

# 1. Executive summary

## 1.1. Introduction

Oxford has developed around the River Thames and sits at the confluence of 7 rivers draining a predominately rural catchment area of approximately 3000km<sup>2</sup>. The River Thames is generally slow to respond to rainfall and floods are long in duration. The floodplain narrows significantly immediately downstream of Oxford which increases flood levels through the city which has been exacerbated by historical development. The channels and structures that cross the river do not have sufficient capacity to allow the flood water to flow through, even for smaller, more frequent, floods.

The River Thames and its tributaries at Oxford have a large developed floodplain without flood defences. If nothing was done to manage flood risk, approximately 2,500 properties would be at risk in a flood that has a 1 in 100 (1%) annual risk of occurring. The Environment Agency's existing flood risk management activities reduces this but around 1,500 properties still remain at risk. This proposal will reduce the likelihood of flooding for all of these properties, with over 1,200 benefiting from a standard of protection greater than a 1 in 100 (1%) annual risk of flooding on opening. If we don't take action the impacts of climate change means that 3,431 properties will be at flood risk in 50 years' time in the same event.

Critical infrastructure is at risk and traffic disruption is a significant problem during floods, particularly along main arterial routes into the city centre – principally Botley Road and Abingdon Road and the railway line, which forms a key part of the strategic freight network. Once the roads close, traffic quickly builds up back to the A34, which stops traffic movement around the city. The impact on transport links and property, combined with the long duration of flooding brings Oxford to a standstill. In addition to the direct damages it also has the result of reducing investment, limiting growth opportunities and therefore has a much wider impact on the city of Oxford than just the floodplain.

Following successive floods a local partnership was formed to initiate a project to protect Oxford from the most frequent floods and to ensure it continues to thrive. It set challenging objectives to reduce flood risk to homes and businesses, to keep transport links open, to safeguard Oxford's reputation as being open for business and to enhance environmental and recreational opportunities.

This Outline Business Case has developed the shortlisted options from the Strategic Outline Case, which focus on improving the flow capacity of the floodplain. This is in line with the strategic approach for this area. It identifies **option 5b** – a medium sized channel and associated defences – as the **preferred economic choice**, delivering a **net present value of £1 billion** and a **benefit:cost ratio of 10:1**.

The scheme, including development costs is forecast to **cost £121.11 million**. This total includes £116.36 million of design and construction costs and £4.75 million as a commuted sum for the first 10 years of maintenance. Risk has been allowed for in the estimates and is 32.2% of the remaining design and construction cost. Significant partnership funding of £51.05 has been secured, with £4.35 million in the final stages of agreement. When the present value is entered into the partnership funding calculator the project achieves an **adjusted partnership funding score of 100%**.

The delivery approach for the main construction contract will be via the Water and Environmental Management Framework. This framework has been developed specifically to deliver best value flood and coastal risk management projects. Construction duration is estimated to be 3 years and will deliver an operational scheme by August 2021.

This Outline Business Case seeks approval to develop the Full Business Case. The Full Business Case will procure the value for money solution, set out the contract for the deal and set out the detailed management arrangements for the delivery and operation and maintenance phases. This will be the final control point before entering into a delivery contract. This will bring the total development cost of the project to £11.9 million and includes £2.3 million risk contingency.

## **1.2. Strategic case**

### **1.2.1. Strategic context**

The Government enacted the Flood and Water Management Act in 2010, partly in response to the impacts of the severe flooding in July 2007 when hundreds of thousands of people were affected and billions of pounds of damage were caused. The act created new roles for Regional Flood and Coastal Committees and Lead Local Flood Authorities, as well as additional duties for the Environment Agency. Oxfordshire County Council fulfils the role of Lead Local Flood Authority for Oxford. The Oxford Flood Alleviation Scheme Sponsoring Group was set up in response to repeated flooding.

Defra has specific policies on reducing the threats of flooding and adapting to climate change. How schemes contribute towards delivering these policies is measured using a series of Outcome Measures. Outcomes monitored include economic benefits delivered, properties moved into a lower flood risk category and water framework habitat improved.

The Environment Agency and its partners have duties under the European Union's Water Framework Directive, 2000. This ensures that a sustainable approach is taken to water resources and aquatic ecosystems when managing flood risk, and wider environmental and social benefits are delivered to local communities.

The Thames Catchment Flood Management Plan provides the high level strategic context in which to promote the partnership scheme. The Thames Catchment Flood Management Plan states that "the actions recommended in the Oxford Flood Risk Management Strategy should be delivered". Oxfordshire County Council has produced a Local Flood Risk Management Strategy. This supports the Oxford Flood Alleviation Scheme proposals.

The Oxford Flood Risk Management Strategy was approved in September 2010, following a public consultation, and describes the Environment Agency's preferred approach to managing flood risk in Oxford over 100 years. This is a strategic plan for phased work to reduce flood risk and respond to the potential impacts of climate change.

The Environment Agency has completed the first phase of this strategy with local improvements. £2.5 million has been invested increasing into the capacity of channels and structures and providing temporary defences. This work helped to reduce flooding in the most recent floods.

The second phase describes increasing the flow capacity of the channels in the floodplain. The final phase is upstream flood storage, taking into account the reduced effectiveness of the new channel caused by the effects of climate change.

The 2 later phases were not economically preferable when the strategy was developed. A 5 year review of the options and updating the modelling has changed this thinking. New modelling supports the observation that floods are becoming more frequent. The latest guidance on climate change has also been incorporated. The Strategic Outline Case demonstrated that phase 2 of the Oxford Flood Risk Management Strategy can now be promoted. This Outline Business Case identifies the preferred option for improved flow capacity.

### **1.2.2. The case for change**

Oxford has experienced repeated flooding in recent years. Properties were flooded in 7 of the years between 2000 and 2014.

Flooding causes property damage to homes and businesses, damages critical infrastructure and mains sewers and cuts off road and rail links. Flooding in Oxford is long lasting, typically 7 to 9 days. This duration of flooding to key roads brings Oxford to a standstill, devastates Oxford's residents and businesses and reduces investor confidence, limiting Oxford's future growth opportunities. Flooding has a much wider impact on Oxford than just the area in the floodplain.

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The cumulative impacts of significant flooding in the winter of 2012, followed immediately by serious flooding in winter 2013/14, demonstrated that the problem was getting worse and would continue to harm the delivery of partners strategies. This resulted in Oxfordshire County Council, Oxford City Council, Vale of White Horse District Council, Oxfordshire Local Enterprise Partnership, Thames Water, the University of Oxford, the Oxford Flood Alliance, the Thames Regional Flood and Coastal Committee and the Environment Agency joining together to drive the scheme forwards. This culminated in the formation of a formal partnership Sponsoring Group and a commitment from all to deliver the Phase 2 recommendation from the Oxford Flood Risk Management Strategy.

The Government has set a target to reduce flood risk to 300,000 homes as part of the 6 year capital investment programme, a clear objective to demonstrate stronger partnership working. It has a target to bring in £600m in partnership funding across the wider programme.

