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## **Outline Business Case Template for the Flood and Coastal Resilience Innovation Programme**



This document provides a template for Outline Business Case submissions for the flood and coastal resilience innovation programme. Authors and Assurers should read this document in conjunction with the “Flood and coastal resilience innovation programme - Outline Business Case Guidance (May 2021)”.

The structure and content of this document are intended to support the application process, alignment of submission with the objectives of the programme, and to set individual projects-up for success during the investment period 2021-2027, and beyond.

### **The flood and coastal resilience innovation programme objectives are:**

- To encourage and enable local authorities, businesses and communities to test and demonstrate innovative practical actions within their areas.
- To improve the resilience of 25 areas to flooding and coastal change, reducing the costs of future damage and disruption from flooding and coastal erosion.
- To improve evidence on the costs and benefits of the innovative actions and demonstrating how different actions work together across geographical areas, and

### **To build, through practical experience and implementation, new evidence and learning developed to inform future approaches to, and investments in, flood and coastal erosion risk management (post 2027).**

### **Submissions are required to meet the following Five Principles:**

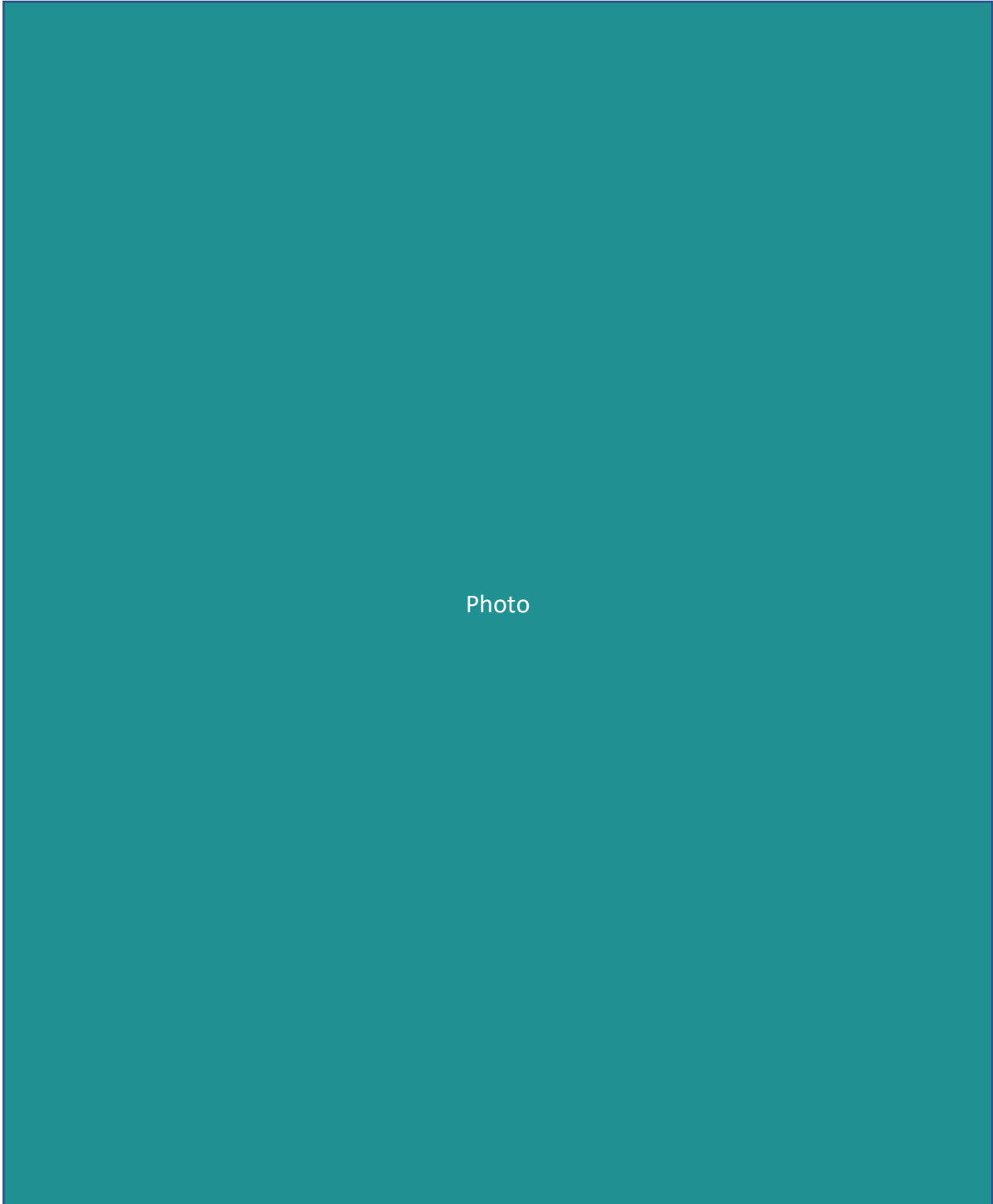
1. Deliver practical changes which increase the resilience within the project area by reducing the likelihood or consequences of flooding or coastal erosion.
2. Deliver benefits to people and their communities
3. Be consistent with existing flood and coastal erosion plans (in particular, local flood risk management strategies, flood risk management plans, catchment flood management plans and shoreline management plans).
4. Demonstrate added value by complementing and going beyond other local resilience work programmes and other funding mechanisms (for example, the Environmental Land Management scheme, flood recovery schemes, Nature for Climate Fund, the DfE’s Flood Resilient Schools work).
5. Demonstrate innovation (in particular by trialing new combinations of resilience actions, filling evidence gaps on costs and benefits, broadening the range of resilience actions, and through innovative approaches to increase the uptake and delivery of resilience actions).

Greater Lincolnshire groundwater Project

## Outline Business Case

Lincolnshire County Council

[date]



Photo

## Issue and revision record

| Revision | Date of Issue | Originator | Checker | Approver | Description |
|----------|---------------|------------|---------|----------|-------------|
|          |               |            |         |          |             |
|          |               |            |         |          |             |
|          |               |            |         |          |             |

## Comment sheet

| Changes from EoI Submission to OBC |
|------------------------------------|
|                                    |
|                                    |
|                                    |
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|                                    |
|                                    |
|                                    |

## Summary of Submission

Project name: **Greater Lincolnshire Groundwater Project**

Project short name: GLGP

Project reference: LIN011

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Total Project Value: **£8,001,000**

OBC Submission Value for Approval: **£7,551,000**

Public Contributions (£): **£0**

Private Contributions (£): **£450,000**

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Primary Source of Risk: **Groundwater Flooding**

Secondary Sources of Risk:

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Milestone Full Business Case Approval **[Insert date]**

Milestone – Readiness for service **[Insert date]**

Project completion **31/03/2027**

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Across the Greater Lincolnshire area there is a record of groundwater causing flooding of property, assets, impacts on the highway network and 'near misses' requiring remedial works on an ad hoc basis.

The Greater Lincolnshire Groundwater Project (GLGP) is an Innovative Partnership approach to better understanding and managing groundwater flood risk and resources. The project will initially focus on 3 trial sites across the region with the intention that the delivery of the project outcomes could be implemented on a wider scale. The emphasis of the project is on integrating with wider issues around environmental land management; health and wellbeing; water as a resource; the creation of new biodiverse environments; creating resilient people and places; and sustainable water level management.

Lincolnshire County Council is leading the delivery of outcomes for this project and is supported by a consortium of partner stakeholders.

Short description of the benefits

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The GLGP aims to achieve the following benefits:

- A wider awareness of the resilience measures available to risk management authorities
- Improved knowledge and understanding of current and future groundwater flooding and resource across Greater Lincolnshire

- In coordination with RMAs, ensure communities have the knowledge to increase their resilience to groundwater flooding
- Reduce flood damage within the identified trial sites
- Identified opportunities across Greater Lincolnshire to sustainably manage flood risk from groundwater
- Provide evidence base on impact and effectiveness of measures

The lessons learnt, and successful practices implemented in the place-based delivery of the project will help inform future approaches and develop a potential pipeline of future groundwater related projects.

