Maidstone Emergency Plan are designed to support service providers during a major incident, including liaison with relevant agencies and delivery managed by their Emergency Planning Service. This fulfils the borough councils duties defined in the Civil Contingencies Act 2004, covering disaster recovery, business continuity and other plans. It will be necessary to ensure the project outcomes are fed into the emergency planning system.

Management of flood risk through Development Control will continue to regulate development in the floodplain to avoid putting new assets at risk in accordance with the National Planning Policy Framework. Through the wider work of the Environment Agency, property owners at risk will continually be encouraged to consider flood resilience measures.

## 2.6. Main benefits

The preferred option will maintain the current standard of flood risk to over 1200 properties as well as securing the integrity of a strategically important Environment Agency asset, The Leigh Flood Storage Area. It will benefit a further 298 properties not currently protected from flooding in Tonbridge and Hildenborough.

The economic analysis undertaken to prepare this SOC indicates the scheme will deliver £220million in Present Value (PV) whole life benefits.

## 2.7. Main risks

The following table highlights the key risks identified at SOC stage. A full risk register will be developed during the appraisal process through risk workshops attended by partner organisations.

**Table 1: Key project risks & mitigation measures**

Key project risk	Proposed mitigation measure
<b>Management</b>	
Internal availability of appropriately experienced staff to manage the project.	Project is identified and prioritised on the national and local resourcing tools.
<b>Financial</b>	
Partnership funding not available/shortfall.	Close collaboration between partner organisations. Sign legal agreement for funding commitment in OBC programme. Area PSO team will seek contributions in line with DEFRA policy and manage partners' expectations. Defra shortfall GiA fund for contingency.
<b>Economic / Technical</b>	
Damaged Environment Agency and partners' reputations due to unviable scheme or a scheme that can only be justified to protect to a lower than expected standard of protection.	Appraisal to build on the detailed technical analysis carried out at IA stage. Community and partner engagement to continue throughout project lifecycle. Senior Environment Agency and political partners to be engaged and support project objectives. Manage expectations with a fully engaged partner/EA led communication strategy.
Project increases risk of flooding.	Modelling as part of options appraisal to assess and design out this risk.
<b>Strategic</b>	
Conflicting priorities between Local Authorities	Close contact at senior level to resolve conflicts and agree priorities supported by Environment Agency Area Manager.
Defra objectives to accelerate outcome measure delivery cannot be met.	Opportunities for programme efficiencies identified early. Mandate to deliver products efficiently built into the commercial approach.
<b>Commercial</b>	
As yet unforeseen difficulties due to contract management or programme delay.	Recognise risks and identify them as part of the procurement strategy. Use Defra commercial support within Environment Agency to manage framework suppliers.

## 2.8. Constraints

The key constraints are:

- Securing sufficient contributions and commitments from partner organisations;
- Impacts of an embankment at Hildenborough on flood risk in Tonbridge;
- Key infrastructure and assets – railway, Southern Water assets;
- Notable and protected species and habitats;
- Landscape and wildlife value;
- Public rights of way;
- Land availability and negotiating easements with landowners.

## 2.9. Dependencies

These are the identified dependencies requiring consideration, this list will be regularly reviewed and considered during the next phase of appraisal:

- The Medway model currently indicates that incorporation of an embankment at Hildenborough may increase flood risk in Tonbridge. This will need to be investigated and either designed out or mitigated. By considering the Leigh FSA and Hildenborough schemes together this dependency will be fully considered;
- The Leigh FSA reduces flood risk to Tonbridge and Hildenborough and, to a lesser extent, further downstream for the areas of Five Oak Green, East Peckham and Laddingford. There are a large number of properties at risk in the area of the confluence of the Rivers Beult, Medway and Teise, including the communities of Yalding and Collier Street. The flood risk reduction due directly from the Leigh FSA this far downstream is relatively small. However, there are inter-linkages relating to the timing of the flood peak. Timing is affected by catchment characteristics (particularly catchment area and slope) and both natural floodplain attenuation and man-made FSA. This is a critical dependency for this project and must be considered;
- There is an existing project to carry out essential works to the gate and ancillary equipment on the Leigh FSA. A formal communication between project teams will be required to ensure that the works are accounted for in any option design for increasing storage and operational changes at the Leigh FSA;
- The project team has entered into discussion with local Councillors and other potential project partners including Southern Water and Tonbridge School. This has been to discuss how each could contribute to the scheme development.

## 3. The Economic Case

### 3.1. Introduction

In accordance with the Capital Investment Manual and requirements of HM Treasury's Green Book (A Guide to Investment Appraisal in the Public Sector), this section of the SOC documents the wide range of options that have been considered through the development of the Medway FSA project to date. The 'Do nothing' scenario has been used as the baseline scenario in the Economic Case.

The Medway catchment has been subject to a number of studies regarding the management of flood risk, which have between them identified a variety of options. Previous FRM schemes have not progressed due to affordability at that time; however, it is considered that external contributions can now make a scheme possible. The following sections describe the conclusions of previous studies and the recommendations from the Medway FSA IA and Hildenborough FAS.

### 3.2. Critical success factors

The high level critical success factors (CSF) for the project developed by the Environment Agency are:

- Delivery of a SOC which makes recommendations and gains approval for the management of flood risk in the study area in accordance with the current investment guidelines;
- Managed reputational risk for the Environment Agency and its partners;
- Option widely accepted by statutory and non-statutory stakeholders;

- Identification and provision of efficiency savings;
- Determining a sustainable long term option to manage flood risk where it is economically viable.

We have also developed project specific critical success factors, as outlined in the following table.

**Table 2: Critical success factors**

Critical Success Factor	Measurement Criteria
Strategic fit & business needs	<ul style="list-style-type: none"> <li>• Meets our partner's strategic objectives;</li> <li>• Continues to deliver benefits allowing for climate change and is compatible with future schemes;</li> <li>• Demonstrates that it does not increase flood risk downstream or elsewhere.</li> </ul>
Potential value for money (VFM)	<ul style="list-style-type: none"> <li>• Achieves a viable cost benefit ratio and incremental benefit cost ratio, when compared with the other available options;</li> <li>• Delivers the efficiencies set by Defra;</li> <li>• Minimises future maintenance and operational requirements.</li> </ul>
Potential achievability	<ul style="list-style-type: none"> <li>• Fits with the study area's constraints;</li> <li>• Meets and exceeds requirements under the relevant legislation to secure necessary consents;</li> <li>• Generates and maintains political and stakeholder support;</li> <li>• Follows a clear, timely and deliverable approval route;</li> <li>• Is integrated with related schemes in the area.</li> </ul>
Supplier capability and capacity.	<ul style="list-style-type: none"> <li>• A clear delivery model is agreed;</li> <li>• The option allows for the establishment of an integrated project team in accordance with the stage of the project.</li> </ul>
Potential affordability	<ul style="list-style-type: none"> <li>• Delivers 'Outcome Measures' according to DEFRA's Partnership Funding rules;</li> <li>• Funding strategy is supported by all partners;</li> <li>• Designs in benefits to potential funding partners.</li> </ul>

### 3.3. Long list options

The chronological development of long list options is summarised as follows.

The Middle Medway Strategy (2007) identified an extensive long list of flood risk management options for the Middle Medway catchment including online storage, offline storage, local defence, conveyance and non-structural options. Following the identification and appraisal of shortlisted options, flood storage on the Rivers Beult and Teise and conveyance options were not taken forward. The 2007 strategy recommended:

- 2 strategic options (including additional storage at Leigh FSA);
- 3 local options (including floodwalls in Yalding and floodwalls and stream diversion in Collier Street);
- A range of non-structural options (e.g. flood warning and resistance / resilience).

Following approval of the strategy, none of the 5 recommended structural schemes were implemented due to specific technical uncertainties and a relatively weak business case with respect to the national prioritisation. As a result to changes in project appraisal and funding prioritisation and the availability of a new model for the catchment, the Environment Agency commissioned a 'structural review' of the strategy.