The support by local partners to address the long term flood risk in Oxford provides an opportunity to deliver the Oxford Flood Risk Management Strategy.

## 1.2.3 Objectives

The high level partnership objectives and sub-objectives for the project are to:

1. Reduce flood damages to at least 1,000 homes and businesses currently at risk in Oxford.
  - By July 2022, move at least 1000 homes to a lower National Flood Risk Assessment (NaFRA) risk category. Noting all properties will see a reduced likelihood of flooding.
  - By July 2022, reduce the number of commercial properties that suffer damages in a 1 in 100 (1%) annual risk flood outline by at least 100.
  - By July 2022, ensure that temporary defence deployment plans are in place, where suitable, for areas of residual risk after the scheme is completed.
2. Reduce flood impacts on transport infrastructure and utilities in Oxford, particularly to the Botley and Abingdon Road, the railway line and the sewerage service.
  - By July 2022, the Botley Road, Abingdon Road, sewerage service and railway line will not be at risk from a river flood up to the size of that seen in 2007.
3. Safeguard Oxford's reputation as a thriving centre of commerce that is open for business.
  - By July 2022, reduce the risk of flooding to at least 40 utility infrastructure assets at risk of flooding.
  - By July 2022, improve the potential for growth by reducing the flood risk to 5 hectares of industrial land with redevelopment potential.
4. Create and maintain new recreational amenities, wildlife habitat and naturalised watercourses accessible from the centre of Oxford.
  - By July 2027, create a net increase of at least 5ha of water-dependant habitat that meets the objectives of the Water Framework Directive.
  - By July 2022, create at least 2km of naturalised watercourses.
  - By July 2022, improve at least 2km of accessible paths within the scheme area.

A more detailed set of critical success factors, defining how the objectives need to be achieved, are explained within the main economic case. It is a requirement of all options to be complementary to any future investments to mitigate climate change impacts.

## *Constraints and dependencies*

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The Oxford Flood Alleviation Scheme is not dependent on the delivery of other works in the 6 year capital investment programme. The following constraints have been identified in the development of the preferred option.

CPO requirements	To initiate the Compulsory Purchase Order (CPO) in line with the project programme, full funding needs to be secured by August 2017.
Consents and authorisations	The central portion of the floodplain near Redbridge is very constrained with complex road and rail infrastructure, Redbridge Recycling Centre, Redbridge Park and Ride and high voltage overhead and underground cables. Consents will be required from Network Rail, the relevant local authorities and utility operators before work can be done on, or adjacent to, their assets.
Funding time constraint	The Oxfordshire Local Enterprise Partnership funding has to be spent by March 2020.
Materials management constraint	Any option that involves significant earthworks is best undertaken between 1 April – 31 October, constraining the construction programme

Table 1-1: Main constraints

### Strategic risks

We have produced a detailed risk register and it has been quantified in monetary terms. This is explained in detail in the management case. As well as the quantified risks there are 3 key strategic risks.

Risk	Mitigation	Owner
<b>Full funding not secured by critical project dates.</b> Certainty of funding is required in order to serve the CPO notices in August 2017.	Funding strategy developed and approved by the Sponsoring Group which includes a funding contingency plan.	Funding and Benefits Realisation Manager
<b>Downstream flood risk.</b> There is a perception in the wider public that flood schemes pass the problem onto other communities. This creates a risk around public acceptance of any proposal.	Hydraulic model has been independently reviewed by Capita with a further academic review undertaken by Vale of White Horse District Council's consultants. There is no increase in risk. Detailed pro-active communications plan being delivered.	Strategic Engagement Manager
<b>Planning or CPO inquiry required.</b> If the planning application gets called in or lands cannot be negotiated in time a planning or CPO inquiry could result in a 12 month delay.	Planning officers group established and agreement to follow a single determination agreed. Detailed lands discussions via land agent. Detailed engagement plans being delivered.	Project Executive
<b>Programme delays lead to preferred commercial model not being available.</b> If the programme up to contract award is delayed by more than 10 months the preferred framework will no longer be available.	Peer review of programme has been completed to give confidence in its durations and interdependencies. Plan to use the next generation supplier arrangements if WEM unavailable.	Project Executive

Table 1-2: Strategic risks

## 1.3. Economic case

### 1.3.1. Options considered

The Oxford Flood Risk Management Strategy considered more than 100 options that were developed into the approved strategic approach to flood risk management. This took an adaptive approach to climate change over 3 phases. This allows for flexibility in future investments as interventions can be adjusted in scale and timing depending on the actual climate impacts observed over time.

The project will deliver Phase 2 of the strategy. It considered 14 options for improved flow capacity of the watercourses in Oxford as part of the Strategic Outline Business Case. The Strategic Outline Case refined these to a shortlist of technically viable options. It concluded that a medium sized flood channel in the western floodplain was the preferred way forward.

The Outline Business Case has reviewed and refreshed this short list to include combinations of shortlisted options and varying timescales of implementation. These have undergone a detailed economic appraisal to select the preferred option.

Option Number	Option Name	Description
1	Do Nothing	All existing work ceases. No operation or maintenance of assets or watercourses would take place. Blockages would not be removed.
2a	Do Minimum	Existing assets and watercourse would be maintained but not replaced. The standard of service will decrease over the appraisal period.
2b	Do Minimum (Sustain)	Existing assets and watercourses would be maintained and replaced. The standard of service will be maintained over the appraisal period.
3	Raised Defences	Localised raised defences and level for level compensatory storage.
4a	Small Channel	Excavation in the undeveloped floodplain to the west of the city centre to provide increased flood flow capacity of 18 cubic metres per second.
4b	Medium Channel	Excavation in the undeveloped floodplain to the west of the city centre to provide increased flood flow capacity of 38 cubic metres per second.
5a	Small Channel + Defences	Small channel with the addition of raised defences to provide increased protection to properties and the Abingdon Road.
5b	Medium Channel + Defences	Medium channel with the addition of raised defences to provide increased protection to properties and the Abingdon Road.
6a(i)	Small Channel + Defences + Flood Storage (in year 0)	Small channel plus defences with the implementation of a 9.8m <sup>3</sup> upstream flood storage area at the same time as the flood channel and defences.
6a(ii)	Small Channel + Defences + Flood Storage (in year 20)	Small channel plus defences with the implementation of a 9.8m <sup>3</sup> upstream flood storage area 20 years after the flood channel and defences.
6a(iii)	Small Channel + Defences + Flood Storage (in year 50)	Small channel plus defences with the implementation of a 9.8m <sup>3</sup> upstream flood storage area 50 years after as the flood channel and defences.
6b(i)	Medium Channel + Defences + Flood Storage (in year 0)	Medium channel plus defences with the implementation of a 9.8m <sup>3</sup> upstream flood storage area at the same time as the flood channel and defences.
6b(ii)	Medium Channel + Defences + Flood Storage (in year 20)	Medium channel plus defences with the implementation of a 9.8m <sup>3</sup> upstream flood storage area 20 years after the flood channel and defences.
6b(iii)	Medium Channel + Defences + Flood Storage (in year 50)	Medium channel plus defences with the implementation of a 9.8m <sup>3</sup> upstream flood storage area 50 years after the flood channel and defences.

