

Outline Business Case

Bristol City Council, South Gloucestershire Council, Environment Agency and Wessex Water

May 2022



Issue and revision record

Rev	Date of Issue	Originator	Checker	Approver	Description
1	11/3/22	N Nutt K Cruickshank	P Easton	T North	Work in progress, for briefing of Council Cabinet. Executive summary is a statement of best information. Remainder of document provides a snapshot of work in progress.
2	7/4/22	N Nutt K Cruickshank	P Easton	T North	Largely complete draft for review and comment by Project Partners and Defra.
3	12/5/22	N Nutt K Cruickshank	P Easton	T North	Updated following comments from the project partners and Defra review.
3.1	12/5/22	N Nutt	P Easton	T North	Corrected value for approval in S1.6

Comment sheet

Changes from EoI Submission to OBC
Minor rebalancing of funding between the 6 workstreams. Primary change reducing the proportion of funding to the River Restoration at Frome Gateway workstream.
NFM workstream – no significant change
SuDS workstream – no significant change
River Restoration at Frome Gateway workstream – the flood reduction at 30 residential properties will be minor. The investment will help enable future development which will provide a potential means to deliver flood risk reduction at these properties.
Policy Challenge – no significant change
Innovative Funding – no significant change
Culvert Monitoring – no significant change

Frome Catchment Innovation Programme

1.1 Summary of Submission

Project name:	Frome Catchment Innovation Programme
Project short name:	Frome CIP
Project reference:	BRI001
Total Project Value:	£7.19M (Capital value inc sunk costs)
OBC Submission Value for Approval:	£6.72M (£6.52M Innovation Resilience Fund)
Public Contributions (£):	£200k
Private Contributions (£):	£475k (unconfirmed) £0 (confirmed)

Primary Source of Risk:

~~Coastal Flooding~~ **Fluvial Flooding** ~~Pluvial Flooding~~ ~~Groundwater Flooding~~ ~~Coastal Erosion~~ (Delete as Applicable)

Secondary Sources of Risk:

Coastal Flooding ~~Fluvial Flooding~~ **Pluvial Flooding** ~~Groundwater Flooding~~ ~~Coastal Erosion~~ (Delete as Applicable)

Milestone Full Business Case Approval	May 2024
Milestone – Readiness for service	March 2027
Project completion	March 2027

Short description of the project

(120 words max)

Using micro interventions to achieve macro benefit, we will improve flood resilience in Bristol and South Gloucestershire via six workstreams:

- 1. Natural Flood Management (NFM) – restoring and enhancing the rural landscape to reduce runoff, attenuate flows and improve the natural environment.*
- 2. SuDS – retrofitting SuDS to decrease runoff and improve water quality.*
- 3. River Restoration – enhancing the water environment, placemaking to support regeneration and increasing opportunities to manage flood risk at Frome Gateway.*

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4. *Policy Challenge – study investigating how the delivery of development objectives can be improved in flood risk areas.*
5. *Innovative Private Funding – working with local business to fund improved flood resilience.*
6. *Culvert Monitoring – innovative 21st century structural and hydrometric monitoring of the culvert system discharging into the Floating Harbour in Bristol.*

Short description of the benefits

(120 words max)

The total value of monetised benefits is estimated to be £19.1M (PV, 40 years). In addition, there will be significant learning benefits.

Key learning benefits:

- *The costs associated with delivering NFM and how commercial decisions affect costs.*
- *The strengths and weaknesses of NFM and SuDS opportunity mapping tools.*
- *Experience delivering SuDS in a range of settings.*
- *How to agree and finance the operation and maintenance of SuDS.*
- *Using land value uplift to monetise economic growth.*
- *The use of innovative private funding to fund flood resilience measures.*
- *How to meet development objectives in flood risk areas.*
- *How to effectively use modern monitoring techniques to monitor historic culverts.*

Key value at risk benefits:

- *Reduction in flood damage to homes, businesses and infrastructure.*
- *Improved flood resilience for communities, businesses and households.*

Key value potential benefits:

- *Enabling the creation of jobs, new homes and economic growth.*
- *Improved amenity, recreation, water quality, air quality, biodiversity and carbon sequestration.*

Lead Authority

Bristol City Council (BCC)

Delivery Partners

Environment Agency (EA)

South Gloucestershire Council (SGC)

Wessex Water

Project Risk (£)¹

£288k

50th percentile

Optimism Bias value (£)

£1,375k

30%

¹ These risks relate to the scope of work being funded by the flood and coastal resilience innovation programme if this is different to the whole project.

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Expenditure Profile:

Costs per year (£k)	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027	Total (£k)
Flood and Coastal Resilience Innovation Programme Funding	338.0	636.3	998.5	910.0	2,149.2	1,487.5	6,519.6
Contributions	-	-	225.0	100.0	100.0	250.0	675.0
Total Project Expenditure	338.0	636.3	1,223.5	1,010.0	2,249.2	1,737.5	7,194.6

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6C	Programme	
6D	Monitoring, Evaluation and Dissemination Strategy	

1 Executive Summary

1.1 Strategic Case

The new government policy statement on flooding and coastal erosion sets out the government's long-term ambition to create a nation more resilient to future flood and coastal erosion risk. Alongside the policy statement, the Environment Agency's (EA) National Flood and Coastal Erosion Risk Management Strategy for England focusses on improving overall resilience and provides a framework to guide the activities of those involved in flood and coastal erosion risk management.

The Bristol Frome has been identified as a priority catchment by the EA and Bristol Avon Catchment Partnership (BACP) to address multiple flooding and environmental challenges. Together, South Gloucestershire Council (SGC), Bristol City Council (BCC), the EA and Wessex Water are co-ordinating their action in the Frome catchment to make it, its tributaries and communities a more healthy and resilient system. The Frome Catchment Innovation Programme (Frome CIP) investment proposed in this business case is an important part of the co-ordinated action.

In parallel to Frome CIP the EA has commenced a Catchment Investment Strategy for the Bristol Frome; this is complimentary to this programme seeking to manage flood risk. The EA's Frome Catchment Investment Strategy, will utilise 'traditional' flood risk management approaches to identify and appraise ongoing, proposed and aspirational investments to manage flooding in the catchment. It will produce a Strategic Outline Case for priority projects in the catchment. The preparatory work for the Frome Catchment Investment Strategy has helped to provide a comprehensive evidence base for this proposed investment.

Preliminary analysis for the preparation of the Frome Catchment Investment Strategy has identified that 815 properties (residential and non-residential) are at risk of fluvial flooding in the present day 1% Annual Exceedance Probability event. The estimated present day annual expected flood damage is approximately £5.9M per annum. Across the catchment, a further 518 properties are at risk of surface water flooding in the 3.3% Annual Probability event resulting in an annual expected flood damage of £4.9M per annum.

This investment aligns with the SGC and BCC Local Flood Risk Management Strategies, Wessex Water's Business Plan and the EA's draft Flood Risk Management Plan. It is seen as a key vehicle for achieving common goals and objectives across the partnering organisations. It will support BCC and SGC to deliver on the commitments they made via the declaration of climate emergencies and the imperative to become carbon neutral by 2030. In parallel, it also aligns well with the BCC Ecological Emergency Action Plan 2021, SGC Green Infrastructure Strategy 2021 and the West of England Climate and Ecological Strategy and Action Plan 2022.

The programme has the following objectives:

- A. Increase the resilience of communities and infrastructure at risk of flooding in the Frome catchment
- B. Demonstrate and quantify the benefits of natural flood management (NFM) measures and retrofitting Sustainable Drainage Systems (SuDS)
- C. Demonstrate the deliverability of retrofit SuDS through non-flood risk programmes
- D. Support sustainable growth and regeneration throughout the Frome catchment area

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- E. Improve local monitoring systems in central Bristol to increase flood resilience
- F. Engage with residents and businesses to understand flood risk and measures they can take to improve their resilience to flooding
- G. Engage with businesses to facilitate innovative funding mechanisms to contribute towards Nature Based Solutions (NBS)

1.2 Economic case

The proposed investment presented for the Frome Catchment Innovation Programme (Frome CIP) within this OBC has been optimised in compliance with the Innovation Programme Guidance. Each workstream has been optimised independently by considering the following factors:

- Engagement – input from stakeholders that has been used to shape the proposal.
- Critical Success Factors (CSF) – checking the optimised solution achieves the CSF.
- Value for money – demonstration that the project provides good value for money.
- Delivery risks – how the proposal has been refined to minimise the project’s risks.
- Carbon – how the proposal has been refined to support achieving carbon targets.
- Environment – the steps taken to minimise detrimental environmental impact and maximise environment gain.
- Health & safety – the steps taken to maximise the safety of the programme’s delivery and those that may interact with the assets created.
- Equality, diversity and inclusion – the steps taken to maximise social outcomes.

Table 1 summarises the cost-benefit analysis undertaken as part of the optimisation.

Table 1: Summary of cost benefit analysis (Present Value, 40 year appraisal period)

Workstream	Present Value Cost PVC £k	Present Value benefits PVbi, including local benefits £k	Benefit Cost Ratio BCR (Pvbi / PVC)
Preparation of OBC	388.0	NA	NA
Preparation of FBCs	89.2	NA	NA
Delivery of the six workstreams	4,403.1	NA	NA
Monitoring & evaluation	25.0	NA	NA
Programme Management	430.0	NA	NA
Risk (50th percentile)	287.9	NA	NA
Optimism bias (30%)	1,484.2	NA	NA
Total	7,107.3	19,149.1	2.7

The CSF are summarised in the bullet points below (full details within Table 13):

1. Strategic fit and business needs – supports the investment objectives and the partners’ strategies.
2. Value for Money – benefits exceed costs and improves flood resilience.
3. Supplier capacity and capability – within the ability of and commercially attractive to potential suppliers.
4. Affordable – evidence the investment can be financed.

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5. Achievable – governance, management, risk management and resources can be put in place to deliver the project.

1.3 Commercial case

The general procurement strategy uses a staged process as follows:

1. Identify most suitable partner lead for each workstream.
2. Identify suitable existing frameworks / contracts available to the lead partner.
3. Procure using pre-defined arrangements.
4. Where no suitable existing frameworks / contracts are available, lead partner to procure bespoke solutions.

Stages 1 and 2 are largely complete.

The procurement strategy ensures value for money by utilising existing arrangements that have demonstrated value for money through a competitive bidding process. Where new contracts are to be procured, value for money will be ensured by applying a suitable quality-price ratio in the tender evaluation criteria.

Inherent project risks due to the innovative nature of the project will be minimised through the procurement strategy that uses a blended approach of established, multi-disciplinary consultants and civils contractors, together with not-for-profit organisations who have practical experience of implementing innovative solutions. Our engagement with this broad range of suppliers has shown that there are multiple routes to market to deliver the types of intervention we propose.

Risks will be managed at an individual contract level during delivery through a risk register that will be owned jointly by the client and supplier(s). At a programme level, risks will be managed through the governance arrangements as set out in the management case.

1.4 Financial case

The proposed £6.72M expenditure (post OBC to March 2027) to improve flood resilience in the Frome catchment will primarily be funded by the Flood and Coastal Resilience Innovation Programme.

Secured funding:

- Flood and Coastal Resilience Innovation Programme - £478k already approved via FCERM7 of £6.0M agreed in principle. An increase to £6,520k allocation under this fund is requested via this OBC.
- South Gloucestershire Council's Climate Emergency Fund - £200k – secured.

Unsecured funding opportunities:

- Depending on the SuDS sites and opportunities selected, Wessex Water may be able to secure additional funding for the development and construction of SuDS retrofit projects where there would be a reduction in flow to the public sewers, reducing the risk of sewer flooding and frequency of storm overflow operation.
- An expression of interest by BCC to participate in the Department for Education's SuDS in school's sites was successful, and we are progressing this to obtain additional funding for the SuDS work stream
- Wessex Water will consider the adoption of SuDS that fall under the Sewerage Sector Guidance provided the SuDS comply with the required design standards.

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- Innovative Private Funding (workstream 5 of this programme) is a funding generating workstream. Our low-end working assumption is that this workstream will bring in £125k of additional funding. We have set a £200k target with the potential to bring in significantly more.
- Contributions at Frome Gateway. There is significant potential to secure contributions for the restoration of the river in the Frome Gateway given the range of beneficiaries. There is also potential to generate income through new amenities such as kiosks.
- To support the delivery of NFM we will encourage land managers to apply for other funding streams such as Environment Land Management Scheme, Countryside Stewardship, Bristol Avon Catchment Market, carbon offset or environmental gain offset. This programme will not apply for the funding on the behalf of others or directly gain access to this stream of funding. However, it is anticipated that this funding will enable others to maintain assets without direct funding from the programme.

Existing maintenance commitments:

- BCC, SGC and Wessex Water invest significant funds annually to maintain existing assets. Aligning with the stipulated Business as Usual baseline, this revenue funding is not reported to avoid misreporting existing funding as “new funding”.

As outlined in the Financial Case (Chapter 5), the Defra funding is available until March 2027. After 2027 alternate sources of funding will be required for any future operation or maintenance costs. The proposed solution for the financing of future expenditure is presented in Section 5.5. As outlined in Section 6.10, the programme has good contingency arrangements to allow the programme to flex to a broad range of outturn cost and funding scenarios.

1.5 Management case

A summary of the proposed programme management structure is presented below.

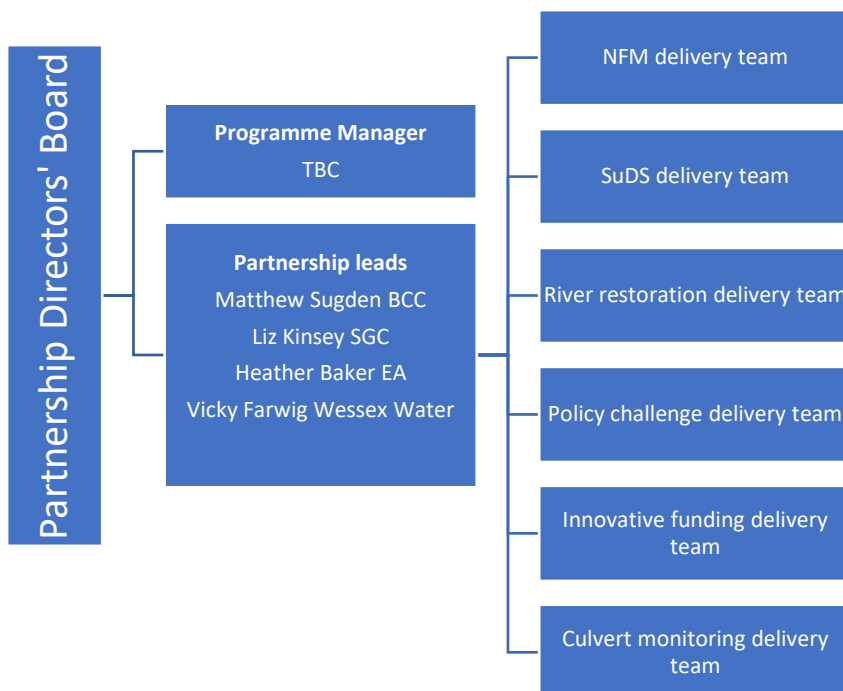


Figure 1: Summary of the proposed management structure for Frome CIP

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The programme will be overseen by BCC and managed by Council staff in compliance with the Council's standard procedures for managing programmes and projects. In turn, the programme will be broken into a series of projects with partner organisations taking on responsibility to deliver the workstream projects with the partner organisations managing projects in compliance with their own internal project management processes.

Risks will continue to be actively managed via programme and workstream risk workshops allowing us to identify risks, plan mitigation and monitor the application of mitigation.

The following should be undertaken to maximise the probability of the programme achieving its investment objectives.

1. Implementation of the Stakeholder Engagement Framework will help secure support for the project from landowners, statutory stakeholders, funders and the local community. Without effective engagement there is an elevated risk that the programme will fail to achieve its objectives.
2. Build on existing and continue political support for the project through the implementation phase to ensure the significant benefits are realised.
3. Learning is a key benefit of the investment. It is therefore important that the Monitoring, Evaluation and Dissemination Strategy is followed.
4. It is a complex programme and will require aligned working between the Programme Partners. The Partners should continue to abide by the Partnership Collaborative Agreement to permit effective collaboration and the achievement of aligned goals.
5. Risk management workshops should continue to be used by the Partnership to identify, mitigate and monitor risks.

1.6 Recommendations

The £7.2M for this proposed investment, Frome CIP, as presented in this OBC, is a robust investment that aligns well with the overarching strategic drivers. It represents good value for money by delivering macro benefits from micro interventions providing society with significant benefits and transferable learning. It is affordable, commercially viable and the programme can be delivered by the partners to achieve the identified benefits. It is recommended that the identified £6,519.6k funding from the Resilience Innovation Fund is allocated to the programme.

2 Strategic Case

2.1 Strategic context

The new government policy statement on flooding and coastal erosion, published on 14 July 2020, sets out the government's long-term ambition to create a nation more resilient to future flood and coastal erosion risk. The press release included information about Defra's £200m flood and coastal resilience innovation programme (FCRIP). Alongside the policy statement, the EA published its new National Flood and Coastal Erosion Risk Management Strategy for England, which is also focussed on improving overall resilience and provides a framework to guide the activities of those involved in flood and coastal erosion risk management. Defra's FCRIP will contribute to addressing the risks from flooding and coastal change identified in the UK Climate Change Risk Assessment and the National Risk Register.