The Middle Medway Strategy Review (2010) developed an enhanced long list of options, using the previous option assessment undertaken by the strategy:

- Leigh Barrier – increase storage capacity;
- Yalding – local wall (earth embankment & structural walls);
- Collier Street – local wall and stream diversion;

- Yalding – bridge arch debris removal;
- Upper Teise – storage;
- Upper Beult – storage;
- Lower Beult – storage;
- Hilden Park/Hildenborough (Hawden Stream) – local wall.

Following an outline modelling process, six options were short-listed for further appraisal, four of which, including the Leigh Barrier increased storage capacity and Yalding Walls, were considered to be technically viable and recommended to be taken forward. The storage options on the Teise and Beult were rejected due to the relatively minor benefits, significant costs and increased flood risk to other areas. The Hilden Park walls option was not considered necessary as the results showed that the current Leigh FSA would reduce flooding significantly in Hilden Park.

In 2013 the Environment Agency commissioned Jeremy Benn Associates Ltd to update the River Medway 2D hydraulic model. Following this model update, in 2015, The VBA consortium was commissioned to undertake an IA to re-assess strategic catchment options for improved flood risk management through reservoir storage. Specifically, at the existing Leigh FSA, and at potential new FSAs located on the River Beult and River Teise catchments upstream of the Yalding and Collier Street communities. At the same time, Capita AECOM carried out an options appraisal and outline design of a flood alleviation scheme (FAS) in Hildenborough in Kent.

Table 3 sets out the long list of options included in the Medway FSA IA and Hildenborough FAS and the results of the initial screening leading to the short-list.

**Table 3: Long list options**

Option	Reason for short list or rejection
<b>Leigh Flood Storage Area Options</b>	
<b>Do Nothing</b>	<b>Short-listed</b> As baseline case.
<b>Maintain Leigh FSA</b> <i>NMOWL at 28.05m AOD.</i>	<b>Short-listed</b> As the existing situation, do minimum option.
<b>Improve Leigh FSA 1</b> <i>Realise some additional FSA capacity plus mechanical improvements. Raise the NMOWL to 28.85m AOD.</i>	<b>Short-listed</b> As the optimum improve option. Has lower benefits than raising the NMOLW to 29.15m AOD but has significantly lower costs.
<b>Improve Leigh FSA 2</b> <i>Realise all additional FSA capacity plus mechanical improvements. Raise the NMOWL to 29.15m AOD.</i>	<b>Rejected</b> Requires significant works at both the embankment and in upstream areas, associated costs reduce the economic viability of the option.
<b>Improve Leigh FSA 3</b> <i>Realise all additional FSA capacity plus new structure. Raise the NMOWL to 29.15m AOD.</i>	<b>Rejected</b> Requires significant works at both the embankment and in upstream areas, associated costs reduce the economic viability of the option.
<b>River Beult Flood Storage Options</b>	
<b>Beult FSA 1 (Chainhurst)</b>	<b>Short-listed</b> Useful flood storage could be provided in this location, however would need to be considered alongside FSA on the Teise to reduce flood risk in Yalding.
<b>Beult FSA 2 (Upstream of Headcorn)</b> <i>&gt; 20km upstream of Yalding.</i>	<b>Rejected</b> Does not provide worthwhile SoP to downstream properties at Yalding.
<b>Beult FSA 3 (Headcorn to Hawkenbury)</b>	<b>Rejected</b> Not technically viable due to the large number of properties present.
<b>Beult FSA 4 (Hawkenbury to Stilebridge)</b>	<b>Rejected</b>

Option	Reason for short list or rejection
< 5km upstream of Yalding	Not technically viable due to the large number of properties present.
<b>River Teise Flood Storage Options</b>	
<b>Teise FSA 1 (Cottage Wood)</b>	<b>Short-listed</b> Would provide potential benefits to Collier Street and wider communities along the Lower and Lesser Teise.
<b>Teise FSA 2 (Stonebridge)</b>	<b>Short-listed</b> This site alone does not provide sufficient storage volume to attenuate flows on the River Teise. It could however be considered in combination with the downstream Cottage Wood FSA.
<b>Hildenborough Options</b>	
<b>Hildenborough FAS</b> <i>Embankment</i>	<b>Short-listed</b> A viable scheme on its own however, if Hildenborough is added to the Medway FSAs project, c£4.5million of additional benefits could be achieved along with other efficiencies.
<b>Yalding Options</b>	
<b>Yalding local defences</b> <i>Walls</i>	<b>Rejected</b> Would increase flood risk to those outside of the walls.
<b>Conveyance improvements 1</b> <i>Open an additional arch to Yalding Bridge SM</i>	<b>Rejected</b> Would have negligible impact on flood risk and consent for work would be difficult.
<b>Conveyance improvements 2</b> <i>Deepen and widen Medway Channel</i>	<b>Rejected</b> Prohibitively high cost and would result in adverse environmental impacts.

### 3.4. Short list options

#### 3.4.1 Overview

The short-listed options in Table 4 have been assessed in more detail during the IA stage in order to identify a preferred short-list to take forward to and assess further at OBC stage.

**Table 4: Short-listed options to take forward to OBC**

Option	Description	Benefits delivered /Issues involved	Reason to take through to OBC or rejection
1	<b>Do Nothing</b>	No capital funding required. Would result in the failure of the Leigh Barrier and FSA. 1,538 properties at risk of internal flooding (1.3% (1-75) SoP)	<b>Take forward to OBC</b> Taken forward as baseline option.
2	<b>Maintain Leigh FSA</b>	Reduces flood depths at specific locations in Tonbridge, Hildenborough, East Peckham and Yalding. Compared with Option 1, 400 residential properties no longer at risk of internal flooding (1.3% (1 in 75) SoP)	<b>Take forward to OBC</b> Taken forward as do-minimum option.

Option	Description	Benefits delivered /Issues involved	Reason to take through to OBC or rejection
3	<b>Improve Leigh FSA 1</b>	Reduces flood depths at specific locations in Tonbridge, Hildenborough, East Peckham and Yalding. Compared with Option 1, 613 residential properties no longer at risk of internal flooding (1.3% (1 in 75) SoP)	<b>Take forward to OBC</b> Reduces flood risk to an additional 213 residential properties compared to Option 2. Option has a strong benefit cost ratio (BCR) and incremental benefit cost ratio iBCR.
4	<b>Improve Leigh FSA 1 + Hildenborough FAS</b>	Compared with Option 1, 675 residential properties no longer at risk of internal flooding (1.3% (1 in 75) SoP)	<b>Take forward to OBC</b> Reduces flood risk to an additional 62 residential properties in Hildenborough compared to Option 3.
5	<b>Improve Leigh FSA 1 + Teise FSA 1 and 2</b>	Reduces flood depths at specific locations in Tonbridge, Hildenborough, East Peckham, Collier Street and Yalding. Compared with Option 1, 709 residential properties no longer at risk of internal flooding (1.3% (1 in 75) SoP)	<b>Rejected</b> Reduces flood risk to an additional 34 residential properties in Maidstone Borough compared to Option 4. Low BCR and high contributions required for little additional benefit to Maidstone Borough.
6	<b>Improve Leigh FSA 1 + Teise FSA 1 and 2 + Beult FSA 1</b>	Reduces flood depths at specific locations in Tonbridge, Hildenborough, East Peckham, Collier Street and Yalding. Compared with Option 1, 741 residential properties no longer at risk of internal flooding (1.3% (1 in 75) SoP)	<b>Rejected</b> Reduces flood risk to an additional 32 residential properties in Maidstone Borough compared to Option 5. Low BCR and significant contributions required for little additional benefit to Maidstone Borough. iBCR is less than 1.

The preferred options recommended to be taken forward to a combined detailed appraisal at the OBC stage, subject to the potential for funding availability and key stakeholder (landowner) support, are:

- Option 1: Do Nothing;
- Option 2: Maintain Leigh FSA
- Option 3: Improve Leigh FSA;
- Option 4: Improve Leigh FSA + Hildenborough flood alleviation scheme.