Table 1-3: Summary of options

**1.3.2. Key findings**

Option 5b “Medium Channel + Defences” is the preferred and most economic advantageous option based on having the highest Net Present Value, i.e. the option that delivers the greatest economic return in monetary terms. The economic decision tree, via incremental cost benefit ratios, also supports the selection of this option. The decision tree is explained in full in the main economic case.

Option Number	1	2a	2b	3	4a	4b	5a	5b	6a(i)	6a(ii)	6a(iii)	6b(i)	6b(ii)	6b(iii)
PV Costs	0.0	11.2	14.9	64.1	94.7	107.8	98.5	111.2	175.8	138.7	113.7	188.6	151.5	126.4
PV Benefits	0.0	915.6	931.5	1,001.7	1,041.1	1,084.8	1,077.4	1,112.4	1,117.6	1,105.7	1,091.3	1,135.3	1,128.7	1,120.9
Residual damages	1,221.8	306.2	290.3	220.1	180.7	137.0	144.4	109.4	104.1	116.1	130.5	86.4	93.0	100.9
Net Present Value	n/a	904	917	938	946	977	979	1,001	942	967	978	947	977	994
BCR	n/a	81.8	62.6	15.6	11.0	10.1	10.9	10.0	6.4	8.0	9.6	6.0	7.5	8.9

Table 1-4: Economic appraisal summary (all costs and benefits in £ millions)

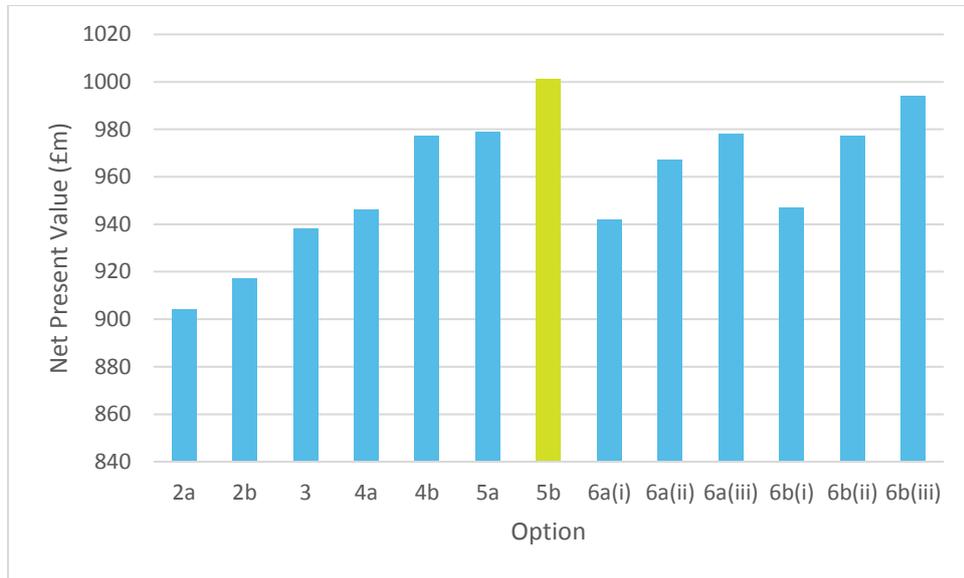


Figure 1-1: Net present value identifying the preferred option

A detailed multi-criteria analysis, informed by extensive public consultation and stakeholder engagement, developed the options and ensures the preferred option presents the best balance of technical, environmental and social needs.

A Preliminary Environmental Information Report and Water Framework Directive assessment is informing the detailed design of the preferred option. The results demonstrate that there are no major environmental issues and the scheme will deliver an overall net increase in wildlife habitat. The main environmental enhancements will be wetland scrapes, backwaters and small ponds. We will create gravel riffles to improve fish breeding habitats. Overall these enhancements will improve the range of habitats available whilst being in-keeping with the wider landscape scene.

**1.3.3. Preferred Option**

The preferred option identified through the economic appraisal in this Outline Business Case is **Option 5b “medium channel and defences”**. The summary economic information for this option is:

Present Value Costs (PVC)	£111.2 million
Present Value Benefits (PVB)	£1,112.4 million
Net Present Value (NPV)	£1,001.2 million
Benefit Cost Ratio (BCR)	10.0

Table 1-5: Preferred option economics

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Sensitivity tests were applied in a series of cost increase and/or benefit decrease scenarios. Option 5b remains the preferred option in all tests.

The preferred option will provide a reduction in flood risk to all properties at risk in Oxford with 1,157 residential properties moving to a lower flood risk band immediately after implementation. The impacts of climate change are expected to reduce this benefit over time. However, the increase in flood risk without the scheme would be even more significant. Without the scheme the number of properties at flood risk would rise to 3,431.

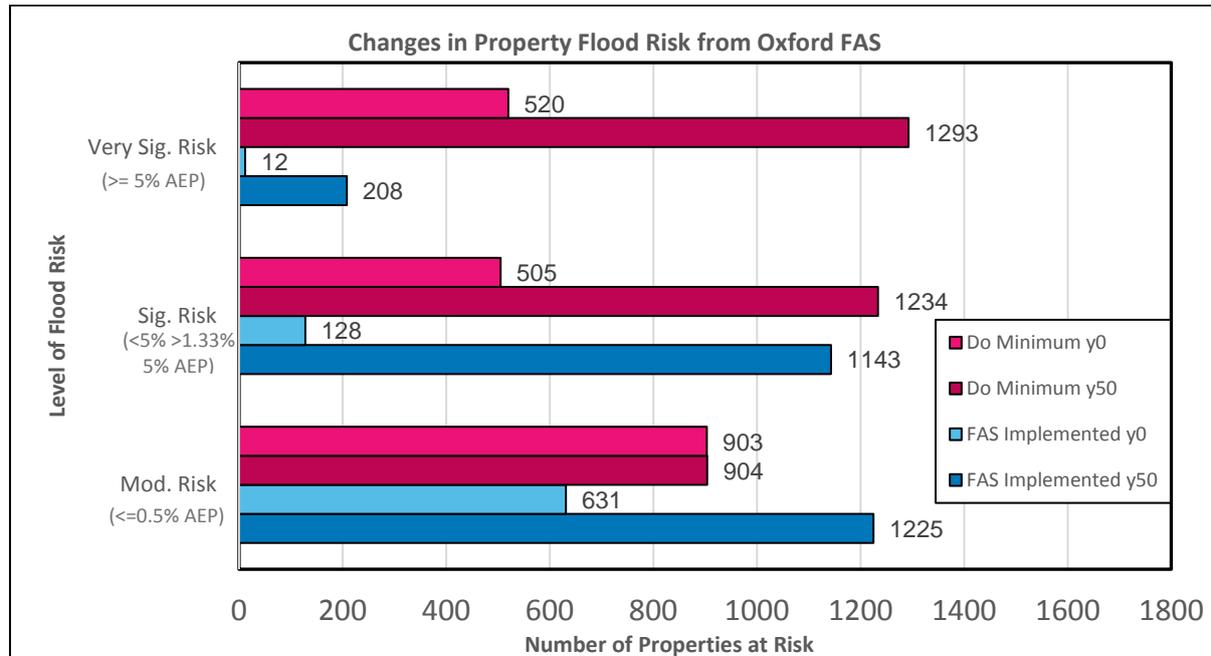


Figure 1-2: Flood risk reduction to residential property over time

The findings are consistent with the Oxford Flood Risk Management Strategy's adaptive approach to climate change. Following the implementation of Option 5b "medium channel and defences" as Phase 2 of the Oxford Flood Risk Management Strategy, a future investment decision will be needed on the delivery of Phase 3 of the strategy. Delivery of upstream flood storage is not forecast before 2070, but will be reviewed at 5 yearly periods.