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Lead Authority

**Lincolnshire County Council**

Delivery Partners

**Anglian Water, Blow Wells Working Group, East Lindsey District Council, North Kesteven District Council, Environment Agency, East Lincolnshire Countryside Wolds Service, Humber Local Resilience Forum, Lincolnshire Chalk Streams Project, Lincolnshire Chalk Streams Trust, Lincolnshire County Council, Lincolnshire Local Resilience Forum, Lincolnshire Rivers Trust, Lincolnshire Wildlife Trust, Lincolnshire Wolds Countryside Service, National Flood Forum, Natural England – Catchment Sensitive Farming, Humber Nature Partnership, Greater Lincolnshire Nature Partnership, Lincolnshire Environmental Record Centre, North East Lincolnshire Council, North Lincolnshire Council, University of Lincoln, Water Resources East, Witham 3rd Internal Drainage Board, Lindsey Marsh Drainage Board**

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Project Risk (£)<sup>1</sup>

[Insert (£)]

[Insert (%)]

Optimism Bias value (£)

[Insert (£)]

[Insert (%)]

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

**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 | 370       | 1238      | 1266      | 2010      | 2025      | 641       | 7551       |
| Contributions   | 23        | 135       | 113       | 90        | 68        | 23        | 450        |
| Total Project Expenditure                                 | 393       | 1373      | 1378      | 2100      | 2093      | 664       | 8001       |

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## **Required appendices**

|    |  |
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| 2A | Communications and engagement plan   |
| 2B | Environment report   |
| 2C | Detailed description of the investment proposals and sub-projects                    |
| 3A | Description of investment optimisation   |
| 3B | Details of costs and benefits  |
| 3C | Investment and innovation risk register  |
| 4A | Procurement strategy   |
| 5A | Detailed expenditure profile   |
| 5B | Contributions  |
| 6A | Partnership agreements and governance structure                                      |
| 6B | Project management and Quality Plan (include SHEW plan)                              |
| 6C | Routemap and programme   |
| 6D | Innovation and learning: Detailed plans for monitoring, evaluation and dissemination |



## 1 Executive Summary

### 1.1 Strategic Case

Summarise the Strategic Case for change, the alignment with the Resilience Innovation Programme and the objectives of the investment.

Across Greater Lincolnshire there is a record of groundwater causing flooding of property, assets, impacts on the highway network and 'near misses' requiring remedial work on an ad hoc basis. Nationally it is the least well understood source of flooding and LLFAs throughout England do not have the capacity to fully evaluate and understand the extent of the risks, to prioritise them in relation to fluvial or surface water flood risk, or to undertake works to manage them.

There is a need to gain a greater understanding of how widespread the groundwater issues are. Numerous homes in Grimsby alone are known to be at significant risk of flooding and there is a recent history of groundwater-related flooding across parts of Lincolnshire, but the true extent and inter-dependencies need to be better understood.

The Innovation Programme provides the opportunity to develop a greater understanding of a broad range of groundwater risks and opportunities across multiple Lead Local Flood Authorities, across Greater Lincolnshire, leading to a range of practical actions delivered through the project at trial sites. It is intended that these actions should incorporate multiple benefits, such that environmental and social resilience is a key factor to be built into the approaches developed.

The project will build on our current knowledge to understand how the predicted impacts of climate change on temperature, rainfall and sea level will have an impact on the groundwater levels of the Lincolnshire Northern Chalk and Lincolnshire Limestone catchments.

The key sequential elements to the project will be:

1. The Conducting of academic research into the risk of salinisation of groundwater flooding in the Lincolnshire Fens and undertaking of a gap analysis and subsequent revision, including output validation, of the Lincolnshire Chalk and Spilsby Sandstone and Lincolnshire Limestone groundwater models. During this process initial community engagement will be undertaken within the potential trial sites of Barton and Barrow-upon-Humber, Grimsby and Scopwick, which have been preliminary selected based on observed flooding across Greater Lincolnshire.
2. Based on the outputs of the revised models, 3 trial sites (and potential future sites) will be confirmed.
3. The development and assessment of proportionate place-based measures within the confirmed trial sites. Throughout this process local communities shall be empowered and actively encouraged to take part in the development of measures, whilst simultaneously having regard to model outputs.
4. The implementation and delivery of packages of work in collaboration with stakeholders, including local communities, within the trial sites as identified through the assessment work, specifically suited to managing groundwater both in terms of flood risk and as a resource.

5. Throughout the development and implementation of the project, progress will be monitored, lessons shall be identified, shared and implemented and performance evaluated all of which shall contribute to, in addition to the above, the development of potential pipeline groundwater related projects.

## 1.2 Economic case

Summarise the Economic Case and the Critical Success Factors.

The GLGP provides the opportunity to develop an understanding of a broad range of groundwater risks and opportunities, leading to a range of practical actions delivered by the Partnership. 3 trial sites will be identified following a review of current groundwater models and gap analysis, but could include Scopwick in Lincolnshire, Grimsby in North East Lincolnshire and Barton and Barrow Upon Humber in North Lincolnshire, selected based on observed records and experiences of groundwater flooding. Business as Usual, regarding groundwater flooding across these sites is limited to remedial works taking place on an ad hoc basis. All three sites have a history of groundwater flooding and have initially been selected due to observed records and experiences of groundwater flooding.

GLGP will deliver against the following Critical Success Factors:

- Ensure learning and feedback is embedded during every aspect of the project
- Understanding current and future groundwater flooding and resource across Greater Lincolnshire
- Improved community resilience to groundwater flood risk withing identified trial sites
- Identify flood risk management techniques that are sustainable, transferable, and affordable

The GLGP requires £7551k from the Flood & Coastal Resilience Innovation Programme.

## 1.3 Commercial case

Summarise the Commercial Case including approach to procurement.

A system of procurement (based on LCCS contract and procurement procedure rules, and in agreement with our project partners) has been established, providing a consistent approach across delivery partners. The method for tendering and scoring for outsourced work will enable value for money and improve cost estimates for similar work as the project progresses.

Existing frameworks will be used where applicable and new contracts will use a Lincolnshire Council Standard Contract. Direct awards will typically only be used when a service or product is provided by a unique supplier with no competitors and the value is below £25k. However, value for money will be demonstrated through the financial benefit of having a supplier in place faster.

It is anticipated all tendering/quotation exercises will be assessed against both price and quality factors, with the importance of each factor determined on a project-by-project basis to help achieve the best commercial outcomes. The balance of quality and price will always aim to drive value for money, ensure quality and achieve innovation and improvement where possible which will be achieved via a bespoke/tailored approach to each project within the programme.

#### 1.4 Financial case

Summarise the Financial Case including funding sources/key contributions.

The project requires £7,551K cash through the Flood and Coastal Resilience Innovation Programme. Without FCRIP funding no additional works could take place and BAU in the 3 trial sites and wider Greater Lincolnshire area would remain.

In-kind contributions amount to £450K through partners time and resource. To date partners have provided officer time and specialist advice to develop the Expression of Interest and Outline Business Case and it is expected that this will continue to some degree throughout the project. Furthermore, volunteers will be sought to take part in certain activities, such as 'citizen scientists' assisting with the monitoring of actions on the ground. It is expected that all delivery aspects of the project will be undertaken through paid contracts with suppliers.

The assessment of costs is drawn from recent experience of project partners gained through the implementation of strands of similar work related to flood risk and environmental management projects across Greater Lincolnshire. The table below shows the yearly cost breakdown.