### 3.4.2 Technical assessment

Not applicable at SOC stage. Technical risks, their impacts, mitigation and opportunities for innovations for the options will be considered during the OBC appraisal process.

### 3.4.3 Environmental assessment

Not applicable at SOC stage. Environmental constraints known at this stage are detailed in Section 2.3. Scheme appraisal will be accompanied by an appropriate level of environmental assessment following formal screening of the preferred option. Opportunities for enhancement will be considered during the appraisal process.

### 3.5. Economic appraisal

The economic appraisal has followed the principals of the Flood and Coastal Erosion Risk Management – Appraisal Guidance (FCERM-AG) (Environment Agency, 2010), as updated by supplementary guidance on the Defra website. Depth damage data has been taken from the Multi-Coloured Manual (MCM) (Flood Hazard Research Centre, 2015). In accordance with Treasury guidance a 100 year appraisal period has been used and the Treasury variable discount rate has been applied. Calculation of Average Annual Damages has included residential and non-residential property damages, evacuation costs, vehicle damages, cost of emergency services and risk to life. The benefits of a reduced risk of flooding on the human intangible effects of health and stress were also included, measured directly as a benefit. At the IA stage there was no inclusion of damages from agriculture or infrastructure. The impact of climate change was incorporated into the economic appraisal in accordance with the Environment Agency guidance (Environment Agency, 2011) current at the time of the assessment and using a high-level approach suitable to the stage of this appraisal.

#### 3.5.1 Benefits

Using the output from the hydraulic modelling, the economic damages over 100 years for the Do Nothing, and all do something options have been calculated and are summarised in Table 5.

With flood risk from three rivers (Medway, Beult and Teise), all of which respond with different timings to rainfall events, the short-list options do not provide a fixed standard of protection and nor do they simply build on each other to provide increasing levels of standard of protection. Furthermore, some of the short-listed options have been designed to reduce flooding in specific communities, (for example the Hildenborough flood alleviation scheme), while the flood storage options reduce flood depths over a much wider catchment area. For these reasons, it is not appropriate to calculate the incremental benefit cost ratio (iBCR) by ordering the short-listed options by increasing standard of protection. The iBCR has therefore been calculated by ordering the short-listed options by average benefit cost ratio. .

**Table 5: Summary of Present Value (PV) Damages and Benefits (£k) and incremental benefit cost ratio.**

	Damage (PVd) (£k)	Damage avoided (£k)	Benefits (PVb) (£k)	Av. Benefit/Cost Ratio (BCR)	Incremental Benefit/Cost Ratio (iBCR)
Option 1 Do Nothing	457,028				
Option 2 Maintain Leigh FSA	272,414	184,614	188,000	12.3	
Option 3 Improve Leigh FSA 1	246,196	210,832	215,442	11.3	7.1
Option 4 Improve Leigh FSA 1 + Hildenborough	242,202	214,826	220,084	9.8	1.4
Option 5 Improve Leigh FSA 1 + Teise FSA 1 and 2	232,919	224,109	229,114	8.5	2.0
Option 6 Improve Leigh FSA 1 + Teise FSA 1 and 2 + Beult FSA 1	225,214	231,814	237,051	6.5	0.8

#### 3.5.2 Costs

In the initial assessment, a breakdown of outline costs was considered for all five shortlisted options. With the exception of the Hildenborough flood alleviation scheme, a lower level of Optimism Bias (risk) at 30% rather than the standard 60% for strategies and initial assessments was applied to all costs. The 30% level reflects the more detailed understanding and knowledge in this scheme than would normally be expected at this stage. For Hildenborough there is more uncertainty and 60% has

been applied. Total 100 year Present Value (PV) costs for each shortlisted option are summarised in Table 6. Note that all the “Future costs (operation + maintenance)” include PV capital costs of £2,499k and £763k for major Leigh FSA structure replacement works in the years 2057 and 2097.

**Table 6: Summary of Options Present Value Costs (£k)**

	<b>Option 2 Maintain Leigh FSA</b>	<b>Option 3 Improve Leigh FSA 1</b>	<b>Option 4 Improve Leigh FSA 1 + Hildenborough FAS</b>	<b>Option 5 Improve Leigh FSA 1 + Teise FSA 1 + FSA 2</b>	<b>Option 6 Improve Leigh FSA 1 + Teise FSA 1 + FSA 2 + Beult FSA 1</b>
Enabling cost (£k)	377	565	622	746	1,143
Capital cost (£k)	5,006	7,512	9,766	12,085	17,285
Land purchase cost/Compensation (£k)				386	870
Other (£k)					
Optimum Bias (30%) (£k)	1,615	2,423	3,116	3,965	5,789
<b>Sub Total (£k)</b>	<b>6,998</b>	<b>10,500</b>	<b>13,504</b>	<b>17,182</b>	<b>25,088</b>
Future costs (operation + maintenance) (£k)	6,356	6,635	6,955	7,581	8,879
Optimum Bias (30%) (£k)	1,907	1,990	2,087	2,274	2,663
<b>Total PV Cost (£k)</b>	<b>15,261</b>	<b>19,125</b>	<b>22,546</b>	<b>27,037</b>	<b>36,630</b>

### 3.5.3 Present Values

Table 7 provides a summary of the net 100 year PV costs and benefits. Where possible, costs and benefits have been quantitatively valued and included in the economic appraisal.

**Table 7: Net Present Values**

<b>Option</b>	<b>PV costs (£k)</b>	<b>PV benefits (£k)</b>	<b>Net PV (£k)</b>
Option 2 Maintain Leigh FSA	15,261	188,000	172,739
Option 3 Improve Leigh FSA	19,125	215,442	196,317
Option 4 Improve Leigh FSA 1 + Hildenborough FAS	22,546	220,084	197,538
Option 5 Improve Leigh FSA 1 + Teise FSA 1 + FSA 2	27,037	229,114	202,077
Option 6 Improve Leigh FSA 1 + Teise FSA 1 + FSA 2 + Beult FSA 1	36,630	237,051	200,421

### 3.5.4 Option ranking & Economic appraisal conclusion

Table 8 summarises the conclusions of the 100 year economic appraisal. The BCRs for Options 2 to 6 are above 1 and therefore provide sufficient justification for selection as the economically preferred options under the FCERM-AG decision rule. The options are ranked in order of economic preference with Option 2: Maintain Leigh FSA as the highest ranked option and Option 6: Improve Leigh FSA1 + Teise FSA1 and FSA2 + Beult FSA1 as the lowest.

**Table 8 Option ranking**

Option	PV costs (£k)	PV benefits (£k)	BCR	Ranking
Option 2 Maintain Leigh FSA	15,261	188,000	12.3	1
Option 3 Improve Leigh FSA	19,125	215,442	11.3	2
Option 4 Improve Leigh FSA 1 + Hildenborough FAS	22,546	220,084	9.8	3
Option 5 Improve Leigh FSA 1 + Teise FSA 1 + FSA 2	27,037	229,114	8.5	4
Option 6 Improve Leigh FSA 1 + Teise FSA 1 + FSA 2 + Beult FSA 1	36,630	237,051	6.5	5

### 3.6. Non financial benefits appraisal

#### 3.6.1 Methodology

Through the next phase of the project, the appraisal supplier will work with NEAS, other Environment Agency teams and partners to understand non-financial benefits. An Appraisal Summary Table (AST) is currently being refined, in line with the issue and adoption of the new River Basin Management Plans. The AST will act as a framework to consider the wider range of impacts and potential benefits that could be delivered at a catchment scale.

In producing the project's OBC, the effectiveness of options in reducing flood risk will be confirmed, engagement undertaken and environmental impacts fully assessed. We will seek to maximise improvements in protection against flooding through optimising SoP and seeking contributions to go further where this is practical. The known risks will be fully explored and as our understanding increases, will influence the appraisal and scheme design.