The project is eligible for £62 million of present value Flood and Coastal Risk Management Grant Aid funding. It has a raw partnership funding score of 54% and requires £53.4 million in present value contributions to be fully funded. This raw economic output is then turn into real cash values for the financial case.

The "medium channel and defences" option has strong public and partner support and will deliver the requirements of the main objectives and sub-objectives, set by the Sponsoring Group. This is a robust economic choice, which is recommended to be progressed to the Full Business Case.

## 1.4. Commercial case

### 1.4.1. Procurement strategy

The scheme includes the design and construction of a 5km, 2-stage flood channel, incorporating 6 bridges and 3 major culverts. Major earthworks including excavation, transportation and disposal of 400,000m<sup>3</sup> of topsoil, alluvium and gravels are required. The earthworks and culvert works represent more than half the overall construction cost.

#### Delivery model

The Oxford Flood Alleviation Scheme benefitted from an Infrastructure and Projects Authority (IPA) Routemap workshop in early 2016 and follow up discussions on the commercial approach with the IPA. The approach to the commercial case and procurement strategy builds on the recommendations identified in this review. In-depth market analysis and engagement has been completed in response to this, together with the development of efficient materials management strategy. The need for targeted market sounding was identified early in the IPA review and has brought significant value to the commercial approach. We have consulted suppliers in detail and they have confirmed their ability and capacity to deliver the project. We have shared our thinking about the commercial model and sought detailed feedback to help shape our approach.

The Environment Agency has an existing accessible framework which has been selected through the Official Journal of the European Union (OJEU) process. This is specifically for work within the 6 year capital investment programme, that the Oxford Flood Alleviation Scheme is a part of. It has been hugely successful in delivering best value for the organisation. The organisation has also developed alternative approaches such as the model for long term asset refurbishment through TEAM2100. The project team have considered a wide range of delivery models within the procurement strategy to ensure that best value is being achieved:

- a bespoke Official Journal of the European Union (OJEU) procurement
- use of the Scape framework
- use of the Water Environment Management framework
- use of a Public Private Partnership arrangement (Design, Build, Fund, Operate / Maintain)

All of the options have their own advantages and disadvantages and the procurement strategy concludes that the Water Environment Management Framework (WEM) offers the best commercial approach for delivering the Oxford Flood Alleviation Scheme. The principle benefits are:

- low procurement costs
- the ability for early benchmarking
- use of the project cost tool
- a short duration tender process
- strong existing relationships that can help us secure the best team
- a well-established culture and ways of working
- A strong focus on driving performance

The end date of the WEM contract has been identified as a strategic risk and mitigation measures are explained in the strategic case summary. The procurement strategy has been peer reviewed and endorsed by Clare Marsden, Head of Defra Group Commercial.

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## *Future maintenance*

Annual maintenance cost estimates for the wider Oxford flood risk management system, after the scheme is in place, total £270,000 per year. The design of the Oxford Flood Alleviation Scheme relies on passive operation to ensure limited intervention is required in times of flood, minimising operational costs. The majority of the annual expenditure will be on vegetation management within the channels.

The maintenance is relatively low risk and low value from a commercial perspective. In the Outline Business Case maintenance has been assessed as being the responsibility of the Environment Agency. However, scope for additional cost savings and securing long term local support for the scheme by adopting a partnership approach for this will be explored. This will not impact the overall commercial approach and will be finalised between Outline Business Case and the Full Business Case. It could, for example, take the form of a maintenance trust.

## **1.4.2. Key contractual terms and risk allocation**

### *Key contractual terms*

Contractual terms will be the Type C Target Cost model from the New Engineering Contract suite of contracts, as modified under the Water Environment Management Framework Deed of Agreement. We have taken a proportionate approach to project specific risk and we have held risks that are of low probability but high consequence. In key areas we have taken more risk on the basis of obtaining a greater return from the suppliers.

- Public Inquiry to planning or Compulsory Purchase Order is held as an Environment Agency risk and the pricing of this risk by suppliers will be disproportionate to the probability of occurrence.
- Appropriate allocation of flood risk and inclement weather, e.g. earthworks summer flood risk will remain with the Environment Agency to maximise productivity, whilst the risk for dealing with groundwater will remain with the contractors as they are best placed to manage this risk through construction methodology.
- A design and build contract model for the construction of the A423 culverts was selected to drive efficiency, this will require contract drafting to deliver the best result. This will award the design element in line with existing approvals with the construction element award tied into Full Business Case approval.

### *Risk allocation*

The key risks that we have identified and addressed as part of the market sounding approach are:

<b>Risk</b>	<b>Summary</b>	<b>Owner</b>
Planning / Compulsory Purchase Order	Obtaining planning permission and land via Compulsory Purchase Order is complex. We are managing the risk by gaining agreement for a single determination from the 3 Local Planning Authorities and running a Compulsory Purchase Order in parallel with our land negotiations. The risk of delays caused by these is held by the Environment Agency as market sounding established the price for them to take it on would be disproportionate to the likelihood of being realised.	Environment Agency
Earthworks	The earthworks are a significant element of the overall construction cost. The methodology for excavation, transport and removal is key to efficient delivery. However, delivery of earthworks operations are susceptible to ground conditions and the weather. The risks have been allocated as: Weather risk – shared as per the New Engineering Contract, Engineering and Construction Contract Winter flood risk – Contractor	Shared

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	Summer flood risk – Environment Agency Groundwater impacts on construction - Contractor	
Major structures	2 culverts are needed under the A423 Southern Bypass. Having undertaken detailed market sounding these will be completed by a separate design and build contract. Risk for these will sit with the contractor.	Contractor
Contaminated land	There are known contaminated land areas at Redbridge landfill site. The design risk for containment and disposal of hazardous waste will be managed by the consultant.	Consultant
Archaeology/ heritage	Discussions have been held with Historic England, Oxfordshire County Council Archaeologist and the Oxford City Council Archaeologist. Requirements have been incorporated into the archaeological investigations work. The risk of impacts from unforeseen archaeological finds remains with the Environment Agency.	Environment Agency
Unidentified Services	There are several known services running across the site that have been positively identified and where necessary, diversion has been proposed in the design. Impacts to design/construction programme from any unidentified services will remain with the Environment Agency.	Environment Agency

Table 1-6: Contractual risk allocations

### *Timescales*

The procurement timetable for the Oxford Flood Alleviation Scheme is:

<b>Activity</b>	<b>Date</b>
Completion of works information and tender documents	December 2017
Tender issue and evaluation	January 2018 – April 2018
Award recommendation and approvals (including instruct A423 culvert contractor led design element)	April 2018
Full Business Case approval & contract award	September 2018

Table 1-7: Procurement timetable

### **1.4.3. Efficiencies and commercial arrangements**

#### *Commercial arrangements*

Managing risk at this early stage ensures we can reduce risk contingency and drive competitive supplier pricing by agreeing a fair and proportionate risk share. This approach is the most appropriate way to drive efficiency and is supported by the supply chain.