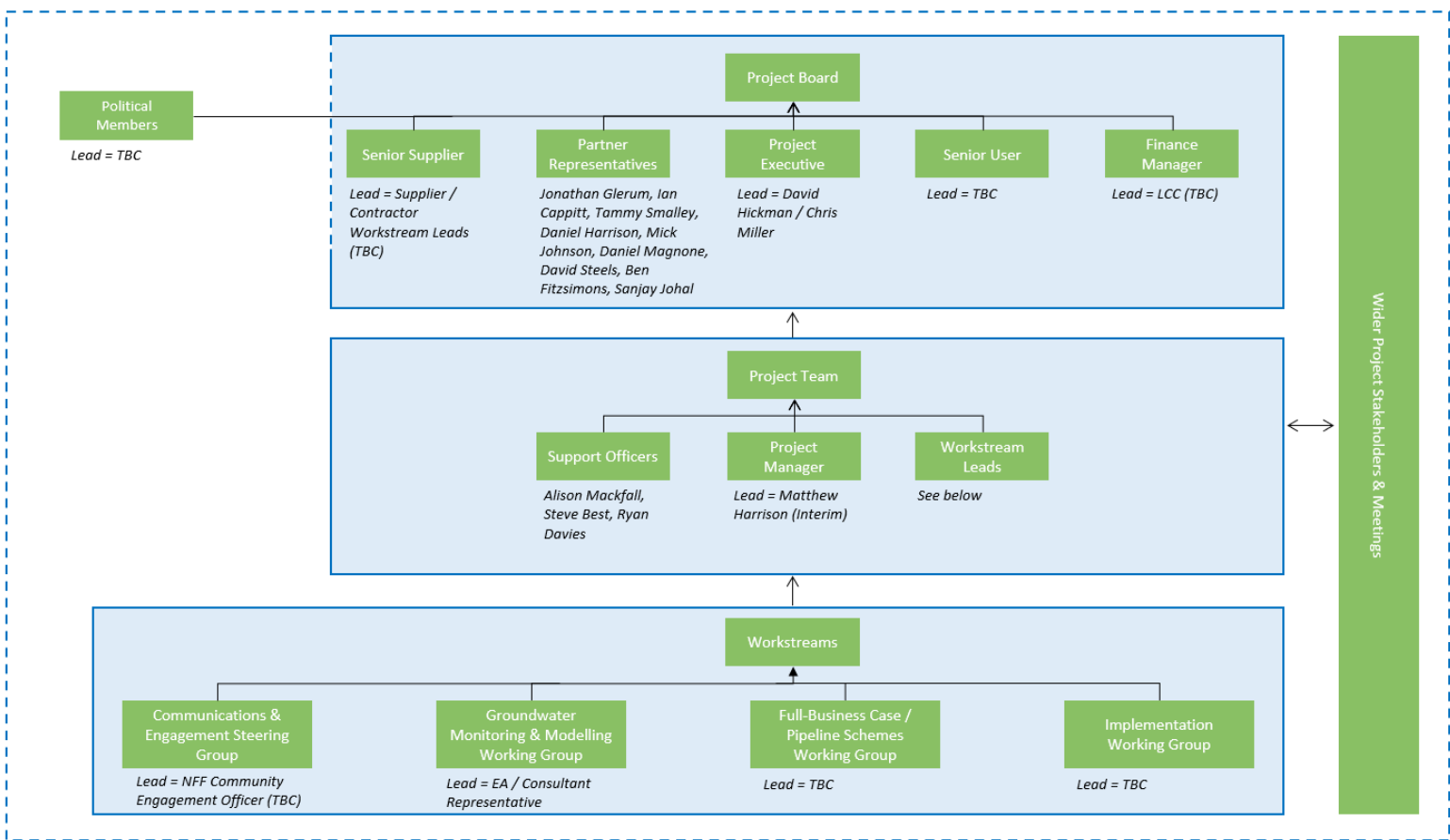
| Costs per year (£K)                                | Year 1 (£K) | Year 2 (£K) | Year 3 (£K) | Year 4 (£K) | Year 5 (£K) | Year 6 (£K) | TOTAL (£K) |
|--|-------------|-------------|-------------|-------------|-------------|-------------|------------|
| FBC development costs                              | 61          |             |             |             |             |             |            |
| Construction, supervision and delivery costs       | 0           |             |             |             |             |             |            |
| Monitoring, learning, evaluation and dissemination | 0           |             |             |             |             |             |            |
| Risk contingency                                   |             |             |             |             |             |             |            |
| <b>TOTAL</b>                                       |             |             |             |             |             |             |            |

### 1.5 Management case

Summarise the Management Case including governance arrangements.

As the lead organisation, Lincolnshire County Council (LCC) has extensive experience of delivering projects of a similar scope and scale. Together they demonstrate a successful history of schemes that have been delivered on time, to budget and substantially align with the objectives of the GLGP.

The GLGP partners provide further experience, expertise and capacity in supporting and developing the project. The delivery of work packages will be undertaken by suppliers via contract agreements. The governance structure and terms of reference have been agreed by all partners.



The Project Board will be made up of relevant political members from Lincolnshire, North East Lincolnshire and North Lincolnshire, representatives from key partners, the project executive, the senior user, the senior supplier and an LCC Strategic Finance Manager. Over and above core membership, specialist or expert advisors can be brought into meetings as and when required. The Project Board provide strategic and policy direction to the Project Team and are responsible for scrutinising delivery of the project.

At an operational level, the Project Manager and Project Team are responsible for the on the ground delivery of the project and report to the Project Board. The Project Team will be made up of workstream leads, the Project Manager and project support officers.

Anticipated risks have been identified by the Partnership, along with mitigations based on expertise and experience from previous project learning. The risk register will be reviewed as standard in Project Board meetings. The main risks identified by the partnership include:

- Capacity and resources of partners and contractors throughout the 6 years.
- Slippage in programme due to constraints on partner and supplier resources or the exploratory nature of delivery takes longer than anticipated
- Lack of willingness or interest of stakeholders and communities to engage in the project

Learnings on costs and benefits will be gathered through monitoring by workstream leads. The Project Team will oversee the lessons learnt and change log and learnings will be reported back to the EA and to the wider programme.

Dissemination of monitoring and evaluation during and post project will be by way of:

- Social media/website
- Webinars/conferences/briefings
- Reports
- Newsletters/ published articles
- Events
- Case Studies
- LLFA political processes and relevant scrutiny committees

## 1.6 Recommendations

A clear statement of the recommendation(s) for approval.

We recommend that endorsement be provided for the continued development of the GLGP up to Full-Business Case, which shall identify preferred options to enhance the resiliency of proposed trial sites to groundwater, including the £7,551k from the Flood & Coastal Resilience Innovation Programme.

(Letters of approval from key partners, submitted with the Expression of Interest, remain unchanged, and all GLGP partners and LCC Executive have signed off the OBC prior to submission).

## 2 Strategic Case

### 2.1 Strategic context

Describe the strategic case in relation to the flood and coastal resilience innovation programme, and the regional and local context for the investment.

- How does this investment align with the national ambitions of the Programme and associated policies and plans?
- How does this investment align with regional and local plans and ambitions?

*(See Guidance Document Aspect 1)*

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 the £200m flood and coastal resilience innovation programme. Alongside the policy statement, the Environment Agency 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.

This new flood and coastal resilience innovation programme will make a significant contribution to the implementation of this wider resilience approach.

The risks from flooding and coastal change are recognised in the UK Climate Change Risk Assessment and the National Risk Register. This flood and coastal resilience innovation programme will contribute towards delivery of the Government's 25 Year Environment Plan and Single Departmental Plan outcome 3) for floods and water: reduced risk of flooding.

Groundwater has played an important part in the physical and social shaping of Greater Lincolnshire. For centuries, it has emerged from springs, provided baseflow for chalk steams and blow wells, and been a source of drinking water, it is also a source of flooding, with the duty to manage the risk resting with the LLFA.