#### 3.6.2 Qualitative benefits

Not applicable at SOC stage

#### 3.6.3 Qualitative benefits scoring

Not applicable at SOC stage

#### 3.6.4 Analysis of key results

Not applicable at SOC stage

### 3.7. Preferred option

The preferred option is not known at this stage. At this stage the project is to progress to OBC. Full appraisal undertaken at OBC will determine the details of the preferred option.

### 3.8. Sensitivity analysis

Minor sensitivity analysis was undertaken during the IA study to determine the impact of varying assumptions made during the cost and benefit calculations. The following sensitivity tests were undertaken:

- Sensitivity test 1: Optimism Bias increased from 30% to 50%, increasing costs of all options to reflect possible uncertainty. Note that a higher Optimism Bias of 60% had already been included in the costs for the schemes at Hildenborough and Yalding to reflect the higher level of cost uncertainty for these options;
- Sensitivity test 2: Leigh Maintain and Improve costs reduced by £620k; the cost of works recommended for reservoir safety purposes and hence could be included as a Measure in the Interest of Safety instead of a FCERM activity;
- Sensitivity test 3: PVb reduced by 10% across all options to reflect the uncertainty associated with the capping value used for properties with MCM code 400 (warehouses);

- Sensitivity test 4: For the Leigh FSA Improve with Hildenborough option only, with the capital costs for the Hildenborough scheme reduced to reflect a potential shorter defence alignment.

While the BCR and iBCRs changed, the changes were not sufficient to change the identified preferred options. Sensitivity testing was also undertaken on the partnership funding calculations.

## 4. The Commercial case

### 4.1. Introduction and Procurement Strategy

The Procurement Strategy is included in Appendix G. The agreed approach in the procurement strategy for the main appraisal contract is to use the Water and Environmental Management (WEM) Framework Lot 3 suppliers. The Lot 3 suppliers have been chosen as they have the better capabilities to deliver outputs because the appraisal requires a consultant, rather than contractor led approach. An Early Supplier Engagement (ESE) contract from a WEM Lot 4 supplier will be let to develop the works methodology, confirm buildability, practical site investigation advice and provide input into costing of options. There will also be a requirement for cost consultancy services to manage the costs on the project, manage the risk register and provide costs for options. This service will be sourced from the National Cost Management Framework 2 (NCMF2).

The Professional Services Contract, Option C target cost contract will be used for the main appraisal contract, using the WEM incentivisation model. A staged procurement process is required to give the flexibility needed. The initial contracts will be to take the appraisal package to Outline Business Case (OBC) with the appraisal/business case supplier taking the risk in producing the economic and financial cases of the OBC (ready to be submitted for approval). Prior to OBC approval there will be a review as to the most appropriate procurement route to take the project to Full Business Case (FBC), i.e. traditional route or 'design and build'.

### 4.2. Key contractual terms & risk allocation

A detailed project risk register will be produced by the appraisal consultant at the next stage of the project following a risk workshop involving the Environment Agency, ESE supplier, NEAS and any intended project partners. This will apportion risk between parties, covering those that arise in planning, design, implementation, construction and any residual risks. The general principle that will be followed is that risk is passed to the 'party best able to manage them', subject to value for money.

A current summary of the obligation/liabilities allocated under the appraisal and OBC Scope is:

- The Lot 3 supplier is responsible for producing the economic and financial case of the OBC in a format ready to be submitted for approval;
- The hydraulic models have been recently reviewed and are considered robust by the Environment Agency. It is not a requirement to remodel the hydrology. During the IA the appraisal consultant procured modelling services through JBA Ltd who developed the Medway hydraulic model. Given the complexity and long run time of the model there is no advantage to be gained by changing this procurement model. The appraisal consultant will request specific model runs as required through JBA;
- The Environment Agency will develop the landscape scope by prescribing the outcomes. It is not considered that the environmental minimum technical requirements are robust enough to develop an outcome focused landscape scope. An allowance has been made for NEAS to carry out this work;
- There are a high number of statutory and non-statutory stakeholders requiring consultation and approvals. Certain well understood approvals (e.g. planning permission) will be the responsibility and risk of the Lot 3 supplier. The Environment Agency will take the risk of additional time/cost due to prolonged negotiations for difficult to define consultation, e.g. with landowners, business & private property owners and community groups;
- The Lot 3 supplier will be required to scope, procure and manage site investigation works and take responsibility for the outcomes in support of justifying the preferred option/s. The Environment Agency project team will place a very high emphasis on the management of any works on or near the reservoir. The Reservoir Panel Engineer will be required to sign off on all proposed works.

### 4.3. Procurement route and timescales

**Table 9: The main contracts required to provide delivery of the project from SOC to FBC**

Description	Framework	Contract type / option	Estimated Value To OBC	Estimated Value OBC To FBC
Consultation costs (CE on IA PSC)	WEM Lot 4	PSC Option C	£20k*	
Appraisal, Design and Ground Investigation PSC	WEM Lot 3	PSC Option C	£340k + £300k GI = £640k	£185k
Early Supplier Engagement PSC	WEM Lot 4	PSC Option E	£40k	£14k
Cost Consultancy PSC	NCMF2	PSC Option E	£20k	£20k

\* £20k is expenditure on the Initial Assessment PSC post SOC approval for public consultation.

Taking the above risk assessment in to account; the Environment Agency are retaining control on some key risks, the project team considers that for the tender assessment, a 50% quality 50% price split is the most appropriate evaluation model to use.

The quality of each proposal will be scored against the following criteria:

1. Methodology including programme – 40%
2. Key Staff and availability – 60%

Given the high profile nature of the project, the emphasis on having experienced staff members in the appraisal team is appropriate and proportionate. A summary of planned procurement milestones up to OBC is:

- Issue tender documents to WEM Lot 3 suppliers: November 2016;
- Tender returns: December 2017;
- Tender assessment period: 3 weeks;
- Appoint WEM Lot 3: February 2017;
- NCMF2 cost consultant: by January 2017 via competitive tender.

### 4.4. Efficiencies and commercial issues

The emphasis on efficiencies at the next phase will be in minimising the work required to reach the OBC stage. The IA has identified most of the evidence required to populate the OBC and the tender and scope of consultancy work will ensure there is no unnecessary repetition of work completed. The project efficiency register will be set up at the commencement of the OBC and potential efficiencies identified. We will continue to use the tendered modelling contract with JBA which will be much more efficient than expecting a new consultant to carry out the modelling work. All other work procured for the next phase will be competitively tendered to the appropriate framework to ensure commercial integrity.

The opportunities for much bigger efficiencies will be during the later planning and construction activities. There are potential opportunities to:

- Minimise the length of the flood embankment at Hildenborough;
- Retain most of the existing gate infrastructure at Leigh;
- Utilise the powdermill stream for fish passage at Leigh.

All efficiencies gained by this approach will be recorded on the project efficiency register (CERT).

## 5. The Financial case

### 5.1. Financial summary

The purpose of this section is to set out the indicative financial implications of the preferred way forward. Detailed analysis of the financial case including affordability takes place at OBC stage, the revised financial case will be developed alongside the economic case for the OBC. The values

shown in this SOC stage differ slightly between the economic and financial case, this is due to further development of the costs made in the financial case after completion of the IA.

The financial case will develop with input from the WEM Lot 3 supplier and the ESE WEM Lot 4 supplier. A specialist cost consultant with experience of costing similar projects will provide input to quality assure the cost information. The table below presents the current project summary. This is based on the following assumptions:

- Staff cost includes Environment Agency staff and consultant design, advice and supervision;
- Capital cost covers site investigation, survey, environmental mitigation and construction fees;
- Future costs are based on the £500k estimate from the LLFRMS (2010) which identified a figure to maintain, refurbish and replace assets beyond the lifecycle of this Scheme once the SOP is lower.