Defra's FCRIP, and by extension its 25 selected projects, will contribute towards delivery of Outcome 3 of the Government's 25 Year Environment Plan and Single Departmental Plan for floods and water: reduced risk of flooding. Defra's FCRIP will make a significant contribution to the implementation of the resilience approach outlined in the National Flood and Coastal Erosion Risk Management Strategy.

The Bristol Frome has been identified as a priority catchment by the EA and Bristol Avon Catchment Partnership (BACP) to address multiple flooding and environmental challenges over the coming years. As a result, South Gloucestershire Council (SGC), Bristol City Council (BCC), the EA and Wessex Water established the River Frome Reconnected Partnership (RFR) in 2018 to oversee and co-ordinate action in the Frome catchment to make it, its tributaries and communities a more healthy and resilient system.

The programme of investment proposed in this business case relates to the (Bristol) Frome Catchment Innovation Programme (Frome CIP). It is one of 25 projects that has secured FCRIP funding to help deliver the objectives of the FCRIP programme. In addition to supporting the FCRIP policy objectives it will also support the delivery of other national and local flood risk management, social, environment and economic growth policy objectives.

In parallel to Frome CIP, the EA has commenced a Catchment Investment Strategy for the Bristol Frome; this is complimentary to this programme seeking to manage flood risk. The EA's Frome Catchment Investment Strategy, will utilise 'traditional' flood risk management approaches to identify and appraise ongoing, proposed and aspirational investments to manage flooding in the catchment. It is a key part of the delivery of the Flood Risk Management Plan (FRMP) and Local Flood Risk Management Strategies (LFRMS) (discussed below). It will produce a Strategic Outline Case for priority projects in the catchment. The work under the Frome Catchment Investment Strategy has helped to provide a comprehensive evidence base for the Frome CIP (this proposed investment).

FRMPs aim to support and contribute to the delivery of the ambitions in the National FCERM Strategy, such as nature-based solutions, and longer-term adaptive approaches for taking action at the right time. The draft 2021-27 FRMP for the Severn River Basin District includes the following local measures relevant to this investment:

1. Engage with BCC and other partners on new development areas in Bristol – aligns with Workstream 4 "Policy Challenge".
2. Refurbish the flood defence assets in the lower reaches of the Bristol Frome – aligns with Workstream 3 "River Restoration" and Workstream 6 "Culvert monitoring".

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3. Support BCC to achieve the objectives of the LFRMS in Bristol – aligns with all workstreams.
4. Work with partners to develop an investment strategy for up to the next 100 years in the Bristol Frome catchment – aligns with all workstreams.
5. Work with partners to undertake a catchment scale assessment of NFM opportunities in rural and peri-urban catchments affecting Bristol and its surrounding communities – aligns with Workstream 1 “NFM” and Workstream 2 “SuDS”.

The LFRMSs for BCC and SGC are also aligned with the FCERM Strategy. BCC LFRMS is also linked with local development plans and Bristol’s status as the European Green Capital 2015, and as a member of the Rockefeller Foundation’s 100 Resilient Cities. The 2016-2022 BCC LFRMS set the following objectives:

1. Gain a greater understanding of the flood risks posed to Bristol and its people and places – Aligns with all workstreams.
2. Actively manage flood risk infrastructure to reduce the likelihood of flooding causing harm to people and damage to society, the economy and the environment – aligns with Workstream 6 “Monitoring of culverts”.
3. Increase public awareness and encourage communities to take action to manage the risks that they face. Understand the concerns and priorities of communities – aligns with all workstreams.
4. Prevent inappropriate development – aligns with Workstream 4 “Policy Challenge”.
5. Improve preparedness for flood events and post flood recovery – aligns with all workstreams.

The SGC 2015-2020 LFRMS set the following objectives:

1. Prioritise and implement improvements to local flood infrastructure to reduce the likelihood of flooding causing harm to the communities, businesses and the environment of South Gloucestershire – aligns with all workstreams.
2. Increase public awareness of the level of flood risk affecting communities and businesses and how they can better protect themselves and their property – aligns with all workstreams.
3. Actively work with other LLFAs and RMAs to coordinate management and reduce flood risk across South Gloucestershire – aligns with all workstreams.
4. Contribute to wider social, economic, environmental and cultural benefits by encouraging sustainable multi-benefit solutions and maximising use of resource – aligns with Workstream 1 “NFM” and Workstream 2 “SuDS”.
5. Improve our understanding of drainage assets, flood risk and how climate change will influence future flood risk – aligns with Workstream 1 “NFM” and Workstream 2 “SuDS”.
6. Ensure future development considers all known flood risks and climate change projections for South Gloucestershire – aligns with Workstream 4 “Policy Challenge”.

Wessex Water is the sole public sewerage provider in the catchment. Wessex Water’s Business Plan (2020-2025) sets performance expectations against nine long-term promises. The Plan includes actions to secure long-term resilience and priorities to minimise sewer flooding and to enhance the environment aligning with Frome CIP’s proposal to install SuDS. Wessex Water’s Drainage and Wastewater Management Plan (DWMP) is under development. The DWMP will identify areas of the catchment where investment is required in the drainage and wastewater infrastructure to deliver future resilience given additional pressures of growth, urban creep and climate change. The key outcomes for the DWMP will

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be to deliver improved drainage and water quality. The final DWMP is due for completion in March 2023, this will inform Wessex Water's PR24 Business Plan, which requests funding from OFWAT for 2025-2030. The Frome CIP has sought to identify locations where surface water and sewer flood risks may be reduced through installation of SuDS or NFM, with a view to developing collaborative projects, aligning investment requirements with needs identified in the DWMP to achieve multiple outcomes.

This proposed investment, Frome CIP, will contribute towards delivery of the Government's 25 Year Environment Plan by reducing risk of harm from environmental hazards such as flooding and will facilitate nature's recovery. It will also contribute to meeting the requirements of the Environment Act 2021 which includes the introduction of the biodiversity net gain condition for development and development of Local Nature Recovery Strategies.

The Severn River Basin Management Plan (RBMP) provides a framework for achieving an improved and sustainable water environment for the Frome. The RBMP divides the Frome catchment into 8 water bodies. The RBMP includes objectives to improve all 8 water bodies by 2027. The Frome CIP aligns with the RBMP process and will complement other stakeholder plans.

The West of England Climate and Ecology Emergency Action Plan and the Climate Emergency Strategies for BCC and SGC set out targets to become carbon neutral by 2030. These documents set out a shared vision addressing both the direct and indirect sources of emissions that are responsible for climate change, as well as addressing climate adaptation. Frome CIP is aligned with these shared visions.

Bristol and SGC have strategies for addressing the ecological emergency, The One City Ecological Emergency Strategy (OCEES) for Bristol sets out the vision and ambition for an ecologically resilient, wildlife rich city by 2030. The strategy includes four key strategic goals to be achieved by 2030, including one for water quality to support healthy wildlife. BCC Ecological Emergency Action Plan sets out how it is delivering on the OCEES ambitions. SGC's 'Greener Places' Green Infrastructure Strategy sets out how SGC will implement the West of England Joint Green Infrastructure Strategy and bring together partners', ambitions, commitments, obligations and priorities for green infrastructure. This includes the planning and design of green infrastructure within new developments and the approach the council will take to managing green spaces.

The National Planning Policy Framework (NPPF) recognises that the planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. The Frome CIP investment will undertake a policy challenge review to explore ways in which the ambitions of the NPPF can be more effectively met without compromising the safety of new developments.

BCC's and SGC's Local Plans are being reviewed alongside a new Spatial Development Strategy (SDS) for the West of England. The SDS and Local Plans will cover the overall housing and employment land requirements and the supporting strategic and detailed planning policies to guide that growth. They will include the provision of green and blue infrastructure, support commitment to nature recovery, sustainable drainage and biodiversity net gain required in new developments as well as protecting areas of flood risk and high ecological value. BCC is producing a Green Infrastructure Strategy, expected in 2022 that will provide a framework for green and blue infrastructure developing on the work already underway in Bristol. All these improvements will benefit the water and the

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land environment, help to provide health and wellbeing benefits and express the objectives of the West of England Joint Green Infrastructure Strategy.

The Yate Masterplan (YM) will deliver a vision for future growth and development in SGC and provides opportunities for improved surface water management. The Frome Gateway is a new neighbourhood regeneration scheme being devised within Bristol city. The development of these areas provides opportunities for restoring the river corridor, reducing flood risk and enhancing accessibility, nature conservation value and recreational potential of neighbouring green spaces and the wider River Frome corridor.

2.2 Environment and other considerations

An environmental report, Water Framework Directive (WFD) assessment and geomorphological river condition assessment (Appendices 2B1 - 2B3) have been produced to support this OBC.

The WFD assessment concluded that the proposed Frome CIP workstreams (primarily comprising of NFM, SuDS and river restoration) are anticipated to have mainly positive effects on WFD quality elements. Further detail will be required on the specific interventions to be taken forward before it can be concluded there are no WFD compliance risks.

The environmental report comprises of a high-level exercise to identify environmental constraints, provide information on consents and permissions which may be required, and identify potential opportunities for enhancement. The Frome Catchment comprises of approximately 175km² of agricultural and urban land. Due to the size of the catchment, a large number of environmental constraints relating to biodiversity, heritage, the water environment, landscape, land use, geology and contaminated land, and air quality were identified. This information has been summarised below:

- **Biodiversity:** Within the BCC district there are two Local Nature Reserves (LNR), two Sites of Special Scientific Interest (SSSI), multiple Tree Preservation Orders (TPOs), multiple recorded priority species and a range of priority habitats. Within the SGC district there are five LNRs, two SSSI, multiple recorded priority species and a range of priority habitats.
- **Heritage:** Within the BCC district there are eight Scheduled monuments, 18 conservation areas and multiple listed buildings. Within the SGC district there are nine Scheduled monuments, six conservation areas and multiple listed buildings.
- **Water environment:** Within the BCC district there is one WFD surface waterbody, and two WFD groundwater bodies. Within the SGC district there are seven WFD surface waterbodies, four WFD groundwater bodies, one nitrate vulnerable zone, and three source protection zones.
- **Landscape:** Within the BCC district there are 21 Local Character Areas (LCAs), and Green Belt. Within the SGC district there are 12 LCAs, Green Belt, and the Cotswold Area of Outstanding Natural Beauty (AONB).
- **Land use, contaminated land & geology:** Within the BCC district there are 15 historic landfills. Within the SGC district there are 18 historic landfills, and three authorised landfills. In addition to mapped historic landfills, there are also various unmapped historic landfill sites such as suspected landfills at the Frome Gateway.
- **Air quality:** The Bristol Air Quality Management Area (AQMA) is within the BCC district, and the Staple Hill AQMA is within the SGC district.

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Further information on the detail, design and location of the interventions that will be delivered by the Programme is required to narrow down the baseline and further understand the environmental constraints relevant to the Programme. If elements of the Programme are located within close proximity to the above constraints it is likely the relevant consents/permits would be required as follows:

- **Biodiversity:** TPO permits / permission from local authority, protected species licensing and mitigation measures, SSSI assent.
- **Heritage:** planning permission for listed buildings, conservation areas and scheduled monuments.
- **Water environment:** A Flood Risk Activity Permit (FRAP), a land drainage consent and planning permission.
- **Landscape:** requires further information from landscape assessments.
- **Land use, contaminated land & geology:** requires further information from contamination / land quality assessments.
- **Air quality:** potential requirement for an AQMA plan

At this stage of design, the following opportunities have been identified:

- Align with local plans: consider green infrastructure within the design and community engagement throughout the process. Incorporation/improvement of pedestrian footpaths and/or cycle paths within the area, and/or improvement of green space and recreational space as part of the design.
- Enhance or improve priority habitats within the catchment.
- Investigate opportunities to improve designations in poor condition.
- Delivery of Catchment Priority Actions identified by Bristol Avon Catchment Partnership.
- Delivery of River Basin Management Plan objectives.

2.3 Objectives (programme and project)

The aims of Defra's flood and coastal resilience innovation programme (FCRIP) are to:

- Encourage local authorities, businesses and communities to test and demonstrate innovative practical resilience actions in their areas.
- Improve the resilience of 25 local areas, reducing the costs of future damage and disruption from flooding and coastal erosion.
- Improve evidence on the costs and benefits of the innovative resilience actions and demonstrate how different actions work together across geographical areas.
- Use the evidence and learning developed to inform future approaches to, and investments in, flood and coastal erosion risk management.

The Investment Objectives for Frome CIP are to:

- A. Increase the resilience of communities and infrastructure at risk of flooding in the Frome catchment.
- B. Demonstrate and quantify the benefits of natural flood management (NFM) measures and retrofitting Sustainable Drainage Systems (SuDS).
- C. Demonstrate the deliverability of retrofit SuDS through non-flood risk programmes.
- D. Support sustainable growth and regeneration throughout the Frome catchment area.
- E. Improve local asset monitoring systems in central Bristol to increase flood resilience.

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F. Engage with residents and businesses to understand flood risk and measures they can take to improve their resilience to flooding.

G. Engage with businesses to facilitate innovative funding mechanisms to contribute towards Nature Based Solutions (NBS).

The Monitoring, Evaluation and Dissemination Strategy (Appendix 6D) breaks the objectives into measurable sub-objectives that are SMART. It presents our proposed approach for monitoring and evaluating the achievement of the objectives.

2.4 Summary project description and mix of actions

This Programme proposes a workstream approach to achieve the macro benefits from micro interventions. Unlike a traditional FCERM scheme, workstreams have been selected to cover all parts of the source-pathway-receptor model.

Table 2 summarises how the investment objectives have been cascaded to the six workstreams. It demonstrates there are no gaps in the delivery of objectives and that all workstreams align with the programme objectives.

The key innovation and learning from the workstreams is summarised in Section 2.5. The supplementary appendices for each workstream (Appendices 2C1 to 2C6.2) provide an expanded description of how they will support a broader range of future FCERM actions and support increased delivery of FCERM resilience actions.

Table 2: Alignment of project workstreams (actions) with project objectives

Action/ Workstream	Objectives – described in Section 2.3						
	A – Increase resilience	B – Demonstrate benefits	C – SuDS	D - growth	E – culvert monitoring	F - engage	G – funding
WS1 NFM Source	✓	✓				✓	
WS2 SuDS Source	✓	✓	✓			✓	✓
WS3 River restoration Pathway	✓			✓		✓	✓
WS4 Policy Challenge Receptor	✓			✓			
WS5 Innovative Funding Receptor	✓					✓	✓
WS6 Culvert monitoring Pathway & receptor	✓				✓		

As demonstrated within the economic case, the actions (workstreams) have been optimised to maximise resilience within the catchment. By utilising innovative funding we will make more extensive use of NBS (including NFM, SuDS and River Restoration) to improve flood resilience. Importantly, the NBS approach will deliver significant additional co-benefits over traditional FCERM assets.

By incorporating innovative asset monitoring, we will be able to manage the existing assets more efficiently helping to reduce costs and to reduce the frequency of flooding by making better asset management decisions in the future.

The policy challenge workstream switches the angle to look at how new development can be made more resilient to flooding. It represents a significantly under discussed aspect of flood resilience and has the potential to transfer learning to improve flood resilience nationally.

2.5 Key innovation learning and main benefits

We propose a mix of flood resilience measures that mirrors the rural to urban nature of the Frome catchment with citizen science and engagement at the core. The mix of activities gives flexibility to the programme to re-distribute funding across work streams to manage risks and capitalise on opportunities if and when they materialise.

The expected learning and innovation, and the main benefits of the workstreams are summarised Table 3.