Across Greater Lincolnshire there is a record of groundwater causing flooding of property (S.19 investigations), assets (Water & Sewer Company sewer flooding and operational records), impacts on the highway network and 'near misses' requiring remedial works.

Currently, actions that improve the resilience to flood risk from groundwater that are eligible for Flood Defence Grant in Aid (FDGiA) or Local Levy a strategic approach is taken but focussed on each individual project.

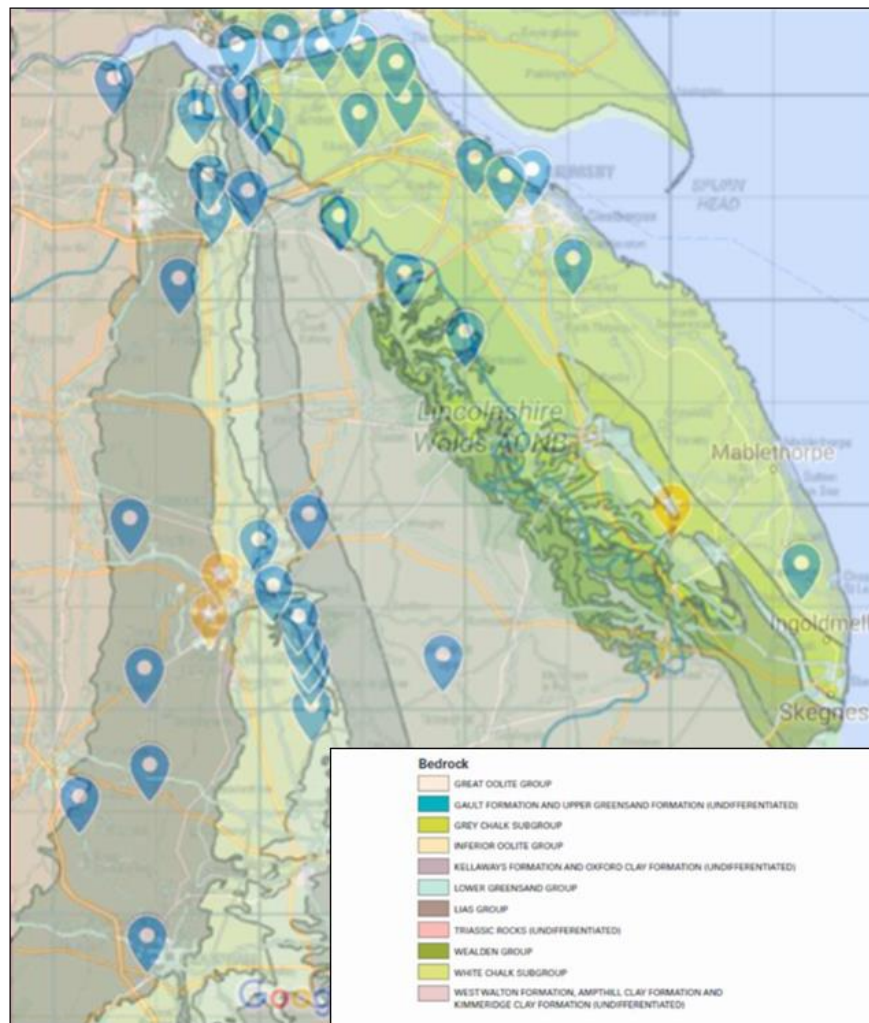
The GLGP will investigate groundwater and what management practices are required not just in flood risk management terms, but also water resources to mitigate against droughts, improve the environment and create communities resilient to multiple risks. The various practical actions, aggregated and singly, will deliver towards the goals within HM Government's 25 Year Environment Plan (2018) and the National Flood and Coastal Erosion Risk Management Strategy.

By identifying and delivering packages of work at trial sites across Greater Lincolnshire, its learning outcomes will provide the evidence base for future capital schemes to mitigate groundwater flood risk. The project will build on the foundations of other initiatives including the EA's Priority Catchment Pilots and the Catchment Based Approach (CaBA).

GLGP may well address the FCRIIP key policy challenges, particularly challenge 1 and 3 as the project progresses and packages of work are established. At this stage it would be too early to confirm further details.

Across the county, local planning authorities are at varying stages of production of their local plans, and some have come together to produce joint local development frameworks, for example Central Lincolnshire and South-East Lincolnshire.

The programme will also help fulfil the National Strategy ambitions across Greater Lincolnshire to create climate resilient places, that today's growth and infrastructure is resilient in tomorrow's climate and that this is a region ready to respond and adapt to flooding.



Locations of high groundwater levels across Greater Lincolnshire during the winters of 2019/20 and 2020/21 overlaying a BGS geology map showing the chalk/limestone features of Greater Lincolnshire

## 2.2 Environment and other considerations

Define any place specific environmental legal obligations, issues and opportunities.

- What is the regional/local environmental context for this investment?
- What key environmental requirements will this investment need to meet?
- What are the key environmental opportunities related to this investment?

The project area is the Lincolnshire Chalk and Spilsby Sandstone and Lincolnshire Limestone in the 3 Lead Local Flood Authority areas show below. Numerous national and locally designated sites may lie at risk of groundwater flooding, for instance, the Lincolnshire Fens is likely susceptible to salinisation from groundwater flooding. In addition to this a Local Planning Authority conservation area exists within Scopwick.

A very important habitat we have in Lincolnshire is the unique blow wells. They are a type of groundwater artesian spring found only in the coastal margins of Lincolnshire which have the designation status of Local Geological Site'. Between Louth and Barton upon Humber, there are around 37 known blow wells, including Tetney Blow Wells, which has been designated as a site of Special Scientific Interest.

We currently have very little information on the full impacts on blow well habitats from abstraction activities. Demand for water in the 1960's reduced groundwater pressure in the chalk aquifer resulting in low or no flow from blow wells. Even though demand for groundwater abstraction has lessened in recent years it is still a key factor impacting on the health of blow wells and chalk steams. The importance of blow wells in the social/cultural, historical and ecological development of Lincolnshire should not be underestimated.

The project will align with / have due regard to the following environmental requirements and strategies:

The Environment Act 2021

The Local Planning Authority conservation area within Scopwick

**The Greater Lincolnshire LEP's Water for Growth - Water Management Plan (2015-2040)** considers the effective management of flood risk and water resources to be a critical factor in enabling future economic growth across the area. The GLGP will align with the LEP's Plan, which seeks to develop Greater Lincolnshire as a national exemplar for water management, in both flood reduction and water supply, and to act as an incentive for investors in the LEP's priority sectors. Water for Growth recognises the significant challenges facing the area from both the risk of flooding and the future availability of water for residential, commercial and natural uses.

The Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB) Management Plan - 2018-23, recognises the importance of the water resource to this nationally protected landscape, and highlights the need to protect and enhance the function and natural environment of the river and stream catchments, their landscape character and wetland habitats. Policies RSP1 - RSP7 provides the AONB Partnership's (the Lincolnshire Wolds Joint



Advisory Committee – JAC) strategic commitment to this area of work, with specific actions RSPA1 - 18 in the Management Plan aligning with elements of the GLGP.

Anglian Water's Strategic Direction Statement sets out a vision for the future, looking ahead to 2045. Outlined within this document are the long-term challenges faced across the east of England, and the outcomes agreed for customers and the environment. This includes four long term ambitions:

1. Making the east of England resilient to the risks of drought and flooding
2. Enabling sustainable growth
3. Becoming carbon neutral by 2030
4. Working with others to achieve significant improvement in ecological quality

Heritage assets within areas at risk of groundwater flooding.

The Environment Agency aims to become a net zero carbon organisation by 2030, with net zero targets also made by the RMAs. Lincolnshire County Council are working together with other public sector partners, including; Lincolnshire Waste Partnership, Greater Lincolnshire Nature Partnership, Central Lincolnshire Planning Group, Greater Lincolnshire Local Enterprise Partnership and Flood Risk and Water Management Partnership to deliver the ambitions set out in the County Council's Green Master Plan. The GLGP will work with and through existing initiatives to achieve mutual benefits.