This is the projected financial position for the Scheme, using current best available information. Revisions have been made to the cost estimate from the IA. This includes a revised profile of staff costs based on recent experience with other similar projects and extra allowance for design during construction. This updated information explains why the costs presented in this section differ from those in 3.5 undertaken during the initial assessment stage. An updated planned profile of costs for the preferred scheme, for the intended lifespan of the project will be included at the OBC stage.

**Table 10: Project financial position including future revenue**

<b>Project Summary £k</b>	<b>Prior years</b>	<b>Yr 0</b>	<b>Yr 1</b>	<b>Yr 2</b>	<b>Yr 3</b>	<b>Yr 4+</b>	<b>Total</b>
Staff	61	71	130	130	130	80	602
Initial investment - Capital cost	65	52	1059.5	429	4667	6771	13043.5
Future costs - Revenue						5760	5760
<b>Project Total</b>	126	123	1189.5	559	4797	12611	19405.5

## 5.2. Funding sources

The IA assessed the economic case for Options 2 to 6 against the partnership funding rules introduced by Defra. The raw partnership funding scores calculated using the Partnership Funding Calculator for Flood and Coastal Erosion Risk Management Grant in Aid (FCERM GiA) are shown in Table 11. PV costs and benefits were calculated over a 40 year period in accordance with the partnership funding mechanism, and hence are different to those previously reported for the 100-year appraisal period.

The partner local authorities have considered the potential benefits and risks of the schemes against the contribution required. They do not consider either of the Teise or Beult FSA options as viable. They have indicated that they will commit to finding the partnership funding required to progress the increased storage at the Leigh FSA and the local defences in Hildenborough but not the Options including FSAs on the Beult and Teise.

**Table 11: Partnership funding scores and contributions**

Option	% score	PV cost for approval (£m)	PV cost for duration of benefits (£m)	Contribution required (£m)	PV GIA for approval (£m)	PV GIA for future spend (£m)
Option 2 – Maintain Leigh FSA	94%	7.0	10.0	0.6	6.4	3.0
Option 3 – Improve Leigh FSA 1	79%	10.5	13.8	2.9	7.6	3.3
Option 4 – Improve Leigh FSA 1 + Hildenborough FAS	66%	13.5	17.1	5.8	7.7	3.6
Option 5 – Improve Leigh FSA 1 + Teise FSA 1 + FSA 2	55%	17.2	21.3	9.6	7.6	4.1
Option 6 - Improve Leigh FSA 1 + Teise FSA 1 + FSA 2 + Beult FSA 1	40%	25.1	30.4	18.2	6.9	5.3

In addition to FCERM GiA this project has therefore secured and unsecured funding from the local authority partners and the LEP. These are:

- Kent County Council have contributed £205k toward developing the appraisal and design. They have agreed to contribute £2.5million toward the capital construction cost of the preferred option;
- LEP funding of £4.54million, this funding is shared between this scheme and another FCRM scheme on the Medway at East Peckham, this funding will be used to make up the required partnership funding to ensure the preferred option is 100% funded;
- Tonbridge and Malling Borough Council have contributed £100k toward developing the appraisal and design. They have agreed to contribute £0.5million toward the capital construction cost of the preferred option;
- Maidstone Borough Council contributed £100k toward developing the appraisal and design.

If the LEP funding is not secured then the Environment Agency have put a contingency funding strategy in place. Defra have requested applications from priority schemes to apply for 'top up' funding for high priority schemes not 100% funded. This combination of funding streams including a contingency funding strategy is sufficiently robust for project development to OBC.

Partnership funding calculators are included in an appendix F, these will be developed and refined during the OBC phase as the Hildenborough and Medway FSA schemes are fully integrated. An updated annualised funding profile will be included for the preferred option, and details on which of the EA's functional budgets will provide funding at the OBC stage.

**Table 12: Annualised funding profile (£k)**

Annualised funding profile (£k)	Prior Yrs	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4+	Total
Grant in Aid	126	123	784.5	359	3000	9311	13703.5
Partnership funding			405	200	1797	3300	5702
<b>Project Total</b>	126	123	1189.5	559	4797	12611	19405.5

A Funding Strategy will be developed through the next stage of the project. This will identify all beneficiaries to the scheme and possible type and levels of support they may be able to provide (e.g. cash funding, payment in kind etc.). The Environment Agency's internal legal, procurement and finance teams will help to secure contributions.

### 5.3. Impact on revenue and balance sheet

The impact on revenue budgets and balance sheet in future years depends on the details of the preferred option taken forward to construction. Currently there is a marginal increase to operation and maintenance budgets from implementing the preferred option in terms of regular operational maintenance such as inspections, surveys and grass cutting. The replacement of the failing and electrical elements at the Leigh FSA will result in a decrease in capital and revenue maintenance costs. The preferred option will be confirmed at Outline Business Case (OBC) and the planned maintenance budgets will need to be adjusted to accommodate.

Opportunities for external contributions towards maintenance will be explored during the appraisal.

The current preferred will create new tangible flood risk assets, which will need to be added to the balance sheet.

### 5.4. Overall affordability

Table 13 shows the initial forecast with regards to the cost of the project over its expected lifespan. These have been developed using the evidence gathered in the IA work and current benchmarked data for other similar schemes. These figures are subject to change in line with an increasingly refined delivery model which it is anticipated will help the project team to meet efficiency targets.

The ability to deliver the Scheme is dependent upon receiving significant contributions from third party funding. The Environment Agency and local authority partners have identified viable funding for this project at SOC stage. Given the high profile nature of the project the Project Sponsor has placed a high priority on ensuring the project objectives can be met and that sufficient funding is available.

**Table 13: Annualised spend profile (£k)**

Annualised spend profile (£k)	Prior years	Yr 0 (16/17)	Yr 1 (17/18)	Yr 2 (18/19)	Yr 3 (19/20)	Yr 4+	Total
<b>To SOC</b>							
Environment Agency Staff costs	61	51					112
Consultant fees	65	20					85
Sub-total	126	71					197
<b>SOC to FBC</b>							
Environment Agency Staff costs		20	130	130			280
Consultant fees		20	340	185			545
GI topo & Env. survey			300	36			336
Cost Consultant fees			20	20			40
ESE supplier fees			40	14			54
Estates & legal fees			60	45			105
Planning Permission			25				25
Risk contingency (30% to FBC costs)		12	275	129			416
Sub-total		52	1190	559			1801
<b>SOC FSoD approval (from SOC approval to FBC). This business case</b>							<b>1801</b>
<b>Construction and detailed design (from FBC onwards)</b>							
Construction Base Cost					3000	5000	8000
Environment Agency Staff costs					130	80	210
Detailed Design					250		250
Site Design / Supervision					120	100	220
GI/Survey							0
Estates & legal fees					40	40	80
Land/Compensation					150	50	200
Optimism Bias (30%)					1107	1581	2688
Sub-total					4797	6851	11648
<b>SOC FSoD approval (from FBC to construction)</b>							<b>11648</b>
<b>Future costs (revenue)</b>							
Environment Agency staff costs							
Revenue						3600	3600
Optimism Bias on Revenue costs (60%)						2160	2160
Sub-total						5760	5760
<b>Project Whole Life Costs</b>	<b>126</b>	<b>123</b>	<b>1190</b>	<b>559</b>	<b>4797</b>	<b>12611</b>	<b>19406</b>

## 6. The Management case

### 6.1. Project management

The project will be managed by the Environment Agency ncps project management service. The project will have a single project manager and project executive. The management structure for the project will consist of an Area Portfolio Board, Project Board and Project Team. The project will be managed in accordance with Projects in Successful Environments 2 (PRINCE2).