Table 3: Summary of the expected learning, innovation and main benefits

The expected learning and innovation	The main benefits
WS1 Natural flood management	
<ul style="list-style-type: none"> • Utilising catchment scale NFM opportunity mapping alongside ground-based reconnaissance to develop a strategic approach for the selection and implementation of NFM interventions. We aim to improve understanding in the commonalities and differences between the sites and types of opportunities that the two different approaches identify. Assess whether there is a cost-effective balance for using these approaches. • The most effective commercial delivery approach for NFM and implications on delivery costs from commercial decisions. • The relationship between desk-based SuDS opportunity mapping and NFM opportunity mapping in transitional urban and rural areas. • Ascertain local preferences for NFM and successful engagement techniques. 	<ul style="list-style-type: none"> • Reduction in fluvial and local surface water flood damage to properties. • Reduction in flooding of rural roads due to blockage of built assets by sediment. • Environmental gain including biodiversity within the catchment. • A cumulative delivery of local intervention measures with a catchment scale impact. • Improved awareness within local and farming communities will inspire individual behavioural change.
WS2 SuDS	
<ul style="list-style-type: none"> • Experience delivering SuDS in a range of settings e.g. schools, other council sites, commercial sites and roads. • Experience on robust arrangements for the operation and maintenance of SuDS. • Utilising catchment scale SuDS opportunity mapping alongside observed flooding hotspots to develop a strategic approach for the selection and implementation of SuDS interventions. Improved understanding in the commonalities and differences between the sites and types of opportunities that the two different approaches identify. We will assess whether there is a cost-effective balance for using these approaches. 	<ul style="list-style-type: none"> • Reduction in surface water and fluvial flood damage to properties. • Reduction in the volume of surface water entering the sewer network, reducing the load on treatment works and freeing up capacity for development. • Reduction in sewer flooding. • Reduction in nuisance surface water flooding on roads and paths. • Environmental gain within the catchment. • A cumulative delivery of local intervention measures with a catchment scale impact. • Improved awareness within communities and businesses will inspire individual behavioural change.
WS3 River restoration	

The expected learning and innovation	The main benefits
<ul style="list-style-type: none"> • How flood risk management investments can effectively collaborate with developers and planners. • Demonstration of the MoRPh river survey approach at a publicly accessible site. Engaging citizen scientists to undertake further MoRPh surveys. • Using Land Value Uplift as a means of estimating the economic value of enabling economic development. Nationally, this methodology could support using Land Value Capture as an innovative means of funding flood defence/resilience improvements. 	<ul style="list-style-type: none"> • Restoration of the River Frome within the Frome Gateway site. • How river restoration can be used to unlock the Frome Gateway development site for an area-wide regeneration project. • Reduction in flood risk and improvements in flood resilience to the surrounding community. • Improvements to amenity, landscape, biodiversity and the local active travel network within Riverside Park.
WS4 Policy Challenge	
<ul style="list-style-type: none"> • Better understanding the specific challenges to obtaining planning consents in areas at risk of flooding". • What can Local Authorities or other public bodies do to enable development in areas at risk of flooding. • The private sector's role in protecting land from the impacts of flooding. 	<ul style="list-style-type: none"> • Improved delivery of 'Bristol Housing Delivery Test Action Plan'. Resulting in increased economic activity (increased employment).
WS5 Innovative Private Funding	
<ul style="list-style-type: none"> • How to form practical links between commercial interests in a region and the landscapes that influence their ability to operate. • The skills, tools and capacity needed to establish a marketplace and engage with businesses to fund resilience actions. 	<ul style="list-style-type: none"> • Businesses realising that the environmental health of local landscapes has a direct impact on their business and workforce. Leading to partnership funding and collaboration. • Creating the methodology and marketplace for local stakeholders to be engaged and trades to take place. An opportunity to grow with further businesses joining, and scope of work and area able to be expanded.
WS6.1 Hydrometric monitoring	
<ul style="list-style-type: none"> • How to efficiently utilise the latest hydrometric monitoring techniques to improve harbour operations. • Better understanding of the harbour's inflows so that we can make better investment decisions in the future. • How much it costs to install and operate modern flow and level telemetry technology. 	<ul style="list-style-type: none"> • Improved quality of flow data will allow us to manage the culvert network and Floating Harbour more proactively. This will reduce the costs to manage the assets and increase flood resilience. • Improved data sharing and management will facilitate more effective management of assets.

The expected learning and innovation	The main benefits
WS6.2 Structural monitoring	
<ul style="list-style-type: none"> • How to efficiently utilise the latest structural monitoring and digital techniques to interpret data and manage assets safely and with better outcomes. • The cost, programme and other considerations associated with using a range of survey techniques (drone LiDAR, thermal imaging, 3D sonar and CCTV). 	<ul style="list-style-type: none"> • A significant health and safety improvement by reducing the need for personnel to enter this challenging confined space environment. • Improved quality and coverage of asset condition data will allow us to more proactively manage the culvert network. • A 3D digital baseline record of the culvert network would provide us with a useful resource to engage with residents, businesses and developers.

2.6 Strategic risks and learning from past projects

The project has the following strategic risks:

1. The programme is reliant on the partner organisations and stakeholders working together. Priorities may misalign or change.
2. NFM, SuDS, river restoration and asset monitoring may reduce the impact of higher probability flood events (not necessarily the low probability event). The occurrence of an extreme flood event may reduce community support for the investment or require the proposed approach to be revisited.
3. Cumulative multiple measures (e.g. NFM, SuDS, river restoration and policy) are required to make a difference at a catchment scale. Failure to deliver a sufficient scale of measures might not make an adequate difference.
4. War/geopolitical instability could increase pressure to maximise land for food or energy production.
5. Uncertainty of how assets will be maintained, and operated post 2027 may significantly constrain what the Programme can deliver.
6. The Programme may be disrupted, delayed or stopped due to:
 - a. Adverse reception from communities
 - b. Change in local/regional/national priorities with regards to flooding and infrastructure investment
 - c. Political pressure/change could alter strategic justification or funding
 - d. Pandemic

From previous projects we have identified the following learning:

1. Catchment reconnaissance undertaken by Farming and Wildlife Advisory Group (FWAG) in 2019/20 identified significant opportunities to implement NFM in the catchment.
2. Via various NFM projects, engagement is key. Landowners cannot be forced to have NFM on their land and must be supportive of the proposals. The commercial approach for NFM delivery has a significant cost impact. Farmers and small agri-contractors can be significantly cheaper than larger contractors.

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3. SuDS at Embleton Road and Southmead identified that good quality engagement and site investigation are essential. Maintenance can be significant, particularly removing litter, clearing inlets and managing community expectations for the aesthetic look in winter months.
4. Wessex Water have learnt from a detailed, in-house cost estimating exercise that compared the CAPEX costs reported by SuDS Studio (for high-level DWMP and Overflow spill reduction options) with estimates by Wessex Water's estimating team. An uplift of 1.5-2.0 was identified as appropriate to estimate the delivery cost; allowing for Wessex Water's framework contractors, design and risk elements etc.
5. Consultation for the Frome Gateway has identified there is an under-provision of open and green space within the Frome Gateway area and that many residents and businesses are not aware of the flooding issues in the area.
6. Engagement with the EA and other regulatory bodies for BCC's recent Silverthorne Lane and St. Phillips Marsh developments has illustrated that agreeing what mitigation is safe in areas subject to hazardous flood depths is challenging .
7. Lessons from Innovative Funding feasibility and piloting in Bristol has identified:
 - a. Momentum is important for effectively engaging with private funders.
 - b. Political and economic uncertainty detrimentally impact private funding.
 - c. A clear menu of options that require funding helps businesses to engage.
8. The EA's 2017 structural inspection survey of the Frome culverts provided learning on tides, survey techniques and data accessibility for surveying the culverts.
9. BCC's Harbour Condition Surveys Project's 'digital twin' has proved to be an efficient tool for the team to operate and maintain the harbour. The tool could be replicated or extended to include the Frome culverts.

2.7 Constraints and dependencies

The following external constraining conditions and parameters for the programme have been identified:

1. The OBC must be submitted by June 2022 and Full Business Cases (FBC) must be completed for the individual workstreams prior to delivery on site. The policy challenge report must be completed by June 2023.
2. There is a cap on the available Innovation Resilience Funding and the deadline for the use of funding is March 2027. The funding cannot be used for maintenance.
3. All necessary consents will need to be secured before commencing site work:
 - Planning Permission including Listed Building, Protected Species, Conservation Area, Protected Landscapes and Scheduled Monument consents.
 - Easements, Rights of Way and permissive routes.
 - Flood Risk Activity Permit, Environmental Permit or Land Drainage Consents.
 - Waste licences.
4. Environment Act and the requirement for Biodiversity Net Gain
5. UK Net Zero Strategy to achieve carbon neutrality by 2050 and partner climate emergency objectives to achieve carbon neutrality by 2030.

The identified project dependencies are:

1. The delivery of the programme is dependent on the co-ordinated long-term commitments and actions from the project partners and stakeholders.
2. The delivery of benefits relating to river restoration at Frome Gateway are in part dependent on the progression of the Frome Gateway re-development.

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3. The successful uptake NFM and SuDS will be dependent on the interests of landowners.
4. The culvert monitoring workstreams are dependent on the EA's existing hydrometric monitoring infrastructure and BCC's existing Harbourside digital twin.

2.8 Stakeholder engagement

The Stakeholder Engagement Framework is presented in Appendix 2A. The framework identifies the key stakeholder groups, objectives, messages and engagement methods for the programme. In recognition that each workstream has unique engagement requirements, individual workstream communications plans will be delivered post OBC prior to commencing the delivery of the workstreams.

The top three influences of stakeholder engagement completed to shape the business case have been:

1. Landowner engagement to develop natural flood management proposals
2. Community and business engagement to develop the river restoration concept
3. Engagement within the partnership organisations' wider stakeholders to steer the business case as a whole.

Further details of how engagement has been used in the optimisation of the proposals to date are presented in Section 3.3. Engagement will continue during the preparation of the FBC and throughout the delivery of Frome CIP. A Programme Manager will be recruited to become the face of the programme helping to give continuity to stakeholders who may otherwise be exposed to many officers, consultants, contractors, and other stakeholders.

2.8.1 Monitoring and evaluation framework, and dissemination

The Monitoring, Evaluation and Dissemination Strategy is presented in Appendix 6D. Monitoring and evaluation has been developed based on the benefits framework (Section 3.6) and Project Objectives (Section 2.3). The overriding principles for monitoring are:

- **Quality over quantity** – we will strive to make a few robust learning contributions that others can rely on over many unreliable findings that are worthless.
- **Real world learning need** – learning on flood resilience topics that will be of real-world practical use to us and others in the future. We will avoid scientifically interesting topics and focus on the day-to-day real-world issues faced by communities and flood risk management professionals.
- **Nature based solutions** – we will prioritise monitoring and collection of data related to nature-based solutions.
- **Value for money** – the cost of capturing the learning is proportionate to the cost savings or improved resilience that the learning will bring.
- **Community focus** - we will maximise the use of community monitoring. It presents a means of increasing community engagement, provides new opportunities for the community and enables monitoring to continue after our funding ends.
- **Good dissemination** - there is no gain if learning outcomes are not shared to those who can make use of the learning. We need to get the right messages to the right audiences.

Frome CIP's key learning benefits are:

- *The costs associated with delivering NFM and how commercial decisions affect costs.*
- *The strengths and weaknesses of NFM and SuDS opportunity mapping tools.*
- *Experience delivering SuDS in a range of settings.*

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- *How to agree and finance the operation and maintenance of SuDS.*
- *Using land value uplift to monetise economic growth.*
- *The use of innovative private funding to fund flood resilience measures.*
- *How to meet development objectives in flood risk areas.*
- *How to effectively use modern monitoring techniques to monitor historic culverts.*

We propose to recruit a Programme Manager as a permanent member of staff to the BCC flood risk management team. A core part of the Programme Manager role will be monitoring, evaluation and dissemination. As a permanent member of staff we anticipate that they will be able to continue monitoring and evaluation of the programme after the programme's funding ends in 2027.

After approval of the OBC for this proposed investment, Frome CIP, we will prepare FBCs for the workstreams. This will be our first learning gateway and will allow us to capture changes to benefits and costs once the workstreams have been designed/scoped and priced by suppliers allowing us to revise our estimates of benefits and costs.

During delivery, each of our workstreams will be required to identify a suitable conference or seminar to present to relevant professionals in the sector. We will also submit an abstract to a national conference such as Flood and Coast to present the full programme.

In the last year of the programme, we propose to publish a post programme review of the learning that has arisen from the programme. This will include any revised estimates of the benefits and costs.

3 Economic Case and Benefits Framework

3.1 Description of the Business as Usual baseline

The Frome catchment is approximately 175km², the catchment extent is shown in Figure 2. The lower catchment is urbanised with the upper catchment being predominantly rural comprising primarily of pasture grazing. In the catchment there are four Risk Management Authorities (the Frome CIP partners).

- EA is responsible for managing the flood risk from main rivers. Its assets in the catchment include the Tubbs Bottom storage site.
- SGC is responsible for managing the flood risk from ordinary watercourses, surface water (including road drainage) and ground water in South Gloucestershire.
- BCC is responsible for managing the flood risk from ordinary watercourses, surface water (including road drainage), the Floating Harbour and ground water in the City of Bristol.
- Wessex Water is responsible for managing flooding from sewers. Four key Wessex Water flood risk assets are the Mylnes Culvert, the Frome Valley relief sewer, the North Bristol relief sewer (due to be completed by Spring 2023) and the Northern Storm Water Interceptor. Wessex Water owns the Eastville Depot, used by the EA to operate the Northern Storm Water Interceptor.

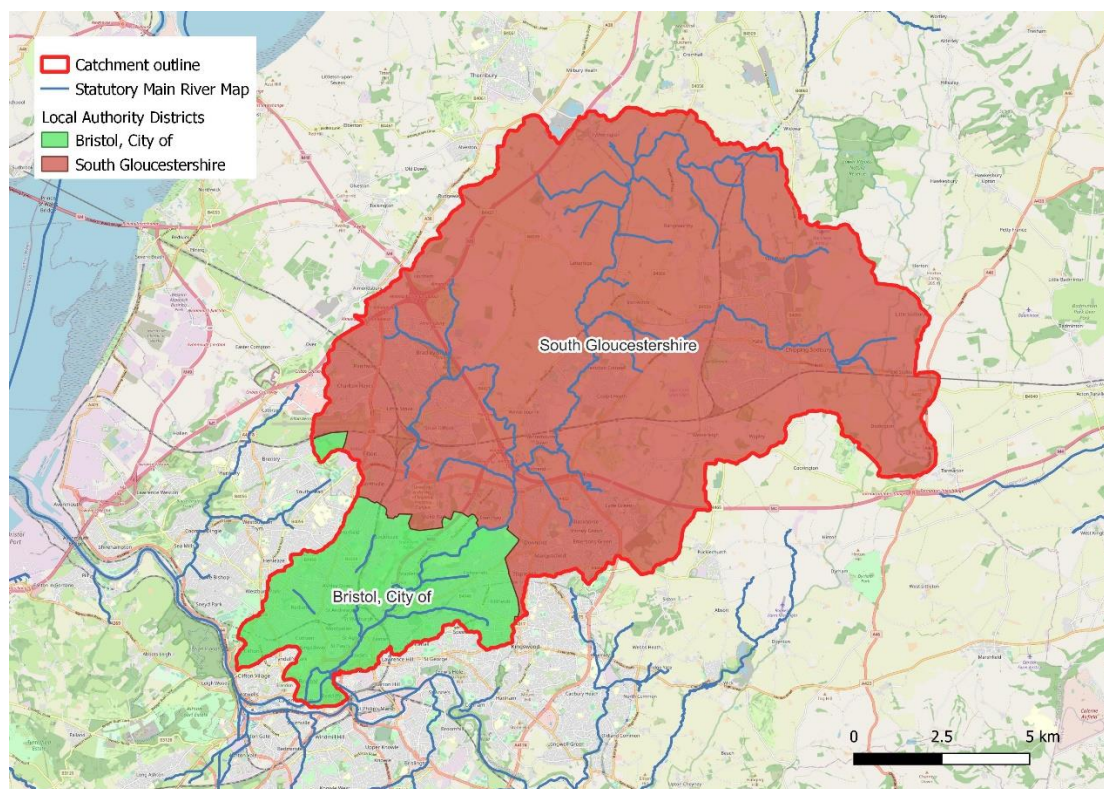


Figure 2 Frome catchment extent

The current arrangements result in significant detrimental impacts:

- Extensive fluvial, surface water and sewer flooding to properties (below).
- Diffuse pollution from farming and urbanisation results in a reduction in water quality.
- Urbanisation and flood defences result in significant morphological pressures on the watercourse (Section 2.2 and Appendix 2B2).

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- Significantly constrained economic growth and delivery of new housing as a result of flood risk blocking development.

A catchment wide flood damage assessment undertaken for the Frome Catchment Investment Strategy has identified there are approximately 815 properties at risk of fluvial flooding in the 1% Annual Probability event. The estimated Annual Average Damage due to fluvial flooding of properties is approximately £5.9M/yr.

In the rural catchment (non-urbanised areas north of the M4) there are 183 properties identified exposed to greater than 150mm flood depths in the 3.3% Annual Probability surface water flood event (Risk of Flooding from Surface Water Map and National Receptor Database). The 3.3% Annual Probability flood depth crosses many local roads with a depth greater than 300mm. The approximate Annual Average Damage to properties due to surface water flooding in the rural catchment is £0.2M/yr.

In the urbanised areas within the catchment there are 335 properties at risk of surface water flooding and sewer flooding in the 3.3% Annual Probability surface water flood event identified in the baseline damage assessment for the SuDS workstream (Appendix 2C2). The estimated Annual Average Damage due to surface water flooding and sewer flooding in the urban catchment is approximately £4.7M/yr.

3.2 Summary description of the investment proposal

The programme comprises of six workstreams (WS) as shown in Figure 3: The Figure 3.