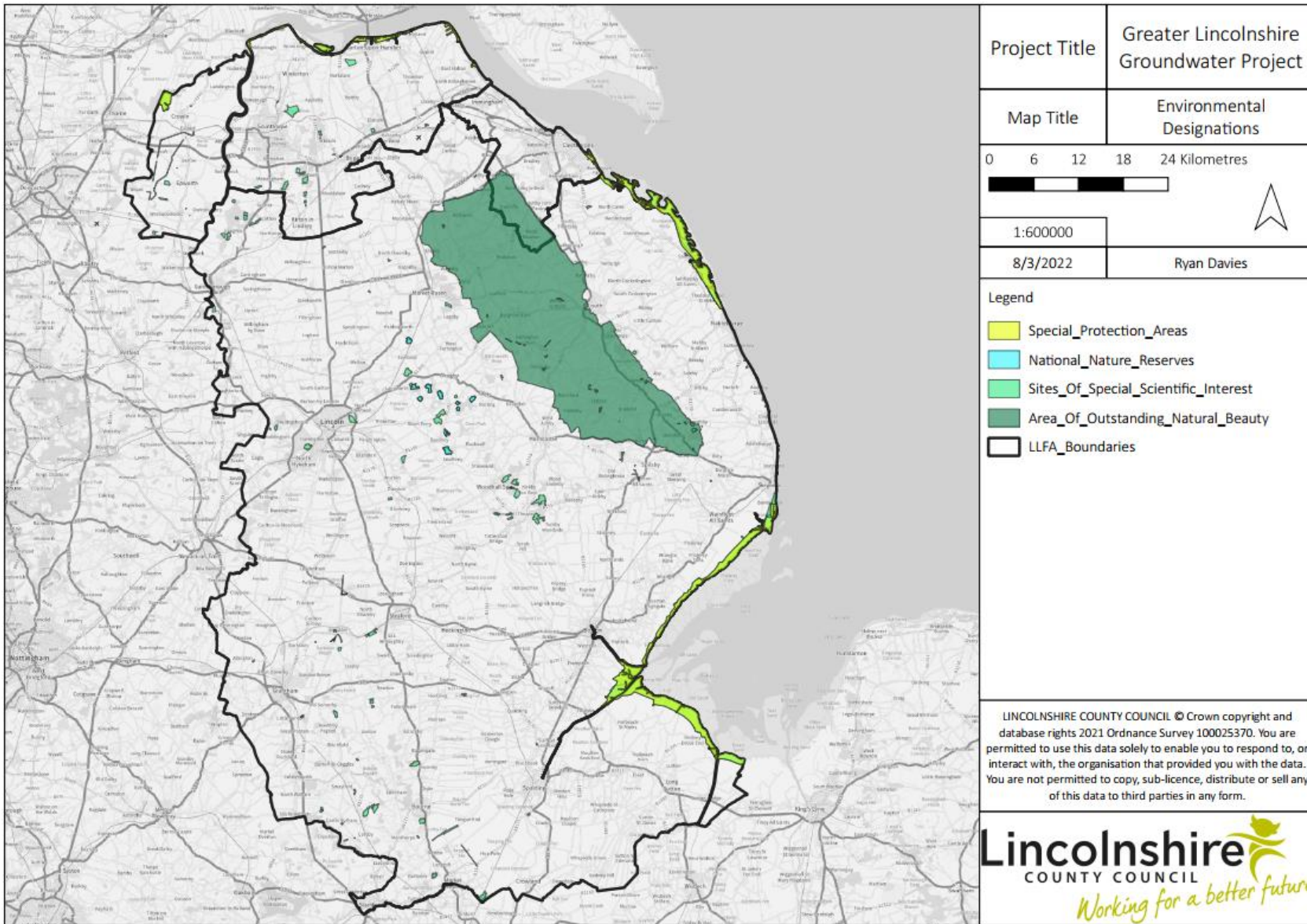
Key environmental opportunities related to the GLGP are outlined below. Further information regarding environmental opportunities is outlined in Section 3.6.3.

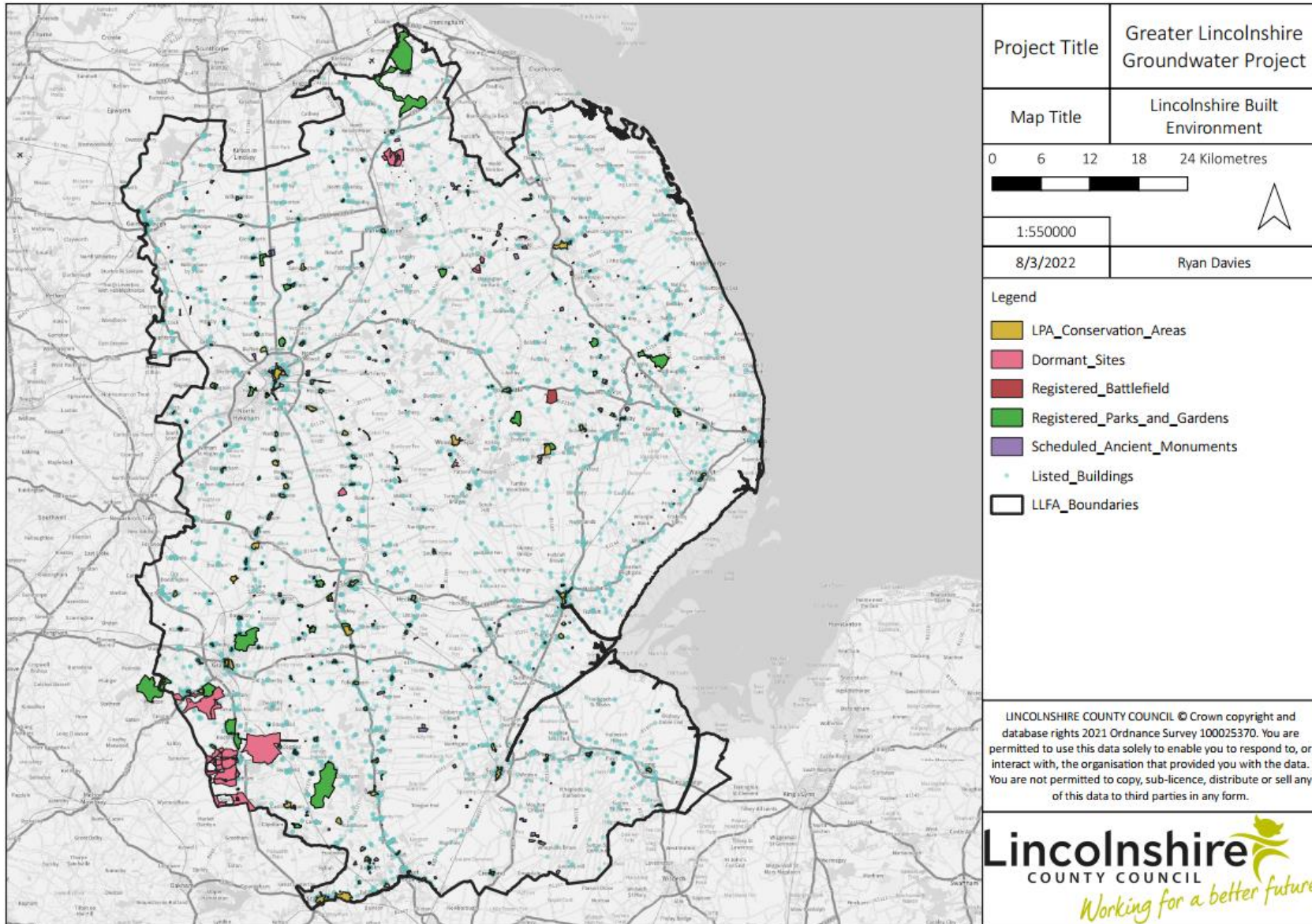
- Potential for biodiversity net gain and carbon sequestration, thereby enhancing the resilience of the natural environment to changes such as climate change, urbanisation etc.
- Potential improvements of the biological, chemical and ecological status of waterbodies across Greater Lincolnshire

At a strategic level, Defra's 25-year Environment Plan calls for a greater use of flood risk management approaches that work with natural systems. GLGP will develop nature-based solutions to manage groundwater in a sustainable way that manages flood risk whilst protecting the environment, enhances watercourses/blow wells, provides amenity benefits and delivers water resources. In doing so, deliver a significant step change in how we manage this precious resource across Greater Lincolnshire.