### 6.1.1 Project structure and governance

The governance structure for the project is shown in Figure 2:

#### Medway FSA: Project Structure and Governance

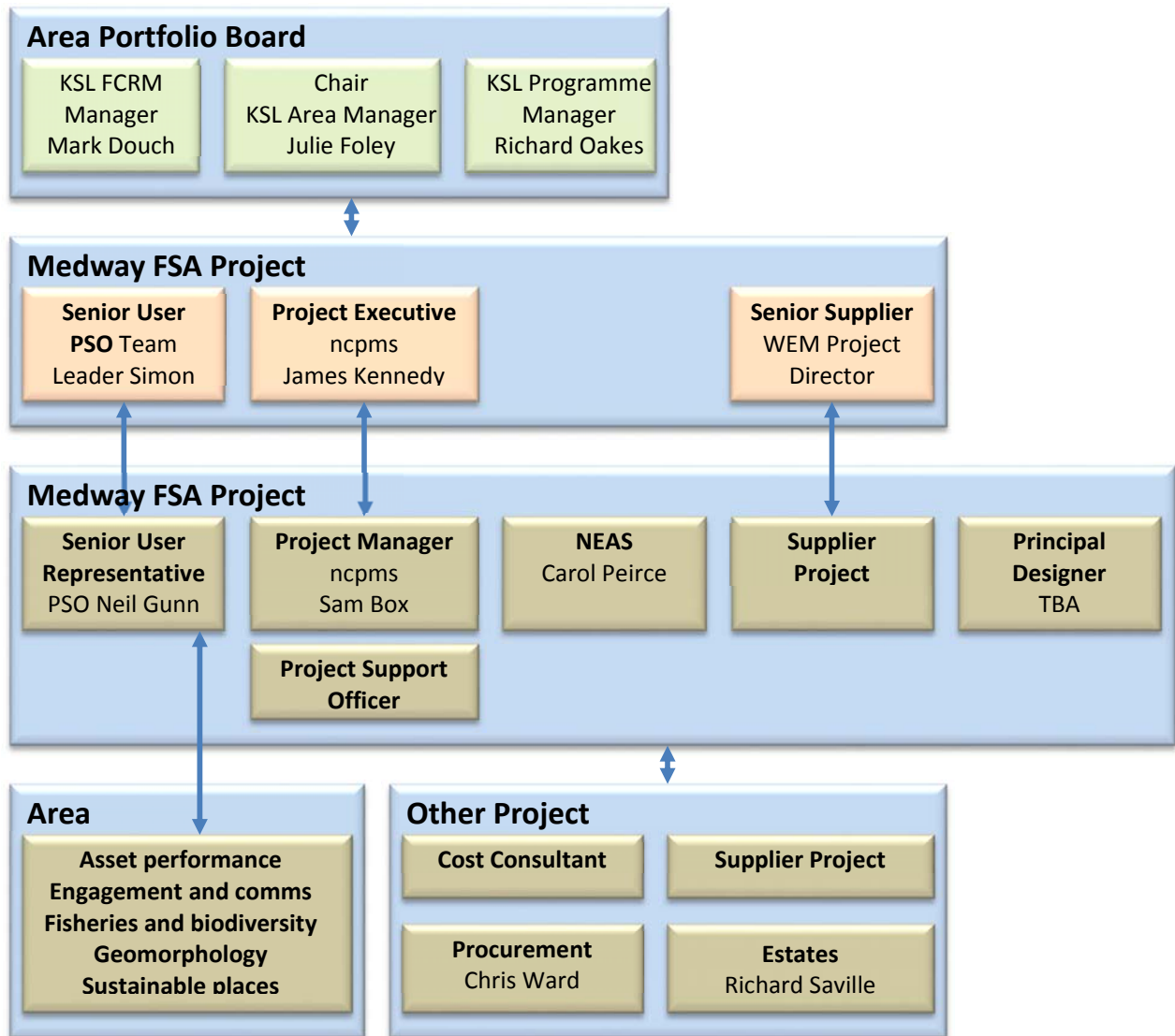


Figure 2: Project governance structure

## 6.1.2 Project roles and responsibilities

**Table 14: Project roles and responsibilities**

Role	Name	Role Description and Main Responsibilities
Project Sponsor	Area FCRM Manager	Ultimately accountable for the success of the project and benefits realisation: <ul style="list-style-type: none"> <li>• Strategic decisions and leadership</li> <li>• Delegation of delivery of business case to Project Executive, within defined approvals</li> </ul>
Programme Board	KSL Area Package Programme Board.	Drive the project forward and support delivery of outcomes: <ul style="list-style-type: none"> <li>• Resolve strategic and directional issues</li> <li>• Ensure project delivers within set parameters</li> <li>• Defining acceptable risk profile and threshold</li> </ul>
Project Board	Medway Project/Package Board	Accountable to Sponsor and Programme Board for delivery of outcomes: <ul style="list-style-type: none"> <li>• Delivery within tolerances set by Sponsor/Programme Board</li> <li>• Manage project issues and risk</li> <li>• Escalation route for project issues</li> <li>• Responsible for project and external communications</li> </ul>
Project Executive	ncpms PM1	Ultimately responsible for the project, supported by the Senior User and Senior Supplier: <ul style="list-style-type: none"> <li>• Responsible for project assurance</li> <li>• Responsible for project achieving its objectives, outcomes and value for money</li> <li>• Balances the demands of the business, customers, users and suppliers</li> </ul>
Project Manager	ncpms PM2	Authority to run the project on a day to day basis: <ul style="list-style-type: none"> <li>• Manage the project to agreed tolerances from Project Board</li> <li>• Delivers the project plan</li> <li>• Manages the agreed products to time, cost, quality</li> <li>• Monitor and report progress, managing change control</li> </ul>
Senior User	PSO Team Leader	The Senior User works closely with the Project Sponsor to represent the needs of the business: <ul style="list-style-type: none"> <li>• Provide the business quality expectations and define project acceptance criteria</li> <li>• Ensure the desired outcomes and benefits of the project are clearly articulated</li> <li>• Ensure the project produces products which deliver the desired outcomes and benefits and meet user requirements</li> </ul>
Project Team	Led by ncpms PM	The project team comprises the Project Manager, Principal Designer, Senior User/Representative, NEAS representative and external Supplier Project Manager: <ul style="list-style-type: none"> <li>• The Project team work with key Area staff and other project staff to deliver the work</li> </ul>

### 6.1.3 Project plan

An initial project plan with key milestones is provided in the following table. The project plan will be developed alongside the project programme as the project progressed to OBC and FBC. At OBC a fully developed programme will be appended to the submission for approval.

**Table 15: Project plan**

Milestone Description	Estimated Start date	Estimated End date	Asset to be created?	Staff Required (FTE)
SOC submission and approval	08/16	10/16	N	1
Appoint appraisal suppliers	10/16	02/17	N	1
Complete appraisal to OBC	02/17	03/18	N	3
OBC approval	03/18	06/18	N	1
Detailed design	06/18	02/19	N	3
FBC Approval	02/19	06/19	N	1
Construction	08/19	09/21	Y	3
Defect period	09/21	09/22	N	0.5
Project closure	09/23	03/24	N	0.25

## 6.2. Communications and Stakeholder engagement

Internal communications will focus on the following areas:

- Establishment of success criteria with Sponsor and Senior Users. Regular review of progress and performance against criteria;
- Co-location of Area, project management and supplier teams at least 1 day per week. This will facilitate regular communication and quicker decision making;
- Monthly highlight reports to be produced by the Project Team for Project Board Members;
- Exception reports to be produced as required;
- Project Board to meet at least quarterly or by exception as required.

External communications will be guided by a stakeholder engagement plan detailing the project stakeholders and the approach to consultation with each group of stakeholders. The Medway FSA project is being delivered in partnership by the Environment Agency, Kent County Council, Tonbridge and Malling Borough Council and Maidstone Borough Council. As a result, the stakeholder engagement plan and its products will be developed and agreed via a communications group made up of representatives of each of the partners. The Environment Agency's 'Working with Others' approach will be used to analyse stakeholders. The stakeholder engagement plan will be developed early on in the appraisal and will identify and prioritise key stakeholders and their interests. The plan will include assigned actions with timelines.

Engagement undertaken to date has included newsletters, briefings to partners, targeted letters to and informal meetings with key stakeholders. There are planned series of public meetings in October 2016 to communicate the findings of the Initial Assessment.