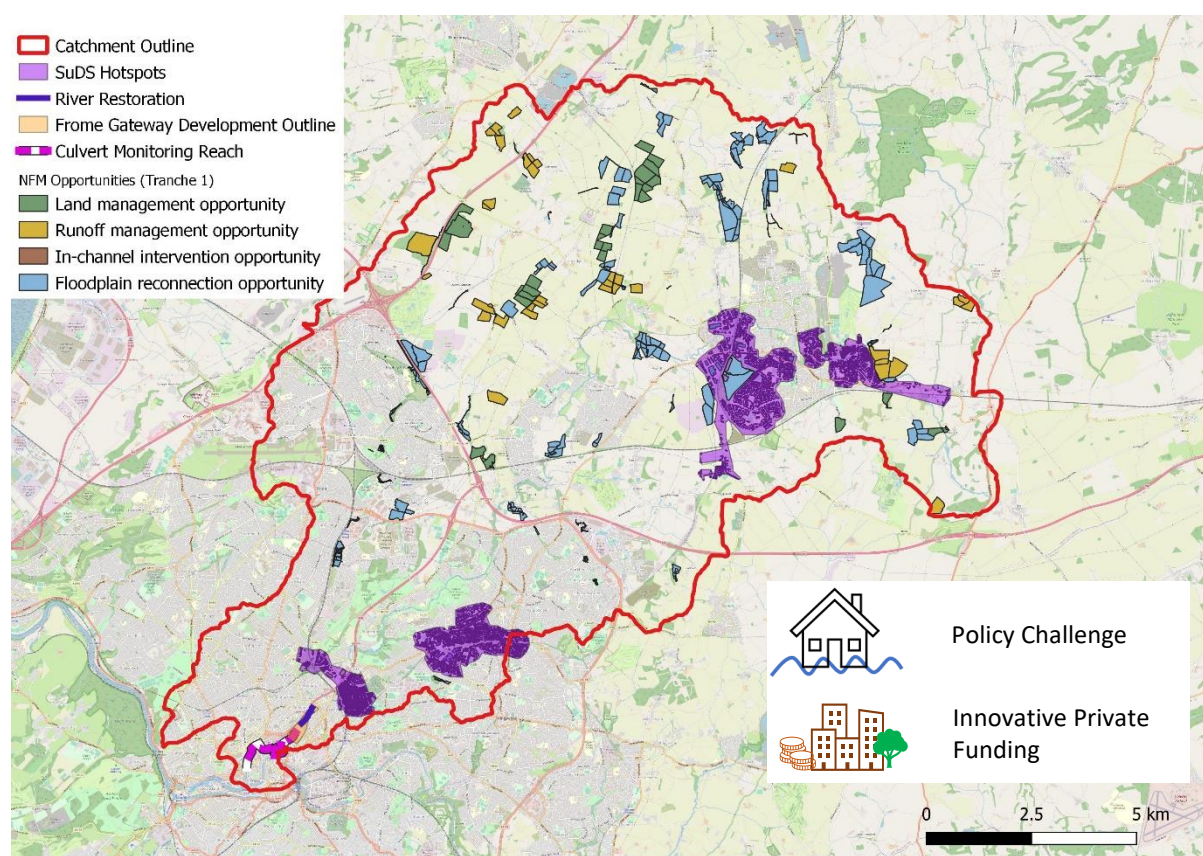


Figure 3: The investment proposal

Expanded descriptions of the investment proposals are presented in the workstream supporting Appendices (Appendices 2C1 to 2C6.2). In summary:

- WS1 – Natural flood management (NFM)

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It is proposed to invest in NFM within the Frome catchment split in two tranches. Tranche 1 is the delivery of demonstrator sites using already mapped opportunities and existing relationships with land stakeholders to engage and enthuse further land stakeholders during the first two years of the programme. Tranche 2 would be a follow-on phase of delivery, building on the momentum and lessons learnt from the first tranche and incorporate more challenging floodplain restoration sites that have been screened out from tranche 1. The NFM techniques will be selected based on consultation with landowners. All proposals have been scoped to be within the capability of potential suppliers.

- WS2 – Sustainable Drainage Systems (SuDS)

Within the urban areas of the catchment, SGC, BCC and Wessex Water propose to pilot the installation of SuDS in a range of settings including around public buildings, car parks, streets and commercial sites, with the intent to engage, inspire and train other organisations to take action to reduce surface water flows and enhance biodiversity and amenities.

Following the OBC's optimisation, we propose to progress four "hotspots" in total, two in Bristol and two in South Gloucestershire and select a range of settings within the hotspots to give greater learning. Opportunity mapping tool SuDS Studio (software) has enabled us to identify 45 promising sites. This represents a first step towards achieving the river scale benefits of street level interventions, aligning with our macro benefits from micro interventions focus. SuDS Studio has identified the potential to retrofit 55,000m³ storage within the catchment via SuDS retro fit translating to a potential £7.8M of fluvial flood damages avoided and £21M of surface water flood damages avoided.

Following the approval of the OBC we will engage with landowners and undertake more targeted site investigations and appraisal to select sites. The funding of maintenance and operation will be key considerations in the final selection of SuDS types and sites. We will work with contractors and suppliers to trial new proprietary products where appropriate.

- WS3 – River Restoration

The river restoration concept looks at using the river Frome corridor as the driver for high quality urban development. Optimising investment for river restoration with increased natural flood resilience as well as providing opportunities for human activity closer to the water and nature whilst improving community connectivity and wider active travel links, to unlock the site's potential. It is proposed to invest in improvements in the Frome Corridor through this location without undergoing major park designs and impacting on the proposed Frome Gateway development.

The river restoration will look at combining hard landscaped interventions at key locations at the interface between the park and river. The corridor will be naturalised at low water levels using rocks, coir rolls and willow revetments increasing sinuosity and encouraging a richer diversity for riparian vegetation, opportunities for fish and bird life to thrive.

Developers associated with the Frome Gateway site may in the future support expanding the proposal either via contributions to this project or as subsequent projects undertaken by or funded by developers.

- WS4 – Policy Challenge

Research is needed to understand how redevelopment of sites within areas at risk of flooding (Flood Zones 2 and 3) can be enabled in Bristol. To do this, research will be

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undertaken to understand the process of developing sites in Flood Zones, and at which parts of this process developments are falling short. This research will also consider potential interventions that would enable developments to be approved in line with NPPF policy and guidance.

A Technical Steering Group will be setup comprising an inclusive group of representatives from both public bodies and privately funded trade groups. It is proposed that six initial case studies be investigated, and the findings will then inform further questions to be taken to stakeholder focus groups. The focus groups should focus on understanding how policy is used by case officers when determining applications, how regulatory bodies review cases and how it is interpreted by developers seeking to undertake regeneration projects. The primary output of this workstream is a report to Defra by June 2023. A final presentation of findings will also be prepared and presented at a suitable conference or seminar.

- WS5 – Innovative Private Funding

Innovative Private Funding will be used to drive private investment for the delivery of SuDS. By working with the local business community, the Partnership will demonstrate the benefits of SuDS and Nature Based Solutions (NBS) to their business. This will justify their investment in NBS to deliver benefits including;

- Reducing flood risk to their business;
- Improvements to work productivity due to associated mental and physical health benefits;
- Provide opportunities for up-skilling;
- Apprentices and training and attracting more visitors;
- Bringing retail and leisure spending; and,
- Attracting further investment.

The Partnership will build on an existing pilot study and experiences from other projects to deliver this workstream. A key output is the establishment of a collaborative marketplace and supporting products, to create a trading mechanism for innovative private funding into NBS. The marketplace will mature over time, well beyond the short five-year time frame of this programme. The outcomes and benefits of this workstream and trading through the marketplace will be long lasting and continue to be delivered post programme, offering an excellent investment opportunity.

- WS6.1 – Hydrometric monitoring of culverts

The proposed solution aims to introduce 21st century local hydrometric monitoring systems to improve the operation of the Floating Harbour and increase flood resilience. The hydrometric monitoring strategy is primarily focused on the city centre urban culverts. The proposal involves the installation of new telemetry and improving how data is managed and accessed.

- WS6.2 – Structural monitoring of culverts

The proposed solution aims to improve the structural monitoring of the Frome culverts within Bristol's city centre to improve asset management and hence increase flood resilience. It will include baseline surveys, creation of "Digital twin" (virtual 3D representation) of the culverts and idealised specification for repeat inspections.

3.3 Description of how the proposed solution was optimised

The proposed solution has been optimised in line with the Innovation Resilience Programme guidance. Unlike a Flood Defence Grant In Aid (FDGIA) business case a long list screening of options has not been undertaken, as the broad basis of the programme (workstreams that make up the selected option) was agreed via the successful 2021 Expression of Interest.

The processes used to optimise the six workstreams are presented in the workstream supplementary appendices (Appendices 2C1-2C6.2). A summary of the optimisation approach used for each of the workstreams is presented in Table 4. The CSF (Table 13) have been used to constrain the optimisation to valid outcomes, these are things that each of the workstreams must demonstrate.

The optimisation of value for money by the workstreams varies with NFM and SuDS more suited to quantified Cost-Benefit Analysis. Additional workstream CSFs (presented in the workstream supporting material in Appendices 2C1-2C6.2) have been used to define “Minimum Viable Products”, hence providing evidence for workstreams that the least cost means of achieving the desired outcome has been achieved where Cost-Benefit Analysis has not been practical.

As detailed in the workstream supplementary appendices (Appendices 2C1-2C6.2) a range of stakeholder and community engagement approaches have been used to optimise the workstreams. The NFM workstream is underpinned by considerable community and stakeholder engagement to date building on relationships developed by FWAG over recent years. This has helped to identify locally acceptable opportunities. The culvert hydrometric and structural monitoring, and policy challenge workstreams have been informed via targeted engagement with key stakeholders. For culvert monitoring, the principal stakeholders engaged were the EA’s Asset Performance, BCC’s Structures Team and EA’s Hydrometry & Telemetry. The Defra team and BCC’s development management team have been involved in shaping the Policy Challenge workstream methodology via works. For the Frome Gateway we have engaged with the Council’s project delivery and parks teams. The SuDS workstream has not undertaken pre-engagement with landowners, as with all workstreams further engagement will be undertaken post OBC. The Stakeholder Engagement Framework outlines the proposed engagement activities (Appendix 2A) including the post OBC preparation of workstream specific communication and engagement plans for each workstream.

In line with the Innovation Programme guidance, the delivery risk, carbon, environment, health & safety and equality, diversity & inclusion (EDI) have been considered when optimising the workstreams by identifying things to include or avoid. The approach used for optimising each workstream is summarised in Table 4.

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Table 4: Summary of the optimisation approach used for each workstream

	WS1-NFM	WS2-SuDS	WS3- Restoration	WS4- Funding	WS5- policy	WS6- monitoring
Critical Success Factors	All workstreams have been assessed against the programme’s CSF. Additional workstream CSFs have been defined to restrict the optimisation to acceptable solutions.					
Engagement undertaken to inform proposals	Pre OBC, FWAG led community and stakeholder engagement OBC phase limited to partnership members - EA, SGC, BCC & Wessex Water	Limited to partnership members - EA, SGC, BCC & Wessex Water	Frome Gateway team, parks team and various community engagement events for Frome Gateway	Pilot engagement with businesses	Defra, EA and Council officers	Public bodies undertaking monitoring
Value for money: Scale, phasing and balancing	Cost-Benefit Analysis: Screening of opportunities to select only opportunities that achieve robust BCR.		Cost-Effect Analysis: A “Minimum Viable Product” lowest cost means of achieving the relevant Investment Objectives for these workstreams has been identified based on the judgement of the workstream teams.			
Delivery risk	The workstream teams have been challenged throughout to minimise delivery risk within the proposal. Specifically in the areas of financing, maintenance responsibility, technology, delivery method and consents. The workstream teams have recorded their decision-making process to minimise delivery risk. A quantified risk register has been presented for the optimised programme to record residual risks.					
Carbon	Carbon has been appraised by the workstream team within the optimisation of the proposals to minimise carbon emissions and maximise carbon sequestration. The carbon reduction hierarchy and prompts within the ERIC Carbon Optimisation Report have been the basis of the reduction approach. The workstream teams have recorded their decision-making process to minimise carbon. A carbon costing for the proposal is presented in Section 3.5.					
Environment	Maximising environmental gain and minimising environmental damage has been appraised by the workstream teams within the optimisation of the proposals to avoid environmental detriment and maximise environmental enhancement. The workstream teams have recorded their decision-making process to maximise environmental outcomes.					
Health & Safety	Maximising H&S throughout the whole project lifecycle has been appraised by the workstream teams within the optimisation of the proposals to minimise hazards					

	and their probability of occurrence. The workstream teams have recorded their decision-making process to maximise H&S.
Equality, Diversity & Inclusion	Improving EDI outcomes has been appraised by the workstream teams within the optimisation of the proposals to avoid disadvantaging protected groups, equally distribute opportunities & benefits based on need and engage all sections of society. The workstream teams have recorded their decision-making process to maximise EDI. Supplemented by an Equality Impact Assessment (Appendix 6E).

3.4 Description of invest less and invest more

In line with the Resilience Innovation OBC guidance Do Less and Do More options have been explored. As per the guidance these options have been scoped with a +/- 20% cost.

An option on the Do Less and Do More for each workstream has been provided below. See the Appendices for full details for each of the six workstreams (Appendices 2C1-2C6.2).

3.4.1 Invest less

This option would reduce the scale of investment by reducing the scope of works as follows:

- **WS1 NFM** – Only more cost-effective sites (sites with high benefit cost ratios) would be progressed.
- **WS2 SuDS** - Only more cost-effective sites (sites with high benefit cost ratios) would be progressed.
- **WS3 River restoration** - Dropping the inclusion of the board walk and viewing platform with seating.
- **WS4 Policy Challenge** - Reduction in the number of case studies reviewed as part of the research.
- **WS5 Innovative Private Funding** – Reduction in the number of businesses engaged with, resulting in fewer funders becoming involved in the private trading marketplace.
- **WS6.1 Hydrometric monitoring** - Not installing telemetry at Broad Weir.
- **WS6.2 Structural monitoring** – Not undertaking a 3D scan and only relying on CCTV 4k video footage obtained from drone surveys.

3.4.2 Invest more

This option would increase the scale of investment by:

- **WS1 NFM** - Additional funding would be spent promoting NFM opportunities that are less cost effective. Hence sites with lower cost benefit ratios would be progressed.
- **WS2 SuDS** - Additional funding would be spent on SuDS that are less cost effective. Hence sites with lower cost benefit ratios would be progressed.
- **WS3 River restoration** - Renewing the multi-use basketball court at a lower elevation to create more flood storage.
- **WS4 Policy Challenge** - Targeted engagement would be undertaken with stakeholders engaged in the case studies to provide primary data to support the case study review.
- **WS5 Innovative Private Funding** - Hold more detailed conversations with potential funders allowing us to expand this workstream.
- **WS6.1 Hydrometric monitoring** - Supplementing the proposal to include upgrading/installing water level telemetry at Stonegate’s and Passage Street.

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- **WS6.2 Structural monitoring** - Visual inspection from touching distance of the lateral side culvert following dewatering or by utilising divers.

3.5 Investment costs

3.5.1 Monetary

The estimated economic costs to deliver this proposed investment, Frome CIP are presented below. Refer to the workstream supporting appendices (2C1 to 2C6.2) for more details of the workstream costing.

The costs are assessed relative to a Business as Usual (BaU) baseline, therefore the cost of Business as Usual activities are excluded. For each workstream consistent periods have been used to estimate costs and benefits. SuDS and river restoration both use 40 year appraisal periods with NFM and culvert monitoring using 20 year periods due to the anticipated lifespans of the investments and recognition of no long term funding commitments being in place. The appraisal periods for the policy challenge and innovative funding workstreams and the monitoring, evaluation and dissemination have been limited to 2027 aligning with the available funding. Refer to the workstream supporting appendices (2C1 to 2C6.2) for more details of the costing.

Table 5: Summary of costs used for economic assessment

Workstream	Capital delivery cost £k	Annual cost over BaU £k	Whole Life Cost (Present Value) £k	Notes
Preparation of OBC (sunk)	388.0		388.0	Sunk cost based on FCERM7.
Preparation of FBCs	89.2		89.2	Based on estimate by potential supplier.
WS1 – NFM	585.1	2.56	641.9	Cost estimate by FWAG based on experience delivering similar works. Works that will be delivered by SGC contractors have been uplifted by 1.67 following a baseline exercise. Costs and benefits only reported over a 20 year period. Our working principle is that we will only install NFM where this places no maintenance commitment on the partner organisations. Hence, for NFM to be attractive, the maintenance cost to landowners/ volunteers must be offset by a benefit to that party. As Frome CIP will have no sight of the maintenance cost of NFM assets these costs are excluded from the costing. The repeating cost of farm advisor visits is the only future cost.
WS2 – SuDS	816.0	6.63	962.9	Cost estimate from SuDS Studio uplifted by 1.35 to account for client overheads, design, land access and surveys following baseline exercise.
WS3 – River Restoration	2,219.2	6.78	2,369.4	Cost estimate by Quantity Survey based on concept sketch. With the exception of the raised boardwalk, all maintenance is in line with the Business as Usual case. The boardwalk maintenance is based on 20 year lifespan for the timber structure (EA asset deterioration curves) with the assumption that the annual maintenance is a 20 th of the original construction value for the boardwalk.
WS4 – Policy Challenge	60.0	0	60.0	Cost estimate provided by potential supplier. Costs and benefits only reported until 2027.
WS5 – Innovative Funding	99.8	0	99.8	Cost estimate provided by potential supplier. Costs and benefits only reported until 2027.
WS6.1 – Hydrometric monitoring of culverts	167.2	3.76	167.2	Cost estimate by EA Hydrometry and Telemetry specialist based on framework rates and experience from similar sites. Costs and benefits only reported over 20 year period.
WS6.2 – Structural monitoring of culverts	92.3	1.00	102.0	Cost estimate provided by potential suppliers and incorporating learning from similar projects. Costs and benefits only reported over 20 year period.
Monitoring, evaluation and dissemination	25.0		25.0	Provisional sum – assumes Programme Manager undertakes most monitoring. Costs and benefits only reported until 2027.
Programme management	430.0		430.0	Assumes a fulltime Programme Manager is appointed at £500/day. Engagement will be led by the Programme Manager, with an allowance (we assume 90% of the Programme Manager’s time will be charged to the project) for additional support from the partners’ engagement teams. The workstreams also include allowances for workstream specific engagement e.g. engaging with landowners for NFM and SuDS, stakeholders for the policy challenge and businesses for the innovative funding.