GLGP will work closely with Water Resources East, the agri-food sector and environmental organisations to identify and appraise opportunities to manage groundwater effectively through a range of measures that reduce flood risk, deliver water quality and water resource benefits, including keeping chalk streams at health levels.

There are many heritage assets also within areas at risk of groundwater flooding. Listed buildings can suffer major damage from long duration flooding and there is often a reluctance to fit typical Property Flood Resilience (PFR) products to heritage assets and/or they are not effective because of the porosity of the buildings' construction.





## 2.3 Objectives (programme and project)

Linked to the strategic context and environmental considerations, describe the project objectives.

- What are the objectives of the investment?
- Are the objectives SMART (specific, measurable, achievable, realistic and time bound)?

The aims of the flood and coastal resilience innovation programme 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 project objectives, as submitted in the Expression of Interest document, have now been reviewed and expanded and are set out below:

**Objective 1.** Within the first two years, we will build on existing academic research and undertake a gap analysis of the Lincolnshire Limestone and Lincolnshire Chalk and Spilsby Sandstone models, including model validation, to gain a greater understanding of groundwater as both a risk and a resource across Greater Lincolnshire.

**Objective 2.** By 2027 we will identify and implement packages of work within the three confirmed trial sites which will enhance the resilience of local communities whilst simultaneously protecting and enhancing the environment, providing amenity benefits and delivering water resources.

**Objective 3.** To maximise the learning for the duration of the project we will continuously review all packages of work. We will adapt the programme to reflect the learning from this review and promote and roll out successful practices to reduce risk and improve resilience.

**Objective 4.** Between 2024 and project end in March 2027, we will, having regard to our newfound understanding of groundwater as both a risk and resource across Greater Lincolnshire, review lessons learnt to help inform and develop a potential pipeline of future groundwater related projects. We will, not only continue to develop understanding in this field but also sustain and further strengthen the partnership developed as part of the Flood & Coastal Resilience Innovation Programme.

## 2.4 Summary project description and mix of actions

Describe the project, the mix of actions and how they relate to the ambitions and objectives.

- How do the mix of actions work together to maximise resilience?
- What new evidence will be established to support a broader range of future FCERM actions?
- How will the project support an increasing uptake and delivery of future FCERM actions?

*(See Guidance Document Aspect 1)*

To date actions that improve the resilience to flood risk from groundwater are currently being considered or taken at a purely local level and on an opportunistic basis. This project offers the opportunity to develop plans and actions that provide broad and sustainable water management at both a strategic and operational levels, tailored to a range of geographical areas. GLGP, through desk based research and gap analysis of existing groundwater models will identify initially 3 trial sites in Greater Lincolnshire, potentially, Scopwick, Grimsby and Barton and Barrow Upon Humber and implement a package of works which, following an evaluation of lessons learnt and successes, could be implemented in other areas.

The proposed activities will improve our ability to understand and plan for groundwater flooding, whilst increasing our ability to protect communities, recover from and respond to high groundwater levels across Lincolnshire. By delivering this mix of actions we will move away from individual actions taken at a very local level to address impacts of elevated groundwater levels, for example on an individual property scale, and move to a more community or regional scale. The project outcomes will provide the evidence base for future capital schemes to mitigate groundwater flood risk.

The following proposed activities, through partnership work, new monitoring and datasets, evolving model systems and innovative thinking and delivery; will improve our ability to understand and plan for groundwater flooding:

*Review existing research and undertake a gap analysis of groundwater issues across the Greater Lincolnshire area:*

- **Strategic Groundwater review** into all groundwater issues across the Greater Lincolnshire area. At the same time, refine the Greater Lincolnshire catchment groundwater models to help identify opportunities for options that deliver multiple benefits from the management of groundwater.
- **Catchment Assessment** to identify and assess opportunities to sustainably manage flood risk from groundwater across Greater Lincolnshire on completion of the modelling work, whilst maximising additional benefits for water quality and water resources.

*This research will help to identify 3 trial sites (and potential future sites) and to undertake an options appraisal to deliver practical solutions for managing groundwater:*

- **Options appraisal** by working with Water Resources East, the agri-food sector and environmental organisations to identify and appraise opportunities to manage groundwater effectively through a range of measures that reduce flood risk, deliver water quality and water resource benefits e.g. keeping the chalk streams at healthy levels, agricultural land making appropriate use of groundwater.

*Implement and deliver packages of work in the test locations as identified through the assessment work, specifically suited to managing groundwater flooding. This could include:*

- **Managing groundwater risk** by delivering practical solutions that manage the risk of groundwater flooding in test locations, which could include Scopwick, Grimsby and Barton.
- **Sustainable operations delivery** to develop and deliver sustainable operations for IDBs, AW and farmers, enabling the management of groundwater through innovative techniques and transferring excess water to areas of need. This may possibly include wellfield operations, sustainable pumping regimes, water transfer and on-farm storage opportunities.
- **Harnessing natural processes** by working with natural processes to identify and deliver natural flood management options in both rural and urban setting, particularly on or near the chalk streams and limestone catchments across Greater Lincolnshire.
- **Implementation of an on-the-ground monitoring program** e.g. smarter monitoring of groundwater levels, measuring watercourse flows to monitor test sites and enhance the groundwater models, create a new network of boreholes with telemetry which can help inform groundwater flood warnings to be issued to increase community resilience.

*Partners will work with stakeholders, including communities in the identified trial sites to deliver resilience measures and raise awareness of groundwater issues:*

- **Community Engagement** by working with local communities in the 3 trial sites to deliver resilience measures and raise awareness of groundwater flooding issues, including flood stores, riverCare (or similar) groups, citizen science monitoring programs.

The project will have identified cost-beneficial actions; actions that increase resilience; synergies and antagonisms; combinations; and actions that are less successful. Moreover, the project will have identified opportunities across Greater Lincolnshire to sustainably manage flood risk from groundwater.

## 2.5 Key innovation learning and main benefits

Summary description of the key innovation learning and investment benefits.

- What are the expected learning outcomes: costs and benefits, management and governance, skills and capacities?
- What are the expected main benefits of the investment?

Until now we have not had the opportunity or resource to bring together active partners across Greater Lincolnshire to tackle the issue of flooding from groundwater. This project, in recent months, presented the circumstance whereby a multitude of partner organisations have come together to discuss how we need to work together across Greater Lincolnshire to deliver the Greater Lincolnshire Groundwater Project.

This innovative large scale collaborative approach to delivering the range of intervention activities the group outlined in Appendix 2C will not only have cost savings but also benefits from the sharing of data, resources, expertise, knowledge, support, links to the farming community and community groups and much more.