Given that the preferred option is to enlarge the Leigh FSA and the construction of an embankment in Hildenborough, the potential for real or perceived harm to landowners' interests arising from construction cannot be dismissed. The project team will have to release information in a controlled and sensitive manner. Owing to legal and commercial sensitivities, options will not be discussed outside of the project team until such time as they have been discussed with landowners and affected interest groups. The Senior User will ultimately be responsible for stakeholder engagement.

Key messages will be defined and agreed with the communications group and used consistently in all project communications. This consistency will apply to internal or external communication,

including press releases, letters to stakeholders, consultation documents, display panels, newsletters, interpretation boards and informal engagement with stakeholders.

Feedback from consultation with partners on the options has been positive with support for the preferred way forward.

### 6.3. Change management

The Project Board is ultimately accountable for project delivery as set out by the Area Portfolio Board (APB) and Project Sponsor. Any deviation from agreed tolerances will need to be raised and agreed by APB. Similarly the Project Board will set tolerances for the Project Team.

The project will directly change the regime of the reservoir and therefore impact on the operation and maintenance activities of the Asset Performance and Operational teams. The Senior User is responsible for representing the interests of these teams; however the Project Team will also need to work alongside the Medway FSA Panel Engineer. The Project Board of which the Senior User is a member will help steer the project to ensure that this change is implemented within the business and keep the project focussed on their requirements.

### 6.4. Benefits realisation

The key benefits to realise are:

- Reduce flood risk to residential properties, infrastructure and key assets in Tonbridge, and Hildenborough providing improved SoP that considers climate change;
- Defra project efficiency objectives to be met, using the Environment Agency efficiency guidance the SOC approval values will be used to benchmark project efficiency;
- Achieve significant whole life benefits in line with the IA economic analysis of £220million.

A Benefits Realisation Plan covering what benefits are to be measured will be developed in the next stage of the project. This will state who is accountable for the expected benefits, how and when achievement of expected benefits will be measured and what resources are needed to carry out the work. Consideration will also be given to whether dis-benefits should be measured and reviewed. Benefits will be calculated in accordance with the appraisal guidance.

The Project Manager will work closely with the Project Board to profile anticipated benefits and maintain the efficiency register.

### 6.5. Risk management

The tools used to manage risk will include governance procedures and a risk register. Governance shall follow the projects in controlled environments (PRINCE2) government recommended approach. Gateways and milestones are set with agreed tolerances within which the project team operate. Monthly highlight reports will be used to report on status.

The risk register will align risks with owners. The WEM Lot 3 supplier will produce an initial project risk register based on the outcome of a risk workshop. Once populated the WEM Lot 3 supplier will lead updates to the risk register throughout the appraisal process. The Project Executive will have control of risk distribution and will apportion it accordingly within the project tolerances set by the board. The process shall follow the requirements of the Employer's Operational instruction 152\_10 Manual of technical guidance for risk management in ncpms projects. The risk management process will have the following objectives:

- Identify and manage risks to the delivery of the appraisal package contract such that the outcomes are achieved as efficiently as possible;
- Identify and actively manage risk with the potential to seriously impact project delivery as early as possible such that abortive work is avoided;
- Identify and take steps to manage significant risks to the future implementation of the preferred way forward. This may include undertaking site investigations to gain an understanding of the risks, the mitigation required and the costs associated with different aspects;
- Calculate risk budgets using a Monte Carlo analysis, or appropriate risk analysis methods;
- Clearly document residual risks to support further business case submissions;

- Set a risk budget for approval that is realistic for the levels of project risk involved.

## 6.6. Contract management

Contract management will be the responsibility of the Project Manager. The project manager will liaise with the Procurement and Commercial teams on a regular basis to manage suppliers contracted on the WEM and NCMF2 frameworks over the life of the project.

The Project Manager will be named as *Employer* for the appraisal contract and will be responsible for managing it. They will be supported by the Environment Agency Commercial Lead and Project Executive.

The capital construction stage of the project will require an NEC Engineering Construction Contract (NEC-ECC). An ECC Project Manager will be responsible for managing the delivery contract. They will support the project during the preparation of the tender for the delivery stage. A detailed strategy for contract management will be set out in the procurement strategy when it is updated at OBC stage.

## 6.7. Assurance

In accordance with Environment Agency guidance on Assurance & Approval Stages for FCERM Capital on the 5 Case Business Model, the table below outlines the current arrangement for reviewing the project business case through peer reviews and assurance boards (LPRG) up to submission of the Outline Business Case.

**Table 16: Current arrangement for assurance review**

Review Stage	Assurance	Date
Strategic Outline Case (draft)	Project Board	August 2016
Strategic Outline Case	LPRG	October 2016
Review point – completion of intrusive surveys and associated consultations, modelling and draft economics	Project Board,	August 2017
Outline Business Case (draft)	Project Board	January 2018
Outline Business Case	LPRG	March 2018

## 6.8. Post project evaluation

Post project appraisal and evaluation will be carried out in accordance with Environment Agency best practice. Due to the complex nature of the actively managed Leigh Flood Storage Area a detailed post project evaluation plan will be developed as part of the OBC.

## 6.9. Contingency plans

Should it be found that the scheme is economically unviable, which is currently considered a low risk, or fails for some other significant reason, the Environment Agency shall need to revert to the current arrangements as detailed in Section 2.4.

The work completed to date and work proposed to OBC is of great value to all the project partners. The investment strategy in the study area is of great importance and the evidence gathered in this project critical to decision making. There is very little risk of completed work not being of use should the project not progress past the SOC or OBC stage. A sustain project is being completed during the appraisal phase of this project; the objective of the sustain project is to replace the critical failing elements of the Leigh FSA outflow structure. This will ensure that the approval and design process for this project will not be driven by the need to address imminently failing infrastructure.

This preferred option in this business case does not offer any improved flood risk management for the communities in and around Yalding and Collier Street. It is recognised that there will be considerable public and media interest in this outcome, particularly if flooding were to occur in the near future. It is the intention of the partner organisations in this project to work with the Environment Agency to explore other options to protect residential properties.

<p>I confirm that the documentation is ready for submission to LPRG.</p> <p>I, as Project Executive, have ensured that relevant parties have been consulted in the development of this project and the production of this submission in particular the Project Sponsor and Senior User.</p>	
<b>Name</b>	James Kennedy
<b>Job Title</b>	Project Executive
<b>Emailed approval</b>	<p><b>From:</b> Kennedy, James  <b>Sent:</b> 22 August 2016 14:32  <b>To:</b> Saunders, Anna E &lt;anna.saunders@environment-agency.gov.uk&gt;  <b>Cc:</b> Box, Sam &lt;Sam.Box@environment-agency.gov.uk&gt;; Gunn, Neil &lt;neil.gunn@environment-agency.gov.uk&gt;  <b>Subject:</b> Medway FSA SOC Submission.</p> <p>Anna,</p> <p>Please accept this email message as confirmation:</p> <p><i>I confirm that the documentation is ready for submission to LPRG.  I, as Project Executive, have ensured that relevant parties have been consulted in development of this project and the production of this submission in particular the Project Sponsor and Senior User.</i></p> <p>We will upload the Medway FSA SOC in word format along with the appendices in the Asite folder created for the submission.</p> <p>Regards</p> <p>James</p>
<b>Date</b>	22 <sup>nd</sup> August 2016

## Appendix A – GIS Overview Map: Medway Flood Storage Areas

File name: 'MFSA Appendix A GIS Overview Map.pdf'

## Appendix B – Medway Flood Storage Areas Initial Assessment (Environment Agency, April 2016)

File name: 'MFSA Appendix B Medway FSA Initial Assessment.pdf'

**Appendix C – Medway Flood Storage Areas Initial Assessment Technical Report  
(Environment Agency, April 2016)**

File name: 'MFSA Appendix C Medway FSA IA Technical Report.pdf'

**Appendix D – Hildenborough Flood Alleviation Scheme Option Appraisal Report  
(Environment Agency, August 2016)**

File name: 'MFSA Appendix D Hildenborough FAS Option Appraisal Report.pdf'

## Appendix E – Hildenborough Flood Alleviation Scheme EIA Filenote (Environment Agency, August 2016)

File name: 'MFSA Appendix E Hildenborough FAS EIA Filenote.pdf'

## Appendix F – Medway Flood Storage Areas Partnership Funding Calculator

File name: 'MFSA Appendix F Partnership Funding Calculator.pdf'

FCRM Partnership Funding Calculator for Flood and Coastal Erosion Risk Management Grant in Aid (FCRM GiA) (Version January 2014) for 'Leigh Barrier Improve' and 'Increased storage at Leigh FSA (NMOWL of 28.85m AOD), with Hildenborough embankment (higher cost)'.