Risk (50th percentile)	287.9		287.9	Using Monte Carlo Analysis –Appendix 3C.
Optimism bias (30%)	1,375.1	6.22	1,484.2	Based on EA guidance for OBCs.
Proposed Investment	6,634.7	26.9	7,107.3	

3.5.2 Carbon

A baseline assessment of the total carbon associated with the proposed investment is summarised in Table 6. The quantified baseline carbon assessment was preceded by a qualitative optimisation of carbon as summarised in Section 3.3. The quantified assessment provided a further opportunity to further optimise the proposed solution by highlighting large sources of carbon. As the Frome CIP progresses through FBC and subsequent delivery, the baseline carbon assessment can be refined and optimised to further reduce carbon emissions.

Table 6: Summary of baseline carbon assessment

Workstream	Total Carbon tCO2e	Notes
Preparation of OBC sunk	Not assessed	
WS1 – NFM	79.6	Works costed using 25% of FCRM programme average of 37tCO2e per £100k site works (9.25tCO2e per £100k). Allowance for mileage. Professional services based on staff carbon footprint (1.14tCO2e per Full Time Equivalent per year).
WS2 – SuDS	273	Works costed using FCRM programme average of 37tCO2e per £100k site works. Professional services based on staff carbon footprint (1.14tCO2e per Full Time Equivalent per year).
WS3 – River Restoration	1,761	Works costed using Carbon Calculator. Professional services based on staff carbon footprint (1.14tCO2e per Full Time Equivalent per year).
WS4 – Policy Challenge	1.69	Professional services based on staff carbon footprint (1.14tCO2e per Full Time Equivalent per year).
WS5 – Innovative Funding	0.82	Professional services based on staff carbon footprint (1.14tCO2e per Full Time Equivalent per year).
WS6 – Culvert monitoring	13.93	Professional services based on staff carbon footprint (1.14tCO2e per Full Time Equivalent per year). Allowance for mileage. Allowance for power consumption of electrical equipment.
Programme management	6.84	Professional services based on staff carbon footprint (1.14tCO2e per Full Time Equivalent per year).
Proposed Investment	2,137	

3.6 Investment benefits framework including learning and innovation

The learning, value at risk and value potential benefits are summarised in the following sections. The workstream supporting appendices (Appendices 2C1 to 2C6.2) expand on the benefits, how they have been valued and how changes will be captured.

3.6.1 Learning benefits

Table 7: Benefits Framework: Learning Benefits

Ref	Benefits Category	Description	Approach to capturing change
1.1	Learning on cost	The cost associated with the delivery of each workstream and the deviation from our baseline costing.	See the Appendices for specific details on the approach for each of the six workstreams (Appendices 2C1 – 2C6.2).
1.2	Learning on benefits	The comparison of effectiveness, reliability and durability of actions against expectation will be assessed within each workstream.	The Monitoring, Evaluation and Dissemination Plan (Appendix 6D) also provides a programme-wide summary.
1.3	Learning on management and governance (project level)	Learning on the approaches and use of innovative techniques will be assessed within each workstream.	In the last year of the programme, we propose to publish a post programme review of the learning that has arisen from the programme. This will include any revised estimates of the benefits since FBC and actual outturn costs.
1.4	Learning on skills, tools (methods and mechanisms) and capacity needed to implement actions and combinations of actions	Issues arising during implementation and solutions/ work arounds will be assessed within each workstream.	The evidence and learning developed will be used to inform future approaches to, and investments in, flood and coastal erosion risk management.
1.5	Learning on management and governance (wider lessons learned)	Findings that can be shared with other projects and more widely disseminated outside the programme will be assessed within each workstream.	

3.6.2 Value at Risk

All value at risk benefits relate to flood damage avoided. The Flood Hazard Research Centre’s Multi-Coloured Handbook (MCH) has been used to estimate flood damages using the existing case as baseline. Each workstream uses a different approach to evaluate damages based on the nature of the investment and the available data. Please refer to the workstream supporting appendices (2C1 to 2C6.2) for details of how benefits were calculated.

The flood damage assessments use a maximum of a 40 year appraisal period although NFM (WS1), and culvert monitoring (WS6.1 and WS6.2) use 20 year appraisal periods in recognition of the anticipated lifespan of these investments. In all cases workstreams use consistent appraisal periods for benefits and costs. We have been careful to avoid double counting of benefit.

Note that the policy challenge and innovative funding workstreams (WS4 and WS5) are not expected to provide any flood reduction to existing development and therefore no value at risk benefit is claimed for these workstreams.

Table 8 Benefits Framework: Value at Risk Benefits

Ref	FCERM-AG AST Category	Sub-category	Description	Approach to capturing change
Value at Risk				
2.1	Economic	Residential property - direct	Reduction in economic flood damage to property	£603k Flood damage avoided, calculated using MCH. Refer to relevant workstreams for approach.
2.2		Commercial property – direct	Reduction in economic flood damage to non-residential properties.	£1,929k Flood Damage avoided. MCH methodology. Refer to relevant workstreams for approach.
2.3		Transport	Damage to roads and associate travel disruption. Investment would reduce probability of occurrence.	£196k Flood Damage avoided. MCH methodology. Refer to relevant workstreams for approach.
2.4		Residential temporary accommodation	Temporary housing for those made homeless by flooding. Investment would reduce probability of occurrence.	£146k Flood Damage avoided. MCH methodology. Refer to relevant workstreams for approach.
2.5		Emergency response	Reduction in providing immediate assistance such as emergency relief and search and rescue.	£414k Flood Damage avoided. MCH methodology. Refer to relevant workstreams for approach.

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2.6	Social (individual and family)	Commercial in- direct	Increased costs to businesses to mitigate impact of flooding. Investment would reduce probability of occurrence	£91k Flood Damage avoided. MCH methodology. Refer to relevant workstreams for approach.
2.7		Vehicles	Damage to cars. Investment would reduce probability of occurrence.	£74k Flood Damage avoided. MCH methodology. Refer to relevant workstreams for approach.
2.8		Disruption to Boat users (recreational, commercial and house boats)	Loss of trust in reliable water levels in the harbour could decrease the popularity of the harbour with boat users. A water loss event occurred upstream in Bath in 2020 causing a significant loss of trust by boat users.	£175k. WS6, based on value of mooring fees, a 10%/yr probability of a loss of trust event leading to a 10% reduction in usage. Refer to relevant workstream for approach.
2.9		Risk to life	Injuries or fatalities because of flooding. Investment would reduce probability of occurrence	£70k Flood Damage avoided. MCH methodology. Refer to relevant workstreams for approach.
2.10		Residential intangible	Loss of memorabilia and ill health because of flooding. Investment would reduce probability of occurrence.	£102k Flood Damage avoided. MCH methodology. Refer to relevant workstreams for approach.
2.11		Recreation	Loss in recreational value to non-boat users	£670k WS6, based on published value of tourism, assuming 1 low water level event avoided a year. Refer to relevant workstream for approach.
2.12		Mental health	Mental health impact because of flooding. Investment would reduce probability of occurrence.	£76k Flood Damage avoided MCH methodology Refer to relevant workstreams for approach.

3.6.3 Value Potential

The value potential benefits for this programme are economic, environmental and social. A range of approaches have been used to evaluate benefits including the Outcome Measure 4 (OM4) qualifying benefit rates from the Partnership Funding Calculator, output from SuDS

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Studio, Department of Communities and Local Government’s guidance on Land Value Uplift and CIRIA BEST. Due to the breadth of benefits that the workstreams will deliver, only monetised benefits are reported in this summary. For details of the often-significant non-monetised benefits, please refer to the workstream supporting appendices (2C1 to 2C6.2) for details of these benefits.

The value potential benefits use a maximum of a 40-year appraisal period although NFM (WS1), and culvert monitoring (WS6.1 and WS6.2) use 20 year appraisal periods in recognition of the anticipated lifespan of these investments. In all cases workstreams use consistent appraisal periods for benefits and costs. We have been careful to avoid double counting of benefit.

Note that the innovative funding and culvert monitoring workstreams (WS5, WS6.1 and 6.2) are not expected to provide significant value potential benefits, therefore no monetised value potential benefits are reported for these workstreams.

Table 9 Benefits Framework: Value Potential

Ref	FCERM-AG AST Category	Sub-category	Description	Approach to capturing change
Value Potential				
3.1	Economic	Enabling Development	Land Value Uplift as a result of WS3 and WS4 making development sites more attractive (Frome Gateway) and removing barriers to development in flood prone areas (across city).	£1,884k Value added. WS3 Department for Communities & Local Government (DCLG) Land Value Uplift. WS4 DCLG Land Value Uplift. Refer to relevant workstreams for approach.
3.2	Environment	Biodiversity	Creation and restoration of new habitat types as part of WS1, WS2 and WS3	£749k Value added. WS1 OM4 qualifying benefit. WS2 SuDS Studio output. Refer to relevant workstreams for approach.
3.3		Air quality	WS1 and WS2 will increase vegetation which will help improve air quality with subsequent improvements to health.	£25k Value added. WS1 OM4 qualifying benefit. WS2 SuDS Studio output. Refer to relevant workstreams for approach.

3.4		Amenity	WS1, WS2 and WS3 will have a positive effect on the attractiveness and desirability of the River Frome Corridor. This in turn will improve the wellbeing of people that live, work in, or visit/play or pass through, the area.	£9,620k Value added. WS1 OM4 qualifying benefit. WS2 SuDS Studio output. WS3 CIRIA BEST - uplift to local house prices classified as "amenity" but will have biodiversity and other benefits. Refer to relevant workstreams for approach.
3.5		Building temperature	WS2 will provide shade and help regulate temperatures in urban areas.	£51k Value added. WS2 SuDS Studio output. Refer to relevant workstreams for approach.
3.6		Carbon Sequestration	WS1, WS2 and WS3 will include vegetation and wetlands that will help sequester carbon. WS2 will reduce the energy requirement to pump and treat waste water.	£937k Value added. WS1 OM4 qualifying benefit. WS2 SuDS Studio output. WS3 CIRIA BEST. Refer to relevant workstreams for approach.
3.7		Flows in Watercourse	The scheme is not expected to measurably alter seasonal flows in the watercourse. Via WS3 the condition of the channel morphology within the Frome Gateway area will be improved providing more diverse flow patterns including deeper water in low flow conditions via the formation of pools and riffles.	£284k Value added. WS1 OM4 qualifying benefit. WS3 CIRIA BEST. Refer to relevant workstreams for approach.
3.8		Water Quality	WS1 and WS2 will help improve the water quality in the channel by capturing pollutants at source and the purification of flows within bioretention	£959k Value added. WS1 OM4 qualifying benefit. WS2 SuDS Studio - not monetised. WS3 CIRIA BEST. Refer to

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			<p>areas. The WS3 restored channel will provide better habitat for fish, invertebrates and other species. It will provide good amenity value.</p>	<p>relevant workstreams for approach.</p>
3.9	Social (individual and family)	Education	<p>WS2 will locate SuDS in communities and in some instances near schools. WS3 Frome Gateway restoration is located in the nearest park to an urban primary school. It may lead to nature-based school outings. WS1 will improve the catchment more generally and provide an opportunity for learning about hydrology and ecology across the catchment.</p>	<p>£126k Value added. WS1 OM4 qualifying benefit. WS2 SuDS Studio output. WS3 CIRIA BEST. Refer to relevant workstreams for approach.</p>

3.7 Comparison of costs and benefits

Table 10 summarises the economic appraisal for the proposed investment. As the programme wide benefit cost ratio (BCR) exceeds unity (with and without local growth benefits), it shows that the investment represents good value for money. As the BCR exceeds unity for each workstream the summary also shows how each workstream represents good value for money.

Table 10: Economic appraisal (quantitative, monetised).

Workstream	Present Value Costs PVc £k	Present Value benefits excluding local benefits PVbe £k	Present Value benefits including local benefits PVbi £k	Benefit Cost Ratio excluding local benefits BeCR,	Benefit Cost Ratio including local benefits BiCR
Preparation of OBC (FCERM7 approved £478k)	388.0	NA	NA	NA	NA
Preparation of FBCs	89.2	NA	NA	NA	NA
WS1 – NFM	641.9	3,572.5	3,572.5	5.57	5.6
WS2 – SuDS	962.9	1,909.4	1,909.4	1.98	2.0
WS3 – River Restoration	2,369.4	3,346.0	10,738.2	1.41	4.5
WS4 – Policy Challenge	60.0	-	1,519.7	-	25.3
WS5 – Innovative Funding	99.8	NA	NA	NA	NA
WS6.1 – Hydrometric monitoring of culverts	167.2	845.3	845.3	5.06	5.1
WS6.2 – Structural monitoring of culverts	102.0	564.0	564.0	5.53	5.5
Monitoring, evaluation and dissemination	25.0	NA	NA	NA	NA
Programme management	430.0	NA	NA	NA	NA
Risk	287.9	NA	NA	NA	NA
Optimism bias	1,484.2	NA	NA	NA	NA
Proposal	7,107.3	10,237.3	19,149.1	1.4	2.7

3.8 Sensitivity of the benefits to the level of investment

In compliance with the FCRIP guidance do more and do less scenarios are presented at the bottom of this section that consider approximately 20% less and 20% more investments.

Each workstream has been subjected to a robust optimisation process to identify an optimal combination of actions. Further details are available within the supporting appendices for the workstreams (2C1 to 2C6.2).

- WS1, NFM – using a monetised Cost Benefit Analysis (CBA), only NFM opportunities with a BCR greater than 1.5 (prior to inclusion of risk, optimism bias and programme overheads) have been selected. This approach effectively ensures an incremental BCR greater than unity.
- WS2, SuDS – the top four hotspots were identified, using a monetised CBA for aggregated costs and benefits for whole hotspots; each selected hotspot having a BCR greater than unity. Within the top four hotspots a further optimisation of the sites was then undertaken by narrowing the selection of potential sites to those that achieve both above average multiple benefits per pound invested and SuDS volume per pound invested. This approach has allowed us to identify good SuDS opportunities in the hotspots that are most beneficial.
- WS3 to WS6 – a monetised CBA has not been undertaken for these workstreams. We have used workstream Critical Success Factors to develop a least cost Minimum Viable Product for each workstream, therefore providing evidence of good value.

The +/- 20% do less and do more scenarios presented below cover the Present Value Cost (PVC) of all workstreams and excludes the relatively fixed costs associated with the preparation of the FBCs, monitoring, evaluation and dissemination and programme management. The Risk and Optimism Bias are assumed to scale proportionately with the +/- 20% change. As an alternative to a 20% cut across all the workstreams, we would consider significantly cutting back or dropping one of the workstreams to achieve a 20% saving. The decision on whether to cut back one workstream would be made collectively by the partnership based on all available information at the time.

Table 11: Do Less

Options	PVC £K
As summarised in Section 3.4.1 and detailed in the workstream supplementary appendices (Appendices 2C1 – 2C6.2)	5,484.3
Description of the reduction in benefits	
As detailed in the workstream supplementary appendices (Appendices 2C1-2C6.2). The programme-wide reduction of all the workstreams is anticipated to have a negative impact on value for money, although we still anticipate a BCR > 1. The reduced value for money would primarily be due to the loss of economy of scale, driving up the costs for the more limited sites we progress. We anticipate that it would not be feasible to scale down programme overheads such as the preparation of the OBC, FBCs and Programme Management to the same extent.	

Table 12: Do More

Options	PVc £k
As summarised in Section 3.4.2 and detailed in the workstream supplementary appendices (Appendices 2C1-2C6.2)	7,954.4
Description of the increase in benefits	
As detailed in the workstream supplementary appendices (Appendices 2C1-2C6.2). The programme-wide scaling up of all the workstreams is anticipated to have a neutral impact on value for money. We believe that diminishing returns from the requirement to select more marginal sites and include more marginal activities would be offset by a greater economy of scale allowing additional investment to sustain a strong Incremental Benefit Cost Ratio.	

3.9 Critical Success Factors

The Critical Success Factors (CSF) are the outcomes that are crucial (not desirable) to the successful delivery of the investment. The CSF in Table 13 have been used when optimising all workstreams to define the solution. Additional workstream specific CSF that are crucial at a workstream level have also been used to supplement the programme wide CSF to help focus the workstream optimisation. Refer to the workstream supporting appendices (Appendices 2C1-2C6.2) for further information.

Table 13: Critical Success Factors (CSF)

Ref	CSF	Measurement criteria
1	Strategic fit and business needs	<ul style="list-style-type: none"> - Must support the delivery of the Investment Objectives (Section 2.3). - Must provide holistic fit and synergies with other relevant strategies and programmes (Section 2.1).
2	Value for Money	<ul style="list-style-type: none"> - Benefits must exceed the costs (monetised whole life present value). - Investment must improve flood resilience.
3	Supplier capacity and capability	<ul style="list-style-type: none"> - Within the ability of potential suppliers to deliver the required services. - The project is likely to be commercially attractive to potential suppliers.
4	Affordable	<ul style="list-style-type: none"> - Balanced spend and funding profiles with evidence that funding is (or can be) secured. - Robust contingency arrangements, including clear ownership of responsibility for funding shortfalls.
5	Achievable	<ul style="list-style-type: none"> - Appropriate governance, management, risk management and resources can be put in place to deliver the project.

4 Commercial Case

4.1 Summary of procurement strategy and timescales

The general procurement strategy will be a staged process as follows:

1. Identify most suitable partner lead.
2. Identify suitable existing frameworks / contracts available to the lead partner.
3. Procure using pre-defined arrangements.
4. Where no suitable existing frameworks / contracts are available, lead partner to procure bespoke solution based on relevant procurement regulations and organisation’s rules.