Within our commercial approach we will take measured risks to deliver benefits. Key decisions made to drive efficiency are:

- selection of the Water Environment Management framework to reduce tender timescale and costs, compared to other procurement options.
- gaining agreement to award the detail design contract in parallel with the Outline Business Case, reducing overall programme duration.
- targeted, informed market sounding on ‘strategic critical’ sub-contract areas that represent greatest cost and complexity to the Environment Agency.
- separate design and construction contracts for the wider scheme, modified to incorporate design and build for the A423 Southern Bypass culverts.
- designed ground investigation scope with the input from tier 1 and tier 2 suppliers to provide the information for detailed risk mitigation.

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- taking on low probability, high consequence risks to allow greater innovation and investment in productivity from the supply chain.

### Efficiencies

In addition to the commercial approaches listed above there are 3 areas that our risk based approach to project delivery has achieved significant efficiencies. These are summarised as:

Item	Description	Saving
Network Rail culverts	In the Strategic Outline Case we identified the need to improve flow capacity under the railway line. Network Rail had already scheduled a closure of the railway line as part of their electrification upgrades in 2016. We secured additional approval for a 'spend now, save later' opportunity and Network Rail installed these as part of their contract and line closure. This cost the partnership £1 million and would have cost £4 million if done separately, resulting in a £3 million efficiency.	£3 million
Critical review of preferred option	During the development of the outline design, using new survey and model information, we identified that a raised defence (embankment) in the Abingdon Road area could provide greater benefits than the channel section at Sandford proposed in the Strategic Outline Case. By switching design approach we have reduced the amount of material that needs to be removed as well as enabling other earthworks material to be reused on site in the embankment.	£8.1 million
Materials management	At the Strategic Outline Case stage all excavated materials generated on site were to be taken to landfill. We have carried out detailed site investigation and developed a materials management plan that means most material will go to restoration sites, only the contaminated material will go to landfill. This reduces the potential landfill tax costs to the scheme.	£2.2 million

Table 1-8: Significant efficiencies secured

As well as these large efficiencies, smaller efficiencies have been captured, including those made by working collaboratively in partnership. The project team will continue their approach to realising innovative and creative opportunities to make further savings.

## 1.5. Financial case

### 1.5.1. Summary of financial appraisal

The base cost profile used as the basis for this financial case is the same as in the Economic case for design, construction and maintenance post scheme completion. However, the financial case excludes the current maintenance expenditure up until scheme completion, as the funding for this is already committed through Environment Agency revenue allocations.

The cost profile is baselined to 2016/17 prices and exclusive of VAT. The combined risk allowance is 32.2% of the remaining design and construction costs of the scheme. This is a combination of P95 mean expected value risk and optimism bias.

Inflation (at 2.5%) has been applied compound from a baseline year of 2017/18. Inflation has not been applied for 2016/17 or 2017/18 as the costs for these years are either fixed already under contracts or take into account current market prices.

There are also a series of River Thames locks and weirs in the benefit area. As these assets have a wider base of beneficiaries (such as the boating community) we have assigned 50% of their maintenance costs within this business case to allow for their flood risk management function. When future work is required on these assets additional contributions from the wider beneficiaries will need to be secured.

As part of the approval of the Strategic Outline Case the principle of providing initial funding for a reduced maintenance period was agreed. We have gained support from Defra, Infrastructure and Projects Authority (IPA) and Her Majesty's Treasury to work to an initial maintenance period of 5-10 years to demonstrate longer term affordability. This is in line with other major infrastructure projects. This is shown as being funded up front as a commuted sum.

	Sunk costs	17/18	18/19	19/20	20/21	21/22	22/23	10 Year maintenance period *	Total
Base Cost	6.17	4.95	12.45	29.1	21.2	9.5	1.53		84.90
P95 Risk	-	0.34	2.9	5.95	4.66	2.08	-		15.93
Optimism Bias	-	0.59	1.5	3.49	2.54	1.14	0.19		9.45
Inflation (2.5%)	-	-	0.41	1.95	2.18	1.32	0.22		6.08
Maintenance	-	-	-	-	-	-	-	4.75	4.75
<b>Total (£ million)</b>	<b>6.17</b>	<b>5.88</b>	<b>17.26</b>	<b>40.49</b>	<b>30.58</b>	<b>14.04</b>	<b>1.94</b>	<b>4.75</b>	<b>121.11</b>

\*as a commuted sum

Table 1-9: Financial cost profile

In summary the total scheme cost is £121.11 million. This includes £116.36 million for design and construction and £4.75 million commuted sum for maintenance.

### 1.5.2. Funding sources

Substantial partnership funding contributions of £51.05 million have been secured towards the scheme, with a further £4.35 million in the final stages of agreement. The overall funding position is summarised as:

	Sunk costs	17/18	18/19	19/20	20/21	21/22	22/23	10 Year maintenance period	Total
Total funding need	6.17	5.88	17.26	40.49	30.58	14.04	1.94	4.75	121.11
FCERM GIA	3.61	4.0	5.62	16.63	24.59	7.15	1.5	2.61	65.71
Thames RFCC – local levy	0.78	1.05	1.0	4	3.75	3.42	-	-	14.00
Growth deal funding (SEP)	-	-	7.5	18.35	-	-	-	-	25.85
Oxfordshire County Council contribution	1.05	0.45	5	-	-	-	-	-	6.5
Oxford City Council contribution	0.73	0.38	0.39	1.0	-	-	-	-	2.5
Thames Water	-	-	-	2.2	-	-	-	-	2.2
High Likelihood Contributions				1.35	3				4.35
Total funding secured	6.17	5.88	19.51	43.53	31.34	10.57	1.5	2.61	121.11
Cumulative balance of funding	-	-	2.25	5.29	6.05	2.58	2.14	0.00	0.00

Table 1-10: Funding profile (all costs are in £ million)

#### Funding status

The status of the current partnership contributions is summarised as:

Driver for investment	Contributor	Amount	Status
Local choices FCRM	Thames RFCC	£14.00m	Confirmed
Future Economic growth	LEP Growth Deal	£25.85m	Confirmed
Local economic and social benefits – transport resilience (roads)	Oxfordshire County Council	£6.5m	Confirmed
Local economic and social benefits – transport resilience (roads)	Oxford City Council	£1.5m £1.0m (land benefit in kind)	Confirmed Agreement in principle
Utility Resilience	Thames Water	£2.2m	Agreement in principle
	<b>Total Contributions secured</b>	<b>£51.05m</b>	

Table 1-11: Agreed contributions summary

#### Conditions on funding

The only restriction on the timing of contributions is the use of the Oxfordshire Local Enterprise Partnership Growth Deal funding, which must be used on capital construction work in 2018/19 and 2019/20.