Learning outcomes, delivered through the place-based activities as detailed in Appendix 2C, include:

- Insights into a wider partnership approach to groundwater flood risk
- Sustaining engagement with stakeholders for the project duration
- Approaches to engagement and collaboration with communities to implement, monitor and evaluate resilient measures
- Further understanding of how to work collaboratively with other RMAs on groundwater projects
- Greater understanding /database of groundwater in Lincolnshire for use across RMAs in the future
- Greater understanding of existing models that can be utilised and adapted to gain a greater understanding of groundwater flood risk
- Enhance understanding of how groundwater resource can be managed
- Insight into how groundwater as a resource can be managed by specific sectors such as agriculture, water and environmental
- A greater understanding of place-based initiatives and their suitability to be implemented at other locations
- Development of an evidence base of what measures enhance resiliency to groundwater flooding (in certain circumstances) including what measures do not work

The main anticipated benefits of the GLGP are summarised below, further detail regarding these benefits are outlined in Section 3.6.

- Improve partners knowledge and understanding of, and identify opportunities (including cost certainty) for the sustainable management of groundwater as a resource across Greater Lincolnshire, including the identification of potential future pipeline schemes
- Enhance stakeholder awareness of groundwater (both as a risk and resource), whilst simultaneously empowering local communities and policy makers to plan and adapt

to flood risk and climate change by actively involving all those concerned within the design, implementation and maintenance of measures.

- Support an increased uptake and delivery of future FCERM actions in combination with actions from other sectors by increasing the acceptance both locally and nationally of investment regarding the integrated management of groundwater.
- Strengthen and build upon existing ways of working across both political and organisational boundaries
- Learning on how to measure resilience to groundwater
- Understanding and improving the emergency response capacity and capability to groundwater flooding amongst partners and communities
- Learning on approaches to monitoring of success of groundwater flood risk solutions

## 2.6 Strategic risks and learning from past projects

Describe the strategic risks and the learning captured from past projects with similarities to the main strategic risks.

- What are the key risks during Full Business Case development and delivery (up to 2027)?
- What are the key risks beyond 2027?

Based on the Readiness Assessment and project's risk register the following table summarises strategic risks to the project through the six-year programme and how learnings from past projects will help us manage them.

| Key Risks  | Mitigation /Past learning   | To FBC | Up To 2027 | Post 2027 |
|--|---|--------|------------|-----------|
| <b>Capacity and resources of partners /contractors throughout the 6 years</b>  | LCC and partners have delivered projects of similar scale. ToR are all in place to demonstrate levels of commitment by the Partnership through regular project board meetings.<br>Contracted suppliers will undertake most of required works, managed by a full time Project Manager and supported with a proposed 2x project officer.<br><br>Utilisation of a diverse supply chain network in accordance with LCC Procurement rules / regulations. | •      | •          |           |
| <b>Slippage in programme /scope creep/delays in delivery of actions</b>  | Regular tracking and review of resource by PM and early indications raised by partners. Forward planning and understanding of risks for each phase so that any delays are more likely to be mitigated   | •      | •          |           |
| <b>Lack of access to data / data granularity for the identified trial sites, subsequently hindering refinement of groundwater models</b> | Maximise partnership networks and engagement opportunities to obtain access to data/land  | •      |            |           |



|  |  |   |   |   |
|--|--|---|---|---|
| <b>Lack of willingness or interest of communities to engage in the project</b>   | Utilise engagement specialists and pre-existing communication channels   | • | • | • |
| <b>Increased costs associated with supplier resource</b>   | Quantify and plan project around maybe a most likely, best case and worse case spend profiles.   | • | • | • |
| <b>Ability to sustain implemented Measures / Works</b>   | Identification of innovative funding sources for maintenance<br>The designing of measures / works to be proportionate / sustainable, having due regard to future funding / maintenance requirements                      |   |   | • |
| <b>Maintaining the engagement of partners throughout the 6-year project</b>  | Provision of regular project updates, actively involving partners in the development of the project and ensuring partners are brought in as and when appropriate times   | • | • |   |
| <b>Ability to Obtain Funding for Future Potential Pipeline Schemes</b>   | Development of proportionate and feasible business cases, which identify and draw upon a broad range of funding sources  |   |   | • |
| <b>Realisation of severe weather events</b>  | Established Local Resilience Forum procedures already in place.  | • | • | • |
| <b>Potential Withdrawal of Project Funding</b>   | N/A  | • | • |   |
| <b>Gap analysis reveals that the groundwater models may not be fit for purpose. The work necessary to revise the models may be greater than expected. The worst-case scenario would be that an entirely new catchment model would need to be produced.</b> | Correspondence with relevant stakeholders has revealed that the Lincolnshire Limestone model is not calibrated for groundwater flood risk assessment, instead low flows, hence revisions of the model will be necessary. | • |   |   |

## 2.7 Constraints and dependencies

Describe the key delivery constraints and dependencies?

- What are the project constraints such as statutory requirements and conditions relate to funding contributions?
- What external project dependencies exist such as links to other projects?

The overarching project dependencies/ constraints are:

- Timescales
- Data access and availability
- Availability of resources (partnership/consultants/volunteers)

The table below identifies further constraints/dependencies for the key proposed project activities:

| Activity               | Constraint/Dependency   |
|------------------------|---|
| Partnership Management | <ul style="list-style-type: none"> <li>• Recruitment of project manager</li> <li>• Procurement of suitable Consultants</li> </ul> |

|   |   |
|---|---|
|   | <ul style="list-style-type: none"> <li>• Capacity of partner members to invest time and resources</li> <li>• Ongoing partner, political and community support for the project</li> <li>• Robust risk management process</li> </ul>  |
| Strategic Groundwater review and catchment assessment | <ul style="list-style-type: none"> <li>• Obtaining groundwater extraction licences</li> <li>• Ability to suitably expand upon existing models</li> <li>• Resolution of existing data / availability of observed data</li> <li>• Supply chain dependencies</li> <li>• Installation of additional boreholes / groundwater monitoring systems</li> </ul>   |
| Options appraisal                                     | <ul style="list-style-type: none"> <li>• Landowner take up and buy in</li> <li>• Model outputs that clearly project current and future groundwater resources under a range of scenarios</li> <li>• Site characteristics / ecological survey requirements</li> <li>• Levels of community engagement</li> <li>• Funding restrictions / limitations</li> <li>• Desired level of annual protection</li> </ul> |
| Operations Delivery                                   | <ul style="list-style-type: none"> <li>• Dependency on landowners/farmers access to land</li> <li>• Planning permission</li> <li>• Landowner buy in</li> <li>• Further lockdown restrictions</li> <li>• Grant funding restrictions (particularly for property flood resilience measures)</li> <li>• Raising cost of materials and inflation</li> </ul>  |
| Harnessing natural processes                          | <ul style="list-style-type: none"> <li>• Constrained by costs as these could be significant</li> <li>• Site feasibility</li> <li>• Clearly defined maintenance arrangements and funding for this maintenance</li> <li>• Land availability</li> </ul>  |
| Community Engagement                                  | <ul style="list-style-type: none"> <li>• Lack of community engagement/support at trial sites (including community buy-in)</li> <li>• Recruitment of Community Engagement Officer</li> <li>• Further lockdown restrictions</li> </ul>  |
| Implementation of on-the-ground monitoring program    | <ul style="list-style-type: none"> <li>• Landowner permission re installing monitoring equipment</li> <li>• Consistency in survey methods</li> <li>• Availability of resources</li> </ul>   |

## 2.8 Stakeholder Engagement

Describe the stakeholder engagement completed to inform the Business Case, and the proposed involvement of stakeholders in development of the Full-Business Case.

- How has stakeholder participation and engagement influenced and shaped the investment proposals?

*(See Guidance Document Aspect 2)*

The GLGP was established in November 2020 with the support of members from both the Lincolnshire Joint Flood Risk & Water Management Partnership and external stakeholders. This new partnership (a number of our partners are therefore also our stakeholders) cuts across many sectors – public, private, non-governmental, communities and the three political boundaries being Lincolnshire, North East Lincolnshire and North Lincolnshire (the full list of partners is detailed in Appendix 6A).