Steps 1 and 2 have largely been completed at this stage. Figure 4 shows the most suitable lead partner identified for each work stream of the programme along with the proposed route(s) to market (see Appendix 4A for a larger version of this graphic).

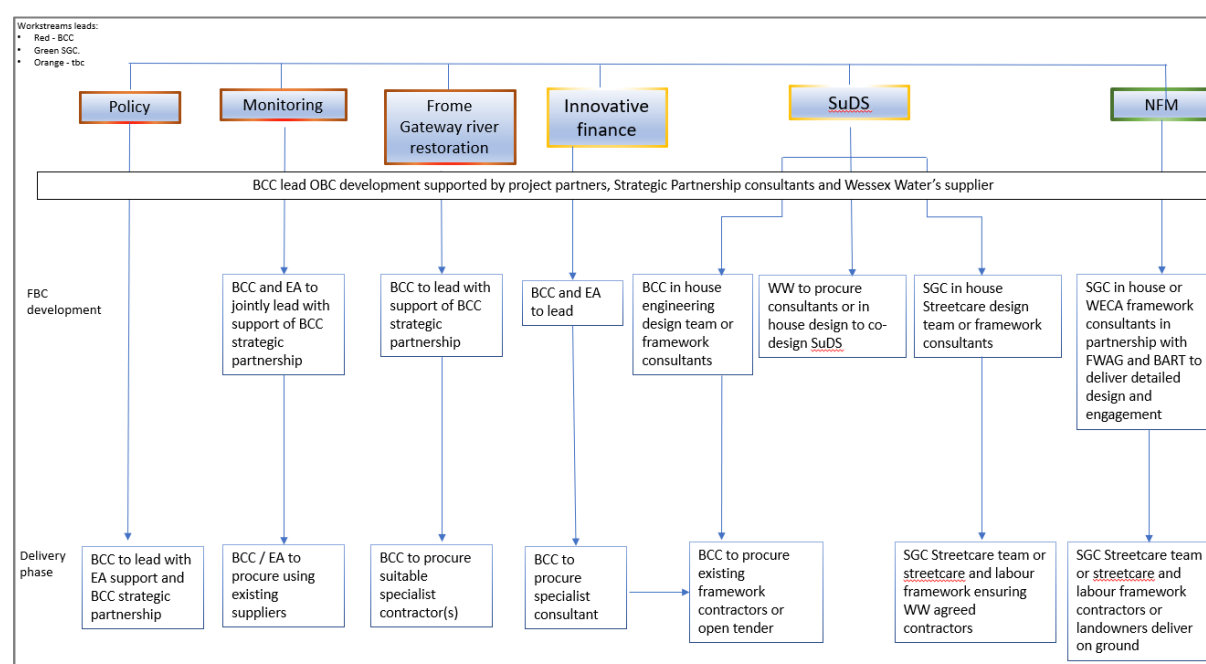


Figure 4: Proposed lead partner and route to market for each workstream

The procurement strategy ensures value for money by utilising existing arrangements that have demonstrated value for money through the competitive bidding process. Where new contracts are to be procured, value for money will be ensured by applying a suitable quality-price ratio in the tender evaluation criteria.

Supplier engagement has informed the procurement approach in several ways, in particular:

- Through engagement with the “wider partnership” (see management case) to identify proven efficient routes to delivery of natural flood management measures.
- By obtaining EA technical specialists’ advice to identify existing supply chains in place to efficiently deliver hydrometry and telemetry solutions.
- By utilising Bristol City Council’s strategic partnership open dialogue arrangements to identify future resource requirements and innovation potential.

Social value is embedded within Bristol City Council’s corporate values and it is a requirement of all contracts to meet minimum requirements in this regard. The Strategic Partnership arrangements include a social value plan, which is based on local suppliers,

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apprenticeships, paid work placements, school age skills programme, diversity, and a focus on priority post codes. As lead partner, Bristol City Council will take responsibility for ensuring social value is also embedded within other contracts that are utilised through the programme.

An example of social value benefits already delivered during the OBC development is a work placement offered to a young person from a Bristol priority postcode to work on the project. The person has now secured a permanent position with consultant Mott MacDonald.

Our full procurement strategy is included in Appendix 4A.

4.2 Contractual terms and risk allocation

Forms of contract that are anticipated to be used in delivering the programme are as shown below.

Table 14: Summary of anticipated forms of contract and the relevant workstreams

Contract	Form	Potential links to work stream(s)
BCC Strategic Partnership Initiative	Crown Commercial Service – Management Consultancy Framework (bespoke terms)	Policy, SuDS, river restoration, monitoring
BCC highways framework	NEC4 Engineering Construction Contract (ECC)	SuDS, culvert monitoring
BCC open tenders	NEC4 preferred	Innovative funding
SGC WECA framework	NEC4 Professional Services Contract (PSC) or NEC4 Professional Services Short Contract (PSSC)	SuDS, NFM
SGC Streetcare labour framework	SGC Framework Agreement (bespoke SGC terms)	SuDS, NFM
SGC others	ESPO Framework 664 Consultancy Services Framework (bespoke ESPO terms)	SuDS, NFM
Wessex Water design framework	NEC3 Engineering Construction Contract (ECC) Option C	SuDS
Wessex Water reactive design framework	NEC3 Engineering Construction Contract (ECC) Option A or Option E	SuDS

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Wessex Water minor civils framework	NEC3 Engineering Construction Contract (ECC) Option A or NEC3 Engineering Construction Short Contract (EC Short) or Supply of Goods and Services (SOGAS) <£20k	SuDS
Wessex Water modelling framework	NEC3 Professional Services Contract (PSC) Option A or Option E	SuDS, NFM
Wessex Water internal design	Cost reimbursement	SuDS
Wessex Water internal modelling	Cost reimbursement	SuDS, NFM

Risks will be managed at an individual project level during delivery through a risk register to be owned jointly by the client and supplier(s). At a programme level, risks will be managed through the governance arrangements as set out in the management case.

To manage risks post-delivery, it will be important to identify the risks during the delivery stage. A key risk identified at this stage for example is ongoing maintenance of assets created during the delivery stage. This will be managed through engagement with relevant organisations and teams within the partnership to ensure post-delivery risks are understood with mitigation in place to manage those risks.

4.3 Innovation and commercial issues

Inherent project risks due to the innovative nature of the project will be minimised through the procurement strategy that uses a blended approach of established, multi-disciplinary consultants and civils contractors, together with not-for-profit organisations who have practical experience of implementing innovative solutions. Our engagement with this broad range of suppliers has shown that there is a market to deliver the types of intervention we propose in several ways.

To ensure innovation is at the heart of the programme, it is proposed to utilise Bristol City Council's Innovation Board. This board is set up to get the best out of suppliers. The board takes "problem statements" from the council and draws on its broad range of experience from three major multi-disciplinary consultants to offer innovative solutions. The board is part of the commitment from the Strategic Partnership to encourage innovation and comes at no cost to individual projects.

The strategic partner has also committed to a research paper, funded by its own research and development budget, to learn from the projects delivered within the programme. The paper will be the intellectual property of the partnership and offered freely to wider stakeholders to ensure public availability and the ability to replicate learning across the industry.

Arrangements regarding Intellectual property rights are addressed in the partnership collaboration agreement. It sets out that Partners shall own the Foreground Rights jointly and in equal shares. It also states that Foreground Rights may be used for subsequent

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projects, subject to the written agreement of the relevant Partners, and agreement shall not be unreasonably withheld or delayed. This approach will ensure public availability and use of the learning, evidence, and project outputs.

Contractual arrangements regarding intellectual property will be dealt with on a contract specific basis. Generally speaking, local authority contracts include a clause to transfer intellectual property to the client. In the case of NEC professional services contracts, this can be ensured by applying option X9. In the case of other contract forms, intellectual property rights will be addressed to ensure intellectual property can be made publicly available.

5 Financial Case

5.1 Summary of Project Cost and Whole Life Cost

A breakdown of the project cost is presented in Table 15. Further details of the derivation of costs for each workstream are presented in Appendix 2C1 to 2C6.2. Aligning with the guidance, optimism bias and a risk contingency (50th percentile) are also included in the costing.

In the delivery phase the costing includes the preparation of the OBC and subsequent workstream FBCs, construction, consult support, supervision and land compensation. Monitoring, learning and evaluation costs are also included.

Engagement will be led by the Programme Manager, with an allowance (we assume 90% of the Programme Manager’s time will be charged to the project) for additional support from the partners’ engagement teams. The workstreams also include allowances for workstream specific engagement e.g. engaging with landowners for NFM and SuDS, stakeholders for the policy challenge and businesses for the innovative funding.

Table 15: Project Cost (not discounted)

Cost heading	Cash Cost (£k)
Costs up to OBC	
Costs up to OBC	388.0
Sub-Total (A)	388.0
Full-Business Case Development Cost	
Staff and external consultant costs	89.2
Design, site investigation and survey	587.5
Programme Manager (also leading engagement)	107.5
Staff and external consultant costs	235.2
Sub-total (B)	1,019.4
Construction, supervision and delivery costs of resilience actions	
Construction/delivery	2,847.0
Consultant/delivery	376.1
Supervision	143.7
Land purchase and compensation	30.2
Payment to operating body	55.3
Programme Manager (also leading engagement)	215.0
Optimism bias (30%)	1,100.2
Contingency/risk allowance (50th percentile)	287.9
Sub-total (C)	5,055.4
Monitoring, learning, evaluation and dissemination	
Monitoring, evaluation and dissemination - external and expenses	25.0
Programme Manager	107.5
Contingency/risk allowance (30% optimism bias)	39.8
Sub-total (D)	172.3
Inflation	
Inflation allowance	559.0
Sub-total (E)	559.0
Total Project Value	
Total Project Value for approval (A+B+C+D+E)	7,194.9

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Table 16 presents the whole life cost of the project. As the Business as Usual case has been used as the appraisal baseline, only operation and maintenance costs additional to those currently incurred are reported (refer to Section 5.5 on future funding and financing for further details).

Table 16: Whole Life Cost (not discounted)

Cost heading	Cash Cost (£k)
Total Project Value from table above (F)	7,194.9
Post-project cost	
Future operation, monitoring and maintenance costs	653.3
Future capital replacement costs	0.0
Optimism bias for future costs	196.0
Sub-total (G)	849.3
Total Whole-Life Cost	
Total Whole-Life Cost (F+G)	8,044.3

5.2 Financial risks and optimism bias

The management of risk and the setting of appropriate contingencies has been undertaken at a programme level. The financial risks and optimism bias have been assessed in line with guidance issued to the Frome CIP project teams on 29/11/21 by Defra/EA.

- Quantified risk register using The Small Projects Risk Tool (Environment Agency, 2021) (Appendix 3C). The economic and financial case both utilise the 50th percentile costing. We have adopted the 50th percentile as the Frome CIP has a high adaptive capacity as outlined in our contingency plans in Section 6.10.
- A 30% optimism bias has been applied to all costs in line with EA guidance on optimism bias for OBCs.

Risk management workshops have been used throughout the preparation of the OBC and will continue to be used during the project delivery phase to identify and manage risks. The risk management workshops have been used to populate the risk register (Appendix 3C).

5.3 Funding sources and contributions

A summary of funding sources is presented below. We recognise that some funding is unsecured. As identified in our contingency plans in Section 6.10, the workstream nature of this proposed investment, Frome CIP, gives us flexibility to adjust the investment to match the available funding. To avoid jeopardising relationships we have not engaged with key land stakeholders, farmers, landowners, developers, businesses etc. to discuss specific opportunities in advance of the OBC being approved. Following OBC approval we will engage with the key land stakeholders and identify specific sites and opportunities and scope potential sources of additional funding.

Table 17: Funding sources and contributions

Source of funding	£k	Comments
Resilience Fund Allocation	6,519.6	£6,000k secured via EoI. We have an adaptive plan in place if the additional funding is not secured – Section 6.10.
SGC Climate Emergency Fund	200.0	SGC Climate Emergency Funding - £200k secured. This will be split between the NFM and SuDS workstreams. The funding has few constraints beyond increasing resilience and flood/biodiversity gain.
Innovative private funding - conservative estimate (target £200k)	125.0	Unsecured. We have an adaptive plan in place if this funding is not secured – Section 6.10
Wessex Water	100.0	Unsecured. We have an adaptive plan in place if this funding is not secured – Section 6.10
Frome Gateway income generation - potential	250.0	Unsecured. We have an adaptive plan in place if this funding is not secured – Section 6.10
Maintenance of NFM assets by landowners	In kind. Reported as £0 (zero)	Our working principle is that we will only install NFM where this places no maintenance commitment on the partner organisations. Hence, for NFM to be attractive the maintenance cost to landowners/ volunteers must be offset by a benefit to that party.
Maintenance of SuDS assets by landowners, local business or adoption by Wessex Water	In kind. Reported as £0 (zero)	Our working principle is that we will only install SuDS where this places no unfunded maintenance commitment on the partner organisations. Hence, for SuDS to be attractive the maintenance cost to landowners or businesses must be offset by a benefit to that party.

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Source of funding	£k	Comments
Wessex Water	In kind. Reported as £0 (zero)	The programme was able to piggyback Wessex Water's commissions to undertake opportunity mapping using NFM Studio and SuDS Studio. This gave us an economy of scale. Estimated to be a £40k saving.
Total funding	7,194.6	

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5.4 Expenditure and Funding Profile (2021-2027)

Table 18: Expenditure Profile (2021-2027)

Costs per year (£k)	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027	Total (£k)
OBC preparation	338.0	50.0					388.0
Full-Business Case Development Cost		29.6	29.7	19.8	10.0		89.2
WS1 – NFM			195.0	195.0	195.0		585.1
WS2 – SuDS			272.0	272.0	272.0		816.0
WS3 – River Restoration					1,109.6	1,109.6	2,219.2
WS4 – Policy Challenge		57.0	3.0				60.0
WS5 – Innovative Funding			39.9	29.9	29.9		99.8
WS6.1 – Hydro' culvert monitoring		12.0	155.2				167.2
WS6.2 – Structural culvert monitoring		46.1	46.1				92.3
Monitoring, evaluation and dissemination		7.5	5.0	2.5	2.5	7.5	25.0
Programme Manager (also leading engagement)		86.0	86.0	86.0	86.0	86.0	430.0
Risk and optimism		332.6	332.6	332.6	332.6	332.6	1,663.0
Inflation *		15.5	59.0	72.1	211.5	201.8	559.9
Total	338.0	636.3	1,223.5	1,010.0	2,249.2	1,737.5	7,194.6

* Inflation assumes 2.5%

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Table 19 Funding Profile £k (2021-2027)

Funding per year (£k)	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027	Total (£k)
Resilience Fund Allocation	338.0	636.3	998.5	910.0	2,149.2	1,487.5	6,519.6
SGC Climate Emergency Fund			200.0				200.0
Innovative private funding - conservative estimate (target £200k)			25.0	50.0	50.0		125.0
Wessex Water				50.0	50.0		100.0
Frome Gateway contributions and income generation - potential						250.0	250.0
Total	338.0	636.3	1,223.5	1,010.0	2,249.2	1,737.5	7,194.6

5.5 Future funding and financing

After 2027, the programme will require significant ongoing investment (over the existing Business as Usual) to continue to achieve the cited benefits. In recognition of the difficulty organisations have committing to long term funding we have limited the appraisal period to a maximum of 40 years, with NFM (WS1) and Culvert Monitoring (WS6) limited to 20 years, and the Policy Challenge (WS4) and Innovative Funding (WS5) being limited to the duration of the Frome CIP capital delivery programme. The funding of maintenance post 2027 is summarised below.

Table 20: Summary of future funding requirements.

Activity	Annual cost to Partners over BaU baseline (£k/Yr)	Proposed financing
WS1 NFM assets	No increase over existing	Our working principle is that we will only install NFM where this places no unfunded maintenance commitment on the partner organisations. Building on FWAG's experiences working in the catchment, it is our intention that landowners/volunteers will maintain NFM. This requires costs to be offset against benefits to the maintaining party be that capturing topsoil on the farm, improving shelter for livestock, improving the landscape around businesses or via access to external environment funding/subsidies.
WS1 NFM farm advisor visits	2.56	To be effective farm advice visits will need to be repeated at approximately 5 yearly intervals. If these do not occur, then the

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Activity	Annual cost to Partners over BaU baseline (£k/Yr)	Proposed financing
		<p>benefits of the farm advice visits will be lost. We propose that the evidence collected by this workstream will give us the evidence we need to apply for and secure funding to keep on doing farm visits. Catchment Sensitive Farming is expanding into the Frome Catchment so this could provide a potential source of funding for this activity. The funding source for follow up visits has not been identified. If this activity ceases it will have no impact on other workstreams.</p>
WS2 SuDS	No increase over existing	<p>Our post OBC site selection for SuDS will prioritise the selection of SuDS opportunities where robust future operation and maintenance arrangements can be put in place with minimal or no financial commitments from the partners. The OBC optimisation has identified approximately 45 “good” sites, with our proposal to progress around 4 to 8 of the sites. This will allow us to be selective in the sites we chose post OBC, with future maintenance being a key part of this decision. Our primary preference is for the site owner to take on full responsibility for SuDS assets.</p> <p>As another option, Wessex Water will consider the adoption of SuDS that fall under the Sewerage Sector Guidance provided the SuDS comply with the required design standards.</p> <p>If we cannot put in place suitable funding arrangements for operation and maintenance, we will not install SuDS. Any cost saving will be diverted to other workstreams where there is evidence that good value for money can be achieved with the additional budget.</p>
WS3 Maintenance of left bank	No increase over existing	<p>The left bank will not be altered by the investment (improved access and creation of 2 stage channel should serve to reduce maintenance costs). Maintenance will continue to be funded by riparian owners as per existing well established maintenance responsibilities.</p>
WS3 Maintenance of channel	No increase over existing	<p>Inspection and minor maintenance activities (e.g. debris clearance) by EA in line with the EA’s existing main river responsibilities. This would be funded via the EA’s existing funding arrangements.</p>
WS3 Maintenance of right bank and park	No increase over existing	<p>The maintenance of the right bank will reduce the maintenance responsibility for BCC as the right bank riparian owner. There will be a switch from infrequent high value capital maintenance of the retaining wall to more frequent low value maintenance. The day-to-day maintenance within the park is largely unchanged and will continue to be funded by BCC’s parks team. The footpaths and cycleway will continue to be funded by the council’s existing arrangements.</p>
WS3 Raised boardwalk structure	6.7	<p>We are exploring several approaches to fund the long-term maintenance of the boardwalk structure but currently have no secured long term funding arrangements in place. Potential funding arrangements include:</p> <ul style="list-style-type: none"> - Securing a long-term commitment from a developer at the Frome Gateway to maintain the boardwalk either by a financial contribution to enable BCC to maintain, or via the developer entering into an agreement to maintain the structure on BCC’s behalf. Developers may be motivated to fund this activity due to improved access to the Frome Gateway, amenity value for users of the development and placemaking that it would provide (all combining to increase the value that developers could extract from the Frome Gateway site).