#### Ongoing negotiations

Our dedicated Funding and Benefits Realisation Team are in the process of negotiating additional contributions from a wide range of contributors. These are detailed in full within the funding strategy

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negotiating plan. High likelihood contributions have been included in the funding table as there is a reasonable expectation that these will be secured. Moderate and low probability contributions are still being actively pursued and we aim to secure the maximum possible amount towards the scheme throughout the Full Business Case stage.

Driver	Contributor	Potential Amount	Likelihood of being secured
Economic growth - redevelopment	University of Oxford	£3m	High
Utility resilience	Thames Water (additional)	£1.2m	High
Economic growth – business development	Four Pillars Hotel	£0.15	High
	<b>Subtotal high likelihood contributions</b>	<b>£4.35m</b>	
Additional negotiations in progress but not required to demonstrate affordability			
Infrastructure resilience	Network Rail	£1m	Moderate
Utility resilience	SSE	£1m	Moderate
Operational resilience	BMW	£0.5m	Moderate
Economic growth	John Lewis Partnership	£0.5m	Moderate
Transport resilience	Oxford Bus Company	£0.02m	Moderate
Transport resilience	Stagecoach	£0.02m	Moderate
Utility resilience	BT Openreach	£0.01m	Moderate
	<b>Total all potential contributions</b>	<b>£7.4m</b>	

Table 1-12: Ongoing negotiation summary

### 1.5.3. Overall affordability

The progress that the project has made on partnership funding so far is a success with £51.05 million secured towards its construction and maintenance. Including the high likelihood contributions, the adjusted partnership funding score is 100%.

The project will therefore be fully funded when the high likelihood contributions are confirmed. This includes carrying forward £2.14 million in contributions to cover shared commuted sum financing of the maintenance period.

A number of approaches are being pursued to address this. The Funding and Benefits Realisation Team are continuing to deliver their funding strategy and negotiation plans. The high likelihood contributions will secure an additional £4.35 million towards the scheme.

The Project Delivery Team are investigating options for innovative materials management approaches. These are expected to improve the baseline cost of all material off site to restoration sites. A value engineering exercise will be completed once the detailed design is developed.

The project will be at risk if we do not continue to proceed with it. Delaying the programme would result in losing the time bound growth deal funding (£25.8 million) and the other major contributions, as these have been secured on the basis of having an operational scheme by 2022.

8.5% of the £600 million contributions target for the entire capital investment programme will be delivered through this project. Not proceeding now will put our contribution towards this important organisational target at risk.

Full funding, either by securing the remaining contributions or through efficiency savings, will need to be secured by August 2017 in order to be ready for the Compulsory Purchase Order submission.

The scheme is strong economically (benefit:cost ratio BCR 10:1, Net Present Value £1 billion), will deliver a step change in risk reduction (to 1,157 residential properties when it opens), will remove barriers to growth and re-development and will protect and enhance the environment and provide

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enhanced recreational opportunities. It will leave a lasting legacy in Oxford and cement the partnership approach we have taken in developing it.

Given the strong performance to date by the team in both securing contributions and efficiency savings, the skills and expertise within the project team and the very strong partnership approach, we believe that continuing would only leave a small exposure to Grant in Aid funding within the 6 year capital investment programme. Continuing at this point with £4.35 million of high likelihood contributions pending final agreement is considered to be a low risk approach. This exposure is equivalent to 3.6% of the project cost which includes more than 30% in risk allocation.

## 1.6. Management case

### 1.6.1. Project management

The Oxford Flood Alleviation Scheme follows a PRINCE 2 methodology and is set up to achieve the 'management by exception' principles. Governance is via a Sponsoring Group, Programme Board and Project Board. All 3 groups include partnership representation.

#### *Project governance groups*

Overall approval of the proposal rests with Her Majesty's Treasury who will make the final investment decision. Gaining this approval will be supported by the Accounting Officer of Defra and the Accounting Officer of the Environment Agency, following a robust assurance process. This is explained in full in the assurance and approvals section within this management case.

Governance is directed at a project level by the Sponsoring Group which comprises senior managers, who have responsibility for setting the strategic direction, defining business direction, and ensuring the strategic fit of the project within their respective organisations. They have sufficient delegated authority to make decisions on behalf of their organisation.

Partners in the Sponsoring Group have signed a memorandum of understanding. This was updated in December 2016, to ensure that it is aligned to the next phase of delivery. The Sponsoring Group meets approximately every 4 months and is chaired jointly by the Environment Agency's Thames Area Director and Oxfordshire County Council's elected Cabinet Member.

The Programme Board drives the project forward to deliver the outcomes and benefits within the tolerances set by the Sponsoring Group. It is chaired by the Project Director. The Programme Board meet approximately every 2 months. Key issues are dealt with in between these times by correspondence.

The Project Board is chaired by the Project Executive. It is responsible for reviewing issue reports before they are escalated to the Programme Board.

We have agreed tolerances at each governance level. This means that each group understands their level of empowerment and when to escalate risks and issues.

#### *Project team roles and responsibilities*

Overall accountability lies with Sir James Bevan as the Accounting Officer for the Environment Agency. Ken Allison, Environment Agency National Flood and Coastal Risk Management Director of Allocation and Asset Management, and graduate of the Major Projects Leadership Academy is the projects' Senior Responsible Owner. The project team is led by Joanna Larmour, Project Director, who has completed the Cabinet Office Project Leadership Programme, is a Registered Project Professional and a Member of the Association for Project Management.

Joanna is supported by a leadership team comprising of the Project Executive, Funding and Benefits Realisation Managers, Strategic Engagement Manager and Assurance and Approvals Manager. Specialist skills from bought in services are embedded within the team to ensure the team has the right mix of skills at the right time.

The team is supported by a resource management plan that sets out the detailed requirements for the next phase (Outline Business Case to Full Business Case) and covers outline arrangements, including transitions through to post project closure activities. The team operate from a dedicated major projects hub in the Environment Agency's Reading office and suppliers work alongside them there.

#### *Project plan*

The project plan, or schedule, has been developed by the project planner. The master programme pulls together individual workstream programmes and includes all main links and interdependencies

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to identify critical path activities. Progress is monitored at monthly progress meetings. Workstream leads attend to ensure that issues can be assessed and corrective action is taken.