## Appendix G – Medway Flood Storage Areas Procurement Strategy

File name: 'MFSA Appendix G River Medway FSA Project Procurement Strategy.pdf'

## Appendix H – Medway Flood Storage Areas SOC to OBC Cost Breakdown

File name: 'MFSA Appendix H SOC to OBC Cost Breakdown.pdf'

## Appendix I – Medway Flood Storage Areas OBC to FBC Cost Breakdown

File name: 'MFSA Appendix I OBC to FBC Cost Breakdown.pdf'

## Appendix J – Ministerial Briefing

File name: 'MFSA Appendix J Ministerial briefing - 3rd Nov 2016.pdf'

Medway and Yalding Ministerial Briefing as issued to Therese Coffey MP on the 3<sup>rd</sup> November 2016.

# Briefing



## Medway Flood Storage Areas Project

### Background

The Environment Agency have been working in partnership with local councils to find the most effective way to reduce flood risk for communities along the Rivers Medway, Beult and Teise. The catchment of the River Medway has over 3,000 properties at risk of flooding. 1,500 homes are at risk in Tonbridge and Hildenborough, 500 in East Peckham and 1,000 in Yalding and Collier Street. Flooding is a frequent occurrence and an event giving flood depths of over a metre occurs in Yalding roughly every 10 years.



*Map of the catchment*

The Leigh Flood Storage Area is situated upstream of Tonbridge and was constructed in 1982. It currently protects 1,200 homes and businesses and provides a 1 in 75 year standard of protection to 400 of these properties (see table below). Many elements of the structure are approaching the end of their life, as a result the structure requires substantial refurbishment.

The communities of Yalding and Collier Street sit at the confluence of the Rivers Beult, Teise and Medway this makes managing flood risk here particularly challenging. The communities have the potential to flood from any or all of these rivers. Although the Leigh Flood Storage Area does help to reduce downstream water levels on the River Medway, as it is 14km upstream it only offers a marginal benefit to these communities. Yalding and Collier Street do not benefit from any other defences.

During the Christmas 2013 flood event, 965 homes were flooded across the Medway catchment. In response to this Kent County Council (KCC) offered to contribute £17 million towards a suite of potential schemes that were estimated at the time to cost a total of £34 million. The leader of KCC, Cllr Paul Carter, committed publicly to "finding the funding to make it happen". Up to this point there were no fully funded projects for these communities.

In May 2016 KCC confirmed they would need to reduce their funding contribution from £17 million to £4 million due to local government funding constraints.

### Initial Assessment

In 2014, soon after the Christmas flooding, the Environment Agency carried out a high level assessment of the cost benefit of various options to protect communities in the Medway. A cost benefit of 1.76 was identified for improving the Leigh Flood Storage Area and constructing storage on the Beult. This was only a provisional assessment and we recognised at the time that we needed to do more detailed work to determine the viability of different flood storage area options.

In April 2014 a partnership between the Environment Agency, KCC, Tonbridge and Malling Borough Council (TMBC) and Maidstone Borough Council (MBC) was formed. Between them, the partners committed £1.05 million to fund the development of a business case for schemes to reduce the risk of flooding in Tonbridge, Yalding and surrounding communities.

This included carrying out more detailed modelling of the Medway catchment to enable us to better refine the costs and benefits of different options. The results of this assessment are summarised in the table below:

	Benefit cost ratio	No. of homes protected 1 in 75 Compared with Do Nothing baseline	No of homes protected 1 in 75 Additional to 'Maintain Leigh FSA'	Present value cost of scheme 40 year life (million)	Partnership funding score	Contributions required (million)
Maintain Leigh Flood Storage Area	12.3	400	N/A	£10.0	94%	£0.6
Enlarge Leigh Flood Storage Area	11.3	613	213	£13.8	79%	£2.9
Enlarge Leigh Flood Storage Area with Hildenborough embankment	9.8	675	275	£17.1	66%	£5.8
Beult Flood Storage Area	0.8	32	32	£9.1	6%	£8.5
Teise Flood Storage Areas	1.7	96	96	£7.5	11%	£6.7

The best option for improving flood protection to homes and businesses in Tonbridge and Hildenborough is to enlarge the capacity of the existing Leigh Flood Storage Area and to build an embankment protecting Hildenborough. Together these will provide additional storage capacity which will benefit 1,475 properties at a cost of £17.1 million. Of these, 675 homes will receive a 1 in 75 year standard of protection (see table above). This scheme qualifies for approximately £11 million of Flood Defence Grant in Aid (66% of the funding) with the remaining funding coming from KCC, TMBC and the South East Local Enterprise Partnership.

The Environment Agency investigated constructing flood storage areas on the Rivers Beult and Teise but found there isn't enough space in the catchment to hold sufficient amounts of floodwater to make a meaningful difference to flood levels in Yalding and the surrounding communities. If all of the reservoirs were constructed, flood depths in Yalding would still be 800mm in an event similar to Christmas 2013 and the majority of properties in Yalding would still flood.

Environment Agency analysis shows that the River Teise and River Beult Flood Storage Areas would reduce the risk of flooding to only 128 properties out of 1,000 properties around Yalding and Collier Street, at an estimated cost of £16.6 million. The majority of the funding for this would need to come from partnership funding contributions (see table above). KCC have made clear that they do not have this funding.

#### **Future works**

The Environment Agency and KCC consider that more properties around Yalding and Collier Street will benefit from localised flood defences and property and community level resilience measures. The Environment Agency will lead work to make properties more resilient to flooding and coordinate projects delivered by partners to make communities and infrastructure more resilient. Early estimates suggest approximately 350 houses could benefit from Property Level Resilience. Current funding rules allow for £5,000 per property giving an overall Flood Defence Grant in Aid contribution of approximately £1.75 million. We expect that KCC will also financially contribute to Property Level Resilience measures for householders. The Environment Agency anticipate starting the detailed surveys for this option in early 2017.

The Environment Agency have a dedicated project manager in place to progress the Property Level Resilience project in consultation with the parish councils of Yalding and Collier Street. The Environment Agency have also funded some time for the National Flood Forum to provide advice to members of the parish councils.

In addition to the above Property level resilience scheme the Environment Agency, KCC and TMBC are progressing the business case for enlarging the Leigh Flood Storage Area and the Hildenborough embankment. Together these will provide additional storage capacity which will benefit 1,475 properties at a cost of £17.1 million. Of these, 675 homes will receive a 1 in 75 year standard of protection. The Environment Agency programme currently indicates construction starting in 2020 with completion in 2022. We are identifying efficiencies and aim to bring this forward as far as possible.

During October 2016, the Environment Agency held public drop in events in the Medway communities to explain our flood risk modelling and proposed options. The Environment Agency Area Manager has also recently met the local MPs, Helen Grant MP and Tom Tugendhat MP, to brief them on our future works.

The Environment Agency are also scoping how we can work with partners to develop a Medway Flood Action Plan modelled on the integrated catchment planning approach of the Cumbria Flood Action Plan. We will be consulting with local partners and elected members on this before Christmas 2016.

**3rd November 2016**  
**Kent, South London and East Sussex Area**