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Activity	Annual cost to Partners over BaU baseline (£k/Yr)	Proposed financing
		<ul style="list-style-type: none"> - We have the potential to generate revenue from the boardwalk via the creation of kiosks etc. This would be dependent on the Frome Gateway development. - If funding of the maintenance cannot be secured, then we will remove the boardwalk from the proposal. Savings would be redirected to another part of the programme where there is evidence that good value for money can be achieved with the additional funding.
WS4 Policy Challenge	No increase over existing	This investment will result in no future funding commitment. Any subsequent investment would be subject to a separate approval.
WS5 Innovative Private Funding	No increase over existing	The continuation of this revenue workstream beyond 2027 is subject to the workstream successfully generating enough funding to allow it to become self-sustaining. If it fails to deliver a good rate of return it would be stopped.
WS6.1 Wade Street, Broad Weir and Netham Locks Flow Monitoring Sites	3.8	The economic analysis identified that using the EA's existing hydrometric IT infrastructure was best value, but a requirement of using the EA's IT is that long term funding is confirmed. As part of the capital delivery, BCC will pay an agreed commuted sum to the EA for the long-term operation of the sites. This cost is already included in the capital delivery of the workstream.
WS6.1 Data management system	No increase over existing	Included in the above commuted sums
WS6.2 Structural monitoring of culverts	No increase over existing	<p>The EA and BCC will continue to undertake surveys in line with their riparian owner duties using existing funding arrangements. It is anticipated that the evidence created by this workstream would help secure funding for General and Principal Inspections.</p> <p>The online digital twin would be maintained by BCC and funded from the flood risk management team's existing revenue funding in recognition that they system enables the team to be more efficient and deliver cost savings elsewhere in its BaU activities.</p>

6 Management Case

6.1 Governance and partnership arrangements

The partnership arrangements proposed for delivery build on the established and successful River Frome Reconnected (RFR) Partnership (see Appendix 6A). RFR is a voluntary partnership of organisations, working collaboratively to provide a strategic and joined-up approach to facilitate the delivery of improvements and multiple benefits to the Bristol Frome Catchment. This collaborative approach has been adopted to enable the partnership to work within a flexible structure and respond to opportunities as they arise. The RFR is supported by the Bristol Avon Catchment Partnership (BACP) who offer strategic guidance. Core funding partners include the BACP, BCC, EA, SGC, and Wessex Water.

The relationship with the wider community includes a ‘wider Partnership’, which is informal and open to organisations who wish to be engaged in a more joined-up approach to the delivery of improvements and multiple-benefit projects on the Bristol Frome Catchment. Such organisations could be involved in individual projects as delivery agents or more generally, as interested parties. The RFR aims to support Local Nature Partnerships and other relevant partnerships.

The partnership is managed by agreed terms of reference. Figure 5 is taken from those terms illustrating the relationship with wider stakeholders and the wider community. The Frome Forum included in Figure 5 is a community of individuals and local groups and organisations and aims to work with local communities to share information and enable joined up action on the ground. This forum will assist engagement and public participation throughout the Innovation programme.

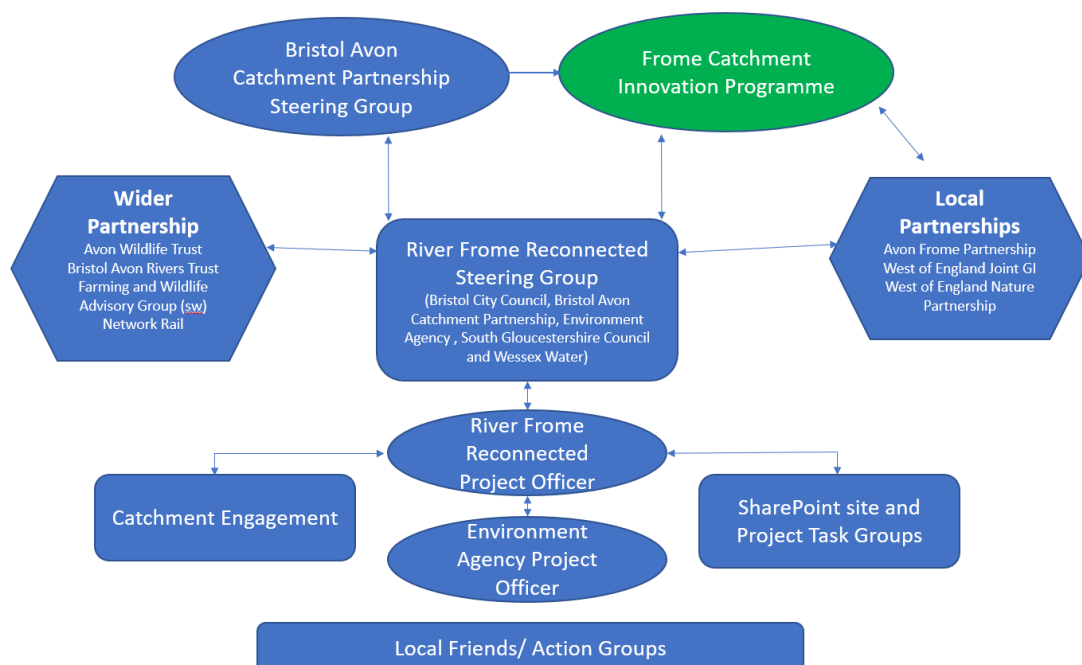


Figure 5: The Partnership’s relationship with wider stakeholders and the wider community

A collaboration agreement specific to the innovation programme has also been developed as a more formal agreement to the RFR terms of reference. This agreement ensures transparency, sets out expectations of the partners and addresses issues of legality,

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intellectual property, liability, and financial arrangements. The draft agreement is included in Appendix 6A.

Commitment of each organisation's leadership team is integral to the success of the partnership and is described further in role and responsibilities in section 6.2. The proposed governance arrangements mean ultimate responsibility for addressing risk and uncertainty including change management sits with a Director's board. This group includes representation from each organisation at a director level, providing adequate financial schemes of delegation to be able to swiftly resolve risks that may materialise into issues.

The varied corporate objectives, values and behaviours of each organisation together with proposed governance arrangements mean that the proposed resilience outcomes will be delivered in such a way as to ensure multiple benefits and enhanced learning opportunities. One such example to illustrate the potential is Wessex Water's focus on reducing CSO spills; by retrofitting SuDS in a way to contribute towards that objective, it may also contribute towards the ecological emergencies declared by the council partners, help deliver WFD objectives and provide a learning opportunity to evaluate the impact of large-scale retrofitting SuDS on CSO spills.

6.2 Project management, roles and responsibilities

The innovation programme will be managed by a central project decision making hierarchy, complemented by each partner's organisational project management and decision-making process. A summary of the proposed central programme management structure is presented below.

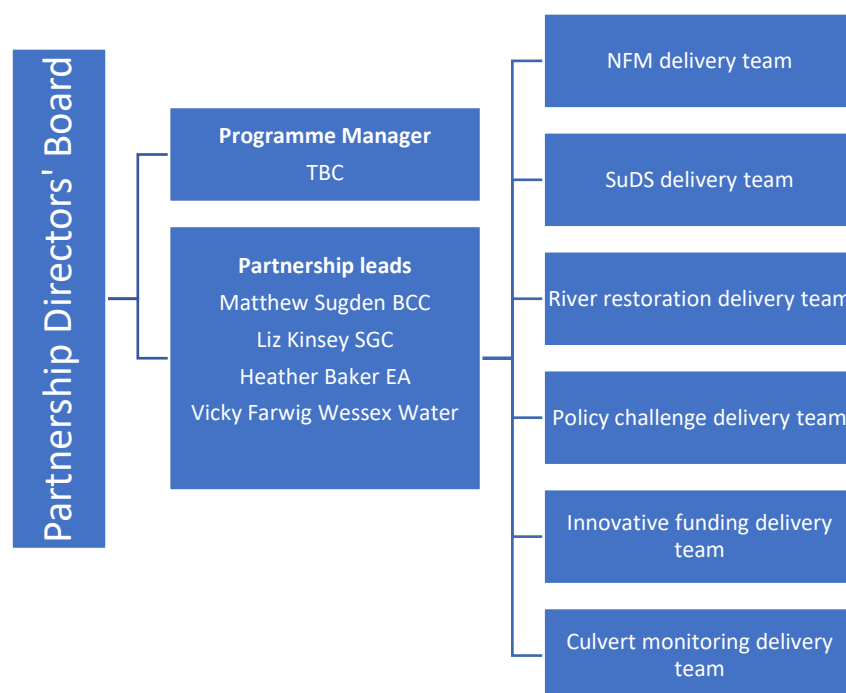


Figure 6: Proposed central programme management structure

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As the lead partner, BCC's values and behaviours will be at the heart of the programme. The BCC's corporate strategy² sets out five values and behaviours as a way of delivering its vision. Amongst other values, it expects employees of the council and its suppliers to be Curious, and Collaborative. It requires us to be bold, and try new things, and it states our belief that there are always ways to do things better. We believe these values will ensure innovation is placed at the heart of the delivery and management processes and is reflected in the values of each of the project partners. For example, Matt Wheeldon, Director of Assets and Compliance at Wessex Water, and representative on the directors' board noted that:

Surface water flow and biodiversity don't work in isolation or within man-made, administrative borders. It's only by working together across our boundaries that we can work with nature to help us to deliver multiple outcomes and deliver sustainable flood risk management and water quality improvements³

Quality is of paramount importance to the partnership given the focus on innovation. Therefore, it is important to ensure the innovation programme deliverables meet the expected and stated standards and requirements set out at the beginning of each project. Each partnership lead will follow its own organisation's quality plan arrangements and report centrally to the programme manager and subsequently to the director's board as required. It is proposed to produce a Project Quality Plan as an overarching document to be owned by the partnership. More detailed plans focusing on specific issues to each workstream will be produced by the lead partner in accordance with that organisation's quality plan arrangements.

As an illustration, BCC's quality plan arrangements for projects delivered within the transport service (including lead local flood authority) follow a five-stage quality assurance process. The process is provided in Appendix 6B.

6.3 Skills and capacity

The partnership benefits from a range of knowledge, skills and experience to drive innovation. It is further supported by suppliers and other organisations with experience of delivering innovative solutions. Such experience includes:

- Wessex Water's in house hydraulic modelling team and innovative opportunity mapping tools SuDS and NFM Studios, supported by suppliers Atkins.
- BCC's Lead Local Flood Authority flood risk engineers' knowledge and experience of delivering successful SuDS retrofit schemes (most recently in 2021), supported by in house engineering design, landscape, housing, and highways teams.
- EA's experience of working with suppliers to deliver innovative funding initiatives through the trade marked Landscape Enterprise Networks process.
- SGC's River Frome Reconnected project officer's wealth of knowledge of issues and opportunities in the river Frome catchment, and close working relationships with the Bristol Avon Rivers Trust and Farming and Wildlife Advisory Group, providing innovative approaches to commercial arrangements to drive efficiency and value for money.

² [Corporate Strategy - bristol.gov.uk](https://www.bristol.gov.uk/corporate-strategy)

³ [New funding announced for innovative flood resilience project - bristol.gov.uk](https://www.bristol.gov.uk/new-funding-announced-for-innovative-flood-resilience-project)

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- EA's experience of delivering and operating innovative monitoring and telemetry.

Knowledge skills and expertise yet to be acquired is principally in two areas; detailed design work and programme management resource availability. To acquire these resources, extensive existing supplier arrangements will be drawn upon as described in the commercial case. To acquire programme management resource, a dedicated programme manager is to be recruited by BCC as the lead partner following approval of the OBC. Furthermore, each organisation has a wealth of experienced communications and engagement teams already involved in the project, and will continue to support the partnership with innovative engagement approaches.

Our detailed plans for monitoring and evaluation will ensure learning through innovation. These plans will foster a learning culture within the team, and is already evident through the appetite to learn from the organisations' more junior representatives involved in the programme. In the case of river restoration in the Frome Gateway area, we are also working closely with an embedded researcher focused on how non-communicable diseases can be prevented by changing the way that urban development decisions are made (see for more information).

Our programme proposes a mix of flood resilience measures that mirrors the rural to urban nature of the Frome catchment and places partnerships, citizen science and engagement at the core. The core partnership is passionate about innovation, with experience of delivering innovative resilience measures through past projects, and implementing innovative delivery models through partnerships with not-for-profit organisations. We believe this passion and experience, bolstered by existing relationships with a range of suppliers and stakeholders, provides the necessary skills and expertise to drive innovation throughout the programme lifecycle.

We are aware of other projects amongst the 25 across the country that seek to deliver similar innovative resilience measures, including SuDS retrofit in Slough and Cornwall's natural flood management proposals. To capture evidence and learning as part of innovation management, we intend to work closely with other project to share experience and learn from each other's successes and failures. In the West of England, it is the intention of the existing South West Flood Risk Managers Group to form an innovation and resilience sub-group formed by the four LLFA's within the south west involved in the programme. This is another example of the existing skills, resource and partnerships in place to facilitate and drive innovation.

6.4 Programme

The detailed programme to FBC is provided in Appendix 6C. Our approach is to develop separate FBCs for each work stream given the differences in content to each and the timescales involved. Those work streams with greater certainty to date, and / or with shorter lead in times (due primarily to engagement and consultation requirements) will present FBCs in a relative short time frame, whereas others will undergo a longer period of engagement, site selection, detailed options appraisal and so forth prior to the finalisation of the FBC. These activities are shown on the programme where appropriate together with the critical path and time allowances for risk.

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The immediate key milestones for the programme are the FBC approvals. These have been programmed to coincide with quarterly directors' board meetings for assurance and review, which is one of the key terms of reference of that board.

In the case of the Policy Challenge Area, it is assumed a FBC for this element is not required, given the expectation to report to Defra by April 2023. A key dependency for this work is the availability of stakeholders to engage in the time frame required. Early engagement to date has indicated a willingness to engage in this process from key stakeholders, thanks to the expected learning benefits this is expected to provide in a short timescale.

A summary timeline of the full programme is presented below.

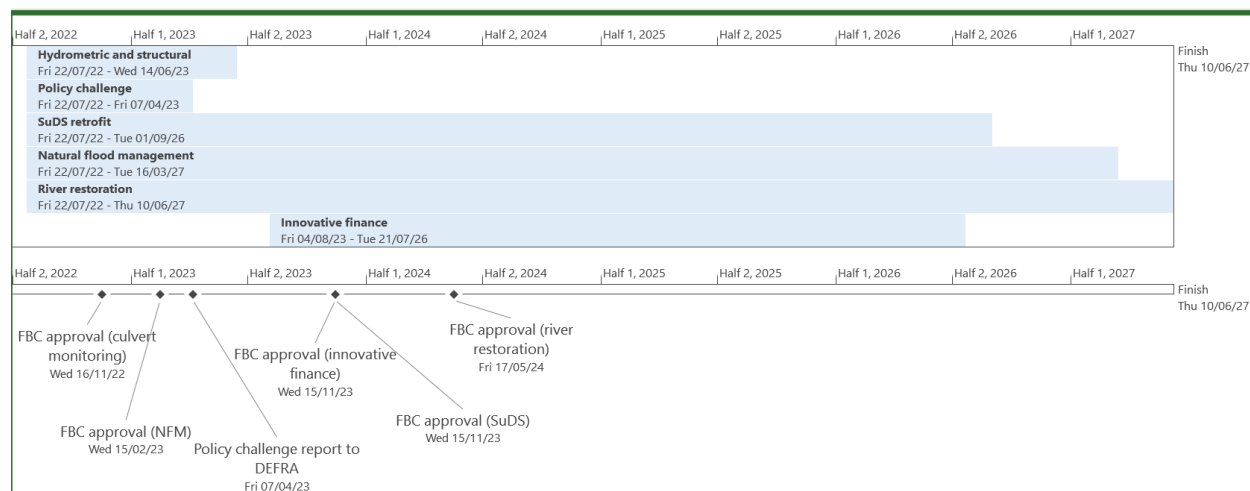


Figure 7: Frome CIP summary timeline

6.5 Communications, stakeholder and community engagement

6.5.1 Communications

A Programme Manager will be recruited to become the face of Frome CIP helping to give continuity to stakeholders who may otherwise be exposed to many officers, consultants, contractors, and other stakeholders. Communications will be overseen by the Programme Manager with support from partner organisations' communications teams. Engagement will continue during the preparation of the FBCs and throughout the delivery of this proposed investment, Frome CIP.