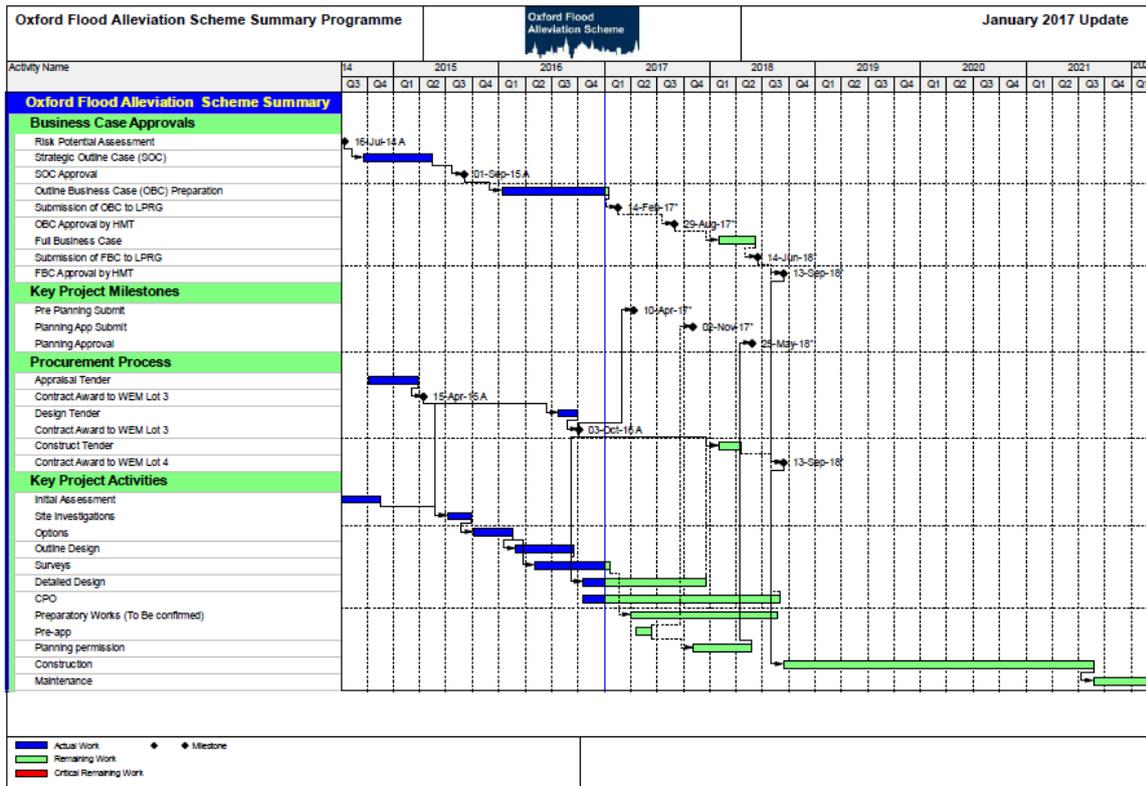


Figure 1-3: High level programme summary

Task	Milestone
Outline Business Case submission	22 February 2017
Pre-planning application submission	10 April 2017
Outline Business Case approved	8 September 2017
Full planning application submitted	2 November 2017
Detailed design complete	23 November 2017
Construction tender issue	22 September 2017
Planning application approved	25 May 2018
Construction tender evaluation complete	17 April 2018
Full Business Case submission	14 June 2018
Full Business Case approved / contract award	13 September 2018
Construction start	12 October 2018
Construction end and gateway 4	25 August 2021

Table 1-13: Key milestones

To achieve the programme there are 2 items to note. The first is that a separate approval needs to be gained to let a preparatory works contract prior to the Full Business Case approval. In line with our previous approvals we will engage early with approvers and have our proposals assured via the Environment Agency Large Projects Review Group, prior to submission.

The second is to agree a 12 week assurance and approvals schedule for the Full Business Case. This has been achieved previously with the Thames Estuary Phase 1 Programme. The schedule

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would be developed and agreed on the basis of the construction contract falling within agreed tolerances. Engagement with reviewers and approvers about other aspects of the Full Business Case which are not reliant on the final agreed tender price, would be scheduled prior to this 12 week period.

### *Stakeholder engagement*

Communications and engagement has been integral to the scheme from the start and will continue throughout the development of the scheme. By fully embracing the Environment Agency's 'working with others' philosophy, we are developing a scheme in collaboration with partners and stakeholders that is making our scheme objectives a reality.

### *Stakeholder management*

We analyse stakeholders using the 4-box grid methodology which groups stakeholder into inform, monitor, consult, and involve categories. We store this information in our stakeholder database.

We hold a stakeholder analysis workshop twice a year with the project team and partners to ensure stakeholders are in the correct category and the project team are focussing their effort proportionately with them. The outputs from these workshops are used as a basis for engagement planning across the subsequent 6 months.

### *Communications strategy, plans and communications channels*

Our communications and engagement approach ensures consistent messages across the partnership. This includes a Communications and Engagement Strategy that details pro-active and reactive communications approaches.

We produce detailed communications and engagement plans for specific pieces of work that deliver the proactive engagement objectives, such as public consultations. Each plan includes the business objective; engagement objectives; milestones; key messages; key stakeholders; and an action plan. The team evaluate these plans throughout delivery, and at completion, to ensure objectives have been met and lessons learnt are fed into current and future plans.

We have received positive feedback about the communications approaches, and there is widespread support for the scheme overall. We will continue to ask for feedback and use it to shape the communications and engagement throughout the lifecycle of the project.

Through this we have identified the key issues the public have about the scheme. These include concerns about downstream impacts, disruption during construction, and loss of trees. We held a series of focus groups with downstream communities to inform our communications and engagement planning. We are engaging with the public in their local communities, at local events, using the communications tools they have requested. Some people are concerned that the scheme will make flooding worse for them, although there is generally a neutral view to the scheme in downstream communities and the focus is on how the Environment Agency work with them on local flood risk issues.

### **1.6.2. Benefits realisation**

A detailed Benefits Management Strategy and plan sets out how benefits and disbenefits will be managed during the detailed design, delivery and post closure stages of the project. The strategy and plan captures the recommendations from the Infrastructure and Projects Authority routemap exercise. It describes the scheme's approach to the identification, analysis, tracking and reporting of benefits realisation and the benefits management products that will be used by the scheme.