Programme partners have worked collaboratively to develop a Stakeholder Engagement Framework for the programme as a whole (See appendix 2A). This document will ensure consistent messaging and alignment of communications across this and other programmes to avoid engagement fatigue. It sets out:

- Engagement carried out to date
- Key stakeholders
- Interest/influence levels
- Priority stakeholder groups
- Engagement objectives
- Key messages across the programme and possible engagement approaches for each stakeholder group
- Indicative timescales for key activities over the next 18 months and

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- Risks relevant to the programme.

In recognition that each workstream has unique engagement requirements, individual workstream communications plans will be delivered post OBC led by the workstream lead partner's communication leads. These plans will be developed as part of the FBC process.

6.5.2 Stakeholder engagement

The innovation project team has identified and prioritised key stakeholders into groups according to the type of engagement that might be needed. Four groups have been set out; landowners, asset maintainers, political and leadership and harder to reach local communities. The prioritised groups are those that will be focused on first during the next 18 months.

It is likely that the engagement of stakeholders will involve a combination of approaches for different objectives and different stakeholder groups, at different stages of the programme. These were discussed in line with the EA's "Working with Others" guidance. For each of the prioritised stakeholder groups a message house was created to give more detail on the engagement, including objectives relevant to these particular groups, possible objections and engagement methods. These can be found in Appendix 2A. Workstream leads will use this information to help develop individual communications plans for each workstream and to continue to develop communication approaches. For example, the NFM workstream will be most relevant to the group 1- landowners while the SuDS workstream will link with both landowners and asset maintainers.

In addition, the River Frome Reconnected (RFR) has a good relationship with the wider community and works with multiple organisations/group wishing to be engaged in a more joined-up approach to the delivery of improvements and multiple-benefit projects relevant to the Bristol Frome Catchment. The RFR will continue to support the innovation programme.

6.5.3 Community engagement

A summary of engagement carried out to date within the workstreams can be found in Appendix 2 A (annex 1). The innovation programme will benefit from a community forum which already exists, the Frome Forum. This is a community of individuals, local groups and organisations aiming to work with local communities to share information and enable joined up action on the ground. Through the innovation programme there is potential to expand this network of organisations, which already has good attendance to reach all parts of the catchment. The forum will assist engagement and public participation throughout the innovation programme. The programme will also be able to gain from existing programme partner communication channels and we are looking to align with parallel funded projects such as SuDs in schools to explore and progress ways to best engagement within the education sector.

In addition, we are looking to proactively identify gaps/disparities and identify positive action which can be taken through the programme over the next 6 years to eliminate them.

We will seek to identify and define hard to reach communities through existing networks and champions and identify specific organisations to help us consider the best approaches to ensure our engagement is meaningful. We will build on our existing knowledge and understanding from previous engagement work in some areas.

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Approaches may include getting literature translated in community languages, holding workshops at a time and location that will make it accessible for these community members, having a presence at community events and creating relevant materials that will engage different communities such as increased use of social media for young people.

6.6 Risk and change management

A significant effort has been made to identify, assess and plan for risks. Risks have been identified and managed in compliance with the EA's guidance on risk management using a series of risk workshops. The register is presented in Appendix 3C along with summaries breaking the risks down by aspect and workstream in Figure 8 and Figure 9 respectively. The primary risks for this workstream are presented in Table 21.

Row Labels	Count of Risk Status	Sum of MEV	Sum of Share of 50th percentile	Sum of Share of 95th percentile
Consents	4	£ 10,729	£ 10,690	£ 26,061
Environment	4	£ 9,500	£ 9,465	£ 23,075
Governance	3	£ 8,583	£ 8,552	£ 20,849
Ground	4	£ 72,221	£ 71,956	£ 175,422
Interface	3	£ 9,750	£ 9,714	£ 23,682
Land	4	£ 5,429	£ 5,409	£ 13,187
Materials	4	£ 5,583	£ 5,563	£ 13,562
Monitoring & evaluation	1	£ 4,333	£ 4,317	£ 10,526
Stakeholder	11	£ 45,958	£ 45,790	£ 111,631
Strategic	2	£ 30,000	£ 29,890	£ 72,869
Supplier	10	£ 68,667	£ 68,415	£ 166,789
Weather	5	£ 19,083	£ 19,013	£ 46,353
Grand Total	55	£ 289,838	£ 288,776	£ 704,005

Figure 8: Summary of risks by aspect

Row Labels	Count of Risk Status	Sum of MEV	Sum of Share of 50th percentile	Sum of Share of 95th percentile
NFM	8	£ 34,333	£ 34,208	£ 83,394
Programme wide (inc OB)	1	£ 30,000	£ 29,890	£ 72,869
Post delivery (monitoring)	1	£ 4,333	£ 4,317	£ 10,526
Programme wide (inc. OE)	8	£ 51,750	£ 51,561	£ 125,699
SuDS	9	£ 54,833	£ 54,633	£ 133,188
Frome Gateway	10	£ 94,875	£ 94,528	£ 230,448
Culvert monitoring	9	£ 6,921	£ 6,895	£ 16,810
Innovative Funding	5	£ 10,000	£ 9,963	£ 24,290
Policy Challenge	4	£ 2,792	£ 2,781	£ 6,781
Grand Total	55	£ 289,838	£ 288,776	£ 704,005

Figure 9: Summary of risks by workstream

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Table 21: Key risks to fulfilling the investment objectives

Ref	Key Risks	Probability (%) and MEV (£k)	Owner	Counter Measures and approach
1	Geotechnical issue(s) at the Frome Gateway site - more contaminated land than expected, wet ground, weak ground, unidentified buried services. Then the risk of delay and cost increase leading to variations, due to a) Late modification of proposals to avoid impact and mitigate b) Designing mitigations c) Implementing mitigations.	30% £45k	BCC	Seek advice from appropriate specialists and complete appropriate studies. Undertake predesign utility searches. Plan works for suitable season. Avoid working areas with geotechnical risks or potential utilities. Develop flexible designs that are tolerant of poor ground conditions.
2	Inflation exceeds the allowance in costing.	10% £30k	BCC	Plan ahead by monitoring inflation forecasts, building inflation into costing and adjusting plans as the evidence changes. Do not unnecessarily delay delivery.
3	If there is failure to secure agreements to maintain new assets. Then the risk of delay and cost increase leading to variations, due to a) Late changes in scope/design b) Additional negotiation time c) Additional time resolving disputes d) Redesign to reduce maintenance e) Additional cost to secure agreements	25% £25k	BCC passing to workstream lead	Minimising the need for future maintenance. Early engagement with stakeholders about maintenance. Open and frank discussions about who will maintain what. Be prepared to drop "good options" that no one will maintain. Re-distribution of funding to other work streams. Use of capital funding to include measures to enable others to maintain.
4	Geotechnical issue(s) at SuDS site(s) - contaminated land, wet ground, weak ground, buried services. Then the risk of delay and cost increase leading to variations, due to a) Late modification of SuDS proposals to avoid impact and mitigate b) Designing mitigations c) Implementing mitigations.	30% £25k	BCC passing to workstream lead	Seek advice from appropriate specialists and complete appropriate studies. Undertake pre design utility searches. Plan works for suitable season. Avoid working areas with geotechnical risks or potential utilities. Develop flexible designs that are tolerant of poor ground conditions.
5	If the tender outturn cost for delivery of the works at Frome Gateway exceed the cost estimate at outline business case. Then the risk of delay and cost increase leading to variations, due	20% £22k	BCC	Engage potential suppliers during the preparation of business case to support the early development of options. Use of experienced quantity surveyor to prepare cost estimate

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Ref	Key Risks	Probability (%) and MEV (£k)	Owner	Counter Measures and approach
	to a) Redesign to reduce costs b) Reduction in benefits or quality			Clearly defined scope prior to tendering Effective challenging of scope and costing Incentivise delivery team to deliver the workstream within the allocated budget
6	If the tender outturn cost for delivery of the NFM on site due to procurement or otherwise exceed the cost estimate at outline business case. e.g if complex floodplain reconnection site chosen Then the risk of delay and cost increase leading to variations, due to a) Securing a redesign to reduce costs b) Reduction in benefits or quality	30% £16k	BCC passing to workstream lead	Engage potential suppliers during the preparation of business case to support the early development of options Clearly defined scope prior to tendering Effective challenging of scope and costing Incentivise delivery team to deliver the workstream within the allocated budget
7	If the tender outturn cost for delivery of the SuDS on site exceed the cost estimate at outline business case. Then the risk of delay and cost increase leading to variations, due to a) Redesign to reduce costs b) Reduction in benefits or quality	20% £10k	BCC passing to workstream lead	Using lessons learnt from Wessex Water costing exercise Clearly defined scope prior to tendering Effective challenging of scope and costing Incentivise delivery team to deliver the workstream within the allocated budget

6.7 Contract management

The commercial case describes the process for identifying the appropriate partner(s) to lead individual work streams. It will be the responsibility of that lead partner to manage the contract(s) associated with that work stream on a day-to-day basis. It will be made clear to suppliers working with the partnership that advice from any partner other than the contracted partner will not be taken as an instruction.

6.8 Assurance

In compliance with the Flood and Coastal Resilience Innovation Programme funding rules, the investment proposed within this business case will be subjected to independent assurance as detailed below.

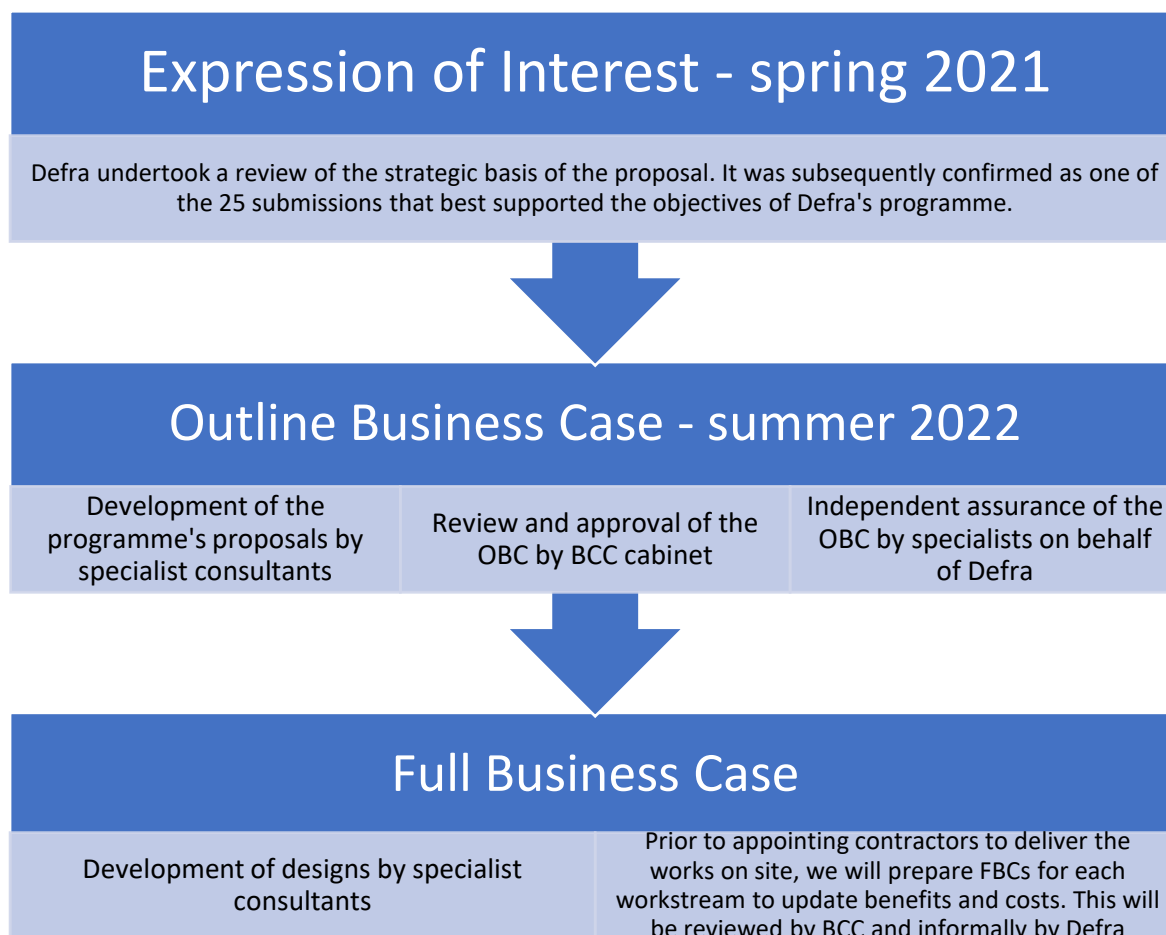


Figure 10: Frome CIP assurance process

BCC's June 2022 cabinet approval delegates assurance and approval of the FBCs to the programme Directors Board, in consultation with the Bristol cabinet member for Strategic Planning, Resilience and Floods. This gives each of the partners appropriate assurance roles, and it is also important to note that the management arrangements are clear that each organisation's own approval rules apply in addition to the central programme management arrangements. This gives added security that relevant assurance processes will be followed.

6.9 Innovation and learning: monitoring, evaluation and dissemination

The monitoring and evaluation plan is presented in Appendix 6D. The overriding principles for monitoring are (Summarised from Section 2.8.1):

- Quality over quantity
- Real world learning need
- Nature based solutions
- Value for money
- Community focus
- Good dissemination

We propose to recruit a Programme Manager as a permanent member of staff to the BCC flood risk management team. A core part of this role will be monitoring, evaluation and dissemination. Although a reduced input, as a permanent member of staff we anticipate that they will be able to continue monitoring and evaluation of the programme after the programme's funding ends in 2027.

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After approval of the OBC for the Frome CIP, we will prepare FBCs for the workstreams. This will be our first learning gateway and will allow us to capture changes to benefits and costs once the workstreams have been designed/scoped and priced by suppliers allowing us to revise our estimates of benefits and costs.

Throughout the programme we hope to continue working with academics at the University of the West of England. This will be mutually beneficial for both organisations by providing a wealth of potential topics for masters students and enable existing Citizen Science projects in the catchment to continue and be expanded upon. We will be guided by projects such as RESPIRES (BCC is a steering group member) and PARCOS - a six-step methodology titled the 'Bristol approach for Citizen Science'. Subject to the provisions of the partnership collaboration agreement regarding intellectual property, by maximising the use of open data and freely available research findings we hope that the community will be able to increase our research coverage and help us continue the research after 2027, e.g. the completion of MoRPh river surveys.

The policy challenge workstream will produce a report for Defra at the end of the policy challenge workstream. We will discuss with Defra, our Technical Steering Group and other key stakeholders regarding the wider dissemination of this report. The policy challenge workstream also plans to use an end of workstream stakeholder questionnaire to provide feedback on the study's findings and ask stakeholders to respond on whether the policy challenge findings and recommendations would make a significant difference.

We will continue to liaise with the other 25 projects in Resilience Innovation Programme and seek to develop informal partnerships with projects working in similar areas to us. We will seek to gain from mutual learning and bring a co-ordinated approach to how we investigate challenges. During delivery, each of our workstreams will be required to identify a suitable conference or seminar to present to relevant professionals in the sector. We will also submit an abstract to a national conference such as Flood and Coast to present the full programme.

In the last year of the programme, we propose to publish a post programme review of the learning that has arisen from the programme. This will include any revised estimates of the benefits and costs.

6.10 Contingency plans

The nature of the programme, and how it is broken into workstreams, gives us a number of options to control the overall project cost, and respond to unfavourable circumstances such as failure to secure funding, consents or approvals. With the exception of the Innovative Private Funding providing part of the funding for SuDS, the workstreams are wholly independent. Any workstream could be dropped or significantly scaled back without affecting the delivery of other workstreams. Unlike the construction of a traditional flood defence such as wall, Frome CIP can be cut back and still deliver significant benefits. This gives the programme good resilience and adaptive capacity.

In the event of a cost overrun the partnership would collectively review the status of all workstreams to determine the most appropriate course of action. Potential approaches could include:

1. Seeking additional funding sources for the delivery of NFM, SuDS and river restoration.
2. Scaling back a workstream. As the culvert monitoring, policy challenge and innovative funding are all likely to be progressed early in the programme there will be little

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potential to scale back these workstreams. As the river restoration at Frome Gateway has a relatively low BCR when local economic benefits are excluded and a good potential to be supported by 3rd party funding, it is likely that funding for this workstream would be the first to be scaled back. A reduced budget to undertake river restoration at Frome Gateway could still deliver locally important river restoration.

3. Re-distribution of funding across work streams. As a final resort, if a proposal is unaffordable or fails to win support or other necessary approvals, then there is the ability to re-distribute funding to other work streams or indeed to other sites / projects within the same workstream. It is anticipated that, in particular, the SuDS and NFM work could be scaled up significantly and still achieve good value for money with the additional investment. As such, it is likely that funding would be re-distributed to one or both of these workstreams should another workstream be dropped or scaled back.