The Benefits Management Strategy is informed by corporate benefits management guidance from the Environment Agency and partners on the project. All benefits management products are owned by the Funding and Benefits Realisation Manager and changes are approved by the Project Board within their defined tolerances. The benefits management products and process have undergone regular

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review by the Programme Board and Sponsoring Group. Benefits are captured in the benefits register, which is summarised below:

Ref	Description	Measure	Category	Link to objective
P1	Residential properties suffer less flood damage	1,000 properties move to a lower flood risk band	Economic / Social	1
P2	Commercial properties suffer less flood damage	100 properties will no longer flood in a 1 in 100 (1%) annual flood event	Economic	1
P3	Lower frequency of flooding to Abingdon and Botley Roads	Roads will not flood in a 1 in 20 (5%) annual flood event	Economic / Social	1 & 2
P4	Fewer flood related electricity disruptions	30 substations at lower flood risk	Economic / Social	2 & 3
P5	Improved resilience of broadband network	16 assets at lower flood risk	Economic / Social	2
P6	Lower frequency of flooding to railway line	Lines will not flood in 1 in 75 (1.33%) annual flood event	Economic	2 & 3
P7	Less likelihood of sewer flooding	88 properties at lower risk of sewer flooding from fluvial event	Economic / Social	2 & 3
P8	Opportunity to improve biodiversity	5ha net WFD criteria habitat created	Environmental	4
S1	New riverside environment	2 km of new channel created	Environmental	4
S2	Increased number of people walking and cycling in the area	2 km accessible path created	Social / Environmental	4
S3	Lower frequency of flooding to existing sites with re development potential	5 ha industrial sites removed from 1 in 100 (1%) annual flood event	Economic	4
T1	Lower impact of flood on local economic output	n/a	Economic	1, 2 & 3

Table 1-14: Benefits register summary

We have produced a benefits map which demonstrates the link between project outputs, delivery of benefits and achievement of the scheme objectives.

Progress updates are reported to the project team in the monthly highlight report. The Programme Board and Sponsoring Group are made aware of any issues with benefits realisation in their meetings and these are escalated as necessary.

### 1.6.3. Risk management

The scheme's Risk Management Strategy is informed by corporate risk management policies from the Environment Agency and partners on the project. It is owned by the Project Manager and changes are approved by the Project Board. This sets out a 5 step approach of identify, assess, plan, communicate and implement.

Identified risks are captured on the risk register. Response actions are agreed and allocated to named individuals. Risk management progress is included in highlight reports and quarterly risk workshops are held to ensure that the risk register remains current.

The risk register allows for a quantification of the costs associated with each of the risks. Each risk is assessed for a minimum cost, most likely cost and maximum cost. These are estimated using time and resources estimates. The full risk register is then run through a Monte Carlo risk analysis to give a normal distribution of the risk costs. The 50th percentile (P50) and 95th percentile (P95) is then used for economic assessment and financial planning. These are summarised below as their raw baseline values.

Risk Percentile	Expected Value
50 <sup>th</sup>	£11.73 million
95 <sup>th</sup>	£15.93 million

Table 1-15: Quantified risk summary

Top 5 risks and mitigation by mean expected value (MEV):

Risk	MEV	Mitigation	Risk Owner
Weather event during construction	£3.4m	Restricting earthworks to period between 1 April and 31 October annually.	Richard Harding, Project Executive
Increase in lands costs	£1m	Ongoing dialogue with landowners to reach negotiated settlements.	Michael Thorne – Estates Agent
Planning or Compulsory Purchase Order Inquiry	£0.8m	Continued dialogue with landowners and stakeholders. Early scoping opinions and pre-planning consultations to understand requirements.	Veronica James – Planning Manager
Cumulative impact of risks delaying construction by 1 year	£0.8m	Active programme management and development of detailed preparatory works schedule.	Richard Harding, Project Executive
Material volumes higher than expected	£0.6m	Full topographic survey commissioned and used in 3D earthworks model.	Phil Marsh, Consultant Project Manager

Table 1-16: Top 5 risks by mean expected value

#### *Optimism bias*

In line with Environment Agency assessment guidelines we have reassessed the optimism bias at the Outline Business Case. At the Strategic Outline Case stage it was calculated as being 38%. Within

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this Outline Business Case optimism bias has been assessed separately for the construction and maintenance periods. This has been calculated at 12% for construction and 5% for maintenance.

Between the quantified risk and optimism bias a total risk allowance of 32.2% is being carried forward in the design and construction costs.

### *Risk Potential Assessment*

The Risk Potential Assessment has been updated as part of the Outline Business Case. There has been no change in the overall classification for the Oxford Flood Alleviation Scheme being medium risk within the national context of major projects.

### **1.6.4. Assurance, approval and post project evaluation**

Due to the value of the project, Her Majesty's Treasury approval is required. At project initiation it was confirmed in discussions with Defra that the scheme would not join the Governments Major Projects Portfolio and external assurance reviews will be managed by Defra as the lead government department.

In order to gain Her Majesty's Treasury approval, the Outline Business Case will undergo internal assurance reviews through the Environment Agency's Large Projects Review Group. This group also undertakes the Accounting Officer's tests report. The business case will also gain the support of the Flood and Coastal Risk Management Committee of the Environment Agency's Board and Defra's Executive Committee (which includes Sir James Bevan, Environment Agency Chief Executive Officer and Accounting Officer, and Claire Moriarty, Defra Permanent Secretary and Accounting Officer) before being submitted to Her Majesty's Treasury for consideration.

A detailed Integrated Assurance and Approvals Plan, which is included as an appendix, has been produced for the scheme which adopts the requirements of the Environment Agency's Integrated Assurance and Approvals Strategy. The key milestones are included within the schemes master programme.

### *External Gateway Reviews*

An external Gateway 1 review was completed in April 2015 as part of the assurance and approval of the Strategic Outline Case submission. The review team found that it is likely the project will achieve its objectives and can be delivered successfully. They also acknowledged that the scheme is being delivered using an exemplar and innovative partnership approach that covers funding and is also achieving public and political support. They gave the project an amber rating with 9 recommendations to consider. This was considered to be a good outcome at the stage of the project. These recommendations have all been addressed prior to the submission of this Outline Business Case.

### *Future Gateway reviews*

A joint meeting was held with the Infrastructure and Projects Authority, Defra and the Environment Agency in January 2017. It was indicated that an external Gateway 2 review is not required for the Oxford Flood Alleviation Scheme. If confirmed, the requirements of the gateway review will be included in the enhanced Large Project Review Group scrutiny of the business case.

### *Project initiation routemap review*

The partnership completed the Infrastructure and Projects Authority routemap review in March 2016. This structured approach explored the timings and interdependencies of the actions that were already identified and further strengthened the likelihood of successful delivery. This culminated in the production of an enhancement action plan with an overall objective of 'committed partners working collaboratively to achieve the scheme objectives with engaged communities'. The full report and

progress delivering the actions is included with this submission. Oversight of delivery has been via the scheme's Programme Board.

### *Post project reviews*

The outline arrangements for Post Implementation Review and Project Evaluation Review have been established. These will be carried out at set milestones, followed by defined review periods. The reviews will incorporate team performance, benefits realisation assessment, better information management, asset performance evaluation, and environmental monitoring.

Reviews will be carried out in the spirit of continuous improvement. Outputs from reviews will be added onto the Project and Programme Management Tool lessons learnt database and shared at the Environment Agency Major Projects Community of Practice. This will support continuous improvement in the wider project delivery profession.

## **1.7. Recommendation**

We, the project partners, recommend to Her Majesty's Treasury that the Outline Business Case for the Oxford Flood Alleviation Scheme is approved with the cumulative sum of £11.9 million authorised to be spent in the development of the Full Business Case. This figure includes a contingency of £2.3 million.

The Full Business Case will procure the value for money solution, set out the contract for the deal and set out the detailed management arrangements for the delivery and operation and maintenance phases. This will be the final control point before entering into a delivery contract.