Consultation in relation to the project has been considered from an early stage in its development. As part of the development of the Expression of Interest and Business Case,

partner workshops were undertaken so as to capture information, develop a fuller understanding of partners issues and to consider the range of proposals that could address these.

In completing the business case, a readiness assessment was undertaken, and a specific steering group established with partners invited to join to assist, inform and make recommendations for its submission. Partners with specific expertise that could inform the business case were identified and consulted with, and the wider project group were asked to make recommendations before its final submission (currently in progress to coincide with the OBC health check submission). Two consultants have been commissioned to carry out the gap analysis work as detailed in the EOI, and whilst this work is ongoing these initial findings will set the scene for much of the planned works.

Moving forward, partners will continue to be part of the project development and play an active part of the delivery of practical actions on the ground. The engagement of stakeholders and partners is key, with each bringing expertise, experience and resource to the project that will ensure its success. Regular partner meetings will continue to inform and update the project and additional subgroups created where required. The project team has worked with Icarus in developing the readiness assessment and hosting partner engagement sessions.

Wider stakeholder engagement will take place in developing the full business case through proactive communication with local communities to support the project.

Community engagement work is currently being carried out in one of the potential trial sites at Scopwick with the involvement of the Scopwick Parish Council in a multi-agency working group looking at groundwater flood risk in the village.

In confirming the trial sites, a stakeholder mapping exercise for each location will be undertaken to ensure we have identified all relevant parties. At this stage further community engagement will take place to help shape and deliver the proposed packages of work, as per the Communication and Engagement Plan (Appendix 2A) . Community engagement may include, but is not limited to:

- Let's Talk Lincolnshire (LCC' public consultation website)
- Newsletters, published articles (LCC County News, Parish/town council news)
- Dedicated website on LCC's and (potentially) partners
- Social media – using LCC's established channels to circulate updates
- Email – a dedicated mailbox has been established for all enquiries
- Meetings: discussion events / workshops/ briefings/ drop in events
- Community Champions and case studies

This will complement the work of the Community Engagement Officer, recruited by GLGP partner National Flood Forum engagement.

## 2.9 Monitoring and evaluation framework, and dissemination

Describe the monitoring and evaluation framework for learning, building new evidence and dissemination of project outputs to achieve maximum impact.

- How will learning be monitored and evaluated?
- How will new evidence of costs and benefits be recorded and evaluated?
- How will dissemination be achieved during and post project?

*(See Guidance Document Aspect 11)*

Progress will be monitored by the Board in accordance with the monitoring mechanisms outlined in the developing governance structure (and through the EA’s reporting expectations); this includes but is not limited to regular Board meetings, political scrutiny and due financial diligence.

Monthly reporting will become part of the governance and project control mechanisms and aligned with LCCS reporting/accounting procedures until the end of the project and feed into the project board. Reports will describe progress against:

- Baseline
- Budget
- Expected benefits

Learnings from GLGP will be identified, captured and shared through the Board by means of summative project assessments for each work package, throughout the life of the programme and post-project. If deemed necessary by the Board, impartial assessments and peer review will be utilised to validate such learning. Sharing can be by many means, for example multi-agency meetings, publicity or professional literature.

While the objectives for the GLGP have been confirmed, not all activities to meet these objectives have been fully formed as these will be established once learning from the desk top research and gap analysis work progresses and trial sites have been identified.

The table below details the key areas for learning and how they will be monitored and evaluated:

| Activity                          | Learning  | How will learning be recorded/analysed/assessed  |
|-----------------------------------|---|--|
| Desktop research and gap analysis | <ul style="list-style-type: none"> <li>• Understanding current groundwater flooding and resource</li> <li>• Reviewing the current groundwater models</li> <li>• ‘best practices’ re adapting groundwater models</li> <li>• Potential to develop new approaches to modelling groundwater</li> <li>• More granular outputs which will inform future decision making around groundwater actions</li> </ul> | <ul style="list-style-type: none"> <li>• Baseline data analysis</li> <li>• Review current groundwater models</li> <li>• Feedback and reports from consultants</li> <li>• Case studies of effective groundwater management</li> </ul> |

|  |   |   |
|--|---|---|
| <p><b>Identify trial sites, options to manage flood risk and wider opportunities</b></p> | <ul style="list-style-type: none"> <li>•</li> <li>• Best course of actions in specific/differing locations</li> <li>• Identify proportionate place based measures / works to reduce risk of flooding within trial sites and how these measures can be implemented in other areas</li> <li>• Mix of actions</li> </ul> | <ul style="list-style-type: none"> <li>• Baseline data analysis of trial site</li> <li>• Continued monitoring of implemented workstreams</li> </ul> |
| <p><b>Community Engagement</b></p>   | <ul style="list-style-type: none"> <li>• How effective have community measures been</li> <li>• What groundwater flood risk measures do communities want</li> <li>• Best practice for working with communities at risk of flood risk</li> </ul>  | <ul style="list-style-type: none"> <li>• Surveys</li> <li>• Interviews</li> <li>• workshops</li> </ul>  |
| <p><b>Packages of work at trial sites</b></p>  | <ul style="list-style-type: none"> <li>• Effectiveness of the place-based packages of work</li> </ul>   | <ul style="list-style-type: none"> <li>• Quantative and qualitative</li> </ul>  |

Once activities have been founded, defined measurement indicators for each of the different activities will be determined, in agreement with the programme strategic evaluation team, to monitor how well the project is performing.

Learnings on costs and benefits will be gathered through monitoring by workstream leads reporting to the Board in line with governance. Learnings will be reported back to the EA and to the wider programme, particularly identifying projects that are similar to GLGP – we have already engaged with other FCRIP groundwater projects.

Dissemination of monitoring and evaluation during and post project will be by way of:

- Shared learnings with other FCRIP relevant projects i.e. GRACE
- Social media/website
- Webinars/conferences/briefings
- Reports
- Newsletters/ published articles
- Events
- Case Studies
- LLFA political processes and relevant scrutiny committees

### 3 Economic Case and Benefits Framework

#### 3.1 Description of the Business as Usual baseline

Describe the Business as Usual baseline.

- What is the current practice including existing asset management, operation and maintenance?
- What are the current baseline costs (maintenance and operations)?
- What are the positive and negative impacts of current practice?

The Business as Usual (BaU) baseline is defined as: the continuation of current arrangements, as if the proposal under consideration were not to be implemented. BaU does not mean doing nothing, because continuing with current arrangements will have consequences and require action resulting in costs (based on HM Treasury Green Book).

Actions that improve the resilience to flood risk from groundwater are currently being considered or taken at a purely local level and on an opportunistic basis across Greater Lincolnshire. Where these actions are eligible for Flood Defence Grant in Aid (FDGiA) or Local Levy a strategic approach is taken but focussed on each individual project.

Business as Usual in the 3 potential trial sites is detailed below:

| Trial Site | Standard works   | Bespoke works  | Costs (£k)  |
|------------|--|--|---|
| Grimsby    | <p>Diversion of groundwater into the sewer network to mitigate against the worst of the impacts.</p> <p>Yearly maintenance is carried out within the allotments to manage silt and vegetation growth to ensure it is flowing as effectively as possible.</p> <p>Underpasses are pumped out at a near constant rate due to ground water filling the wetwell chambers.</p> | <p>At the Salting's allotments, a series of channels have been excavated to try and drain the waterlogged area into the combined sewer network. This has limited success due to the levels, but it helps to keep the water level outside of houses, although the sub-floor spaces are almost permanently waterlogged causing issues with damp and black mould.</p> <p>A footpath through Ainslie Street Park had to be raised by half a metre in order to open access back up to the park, as it had been submerged for over a year at the cost of approximately £75k.</p> <p>In other areas of the town, springs have been diverted into the sewer network to prevent properties from flooding.</p> | NELCC maintenance costs pa £15-20k  |
| Scopwick   | <p>Repairing / relining of the public sewer system</p> <p>Over pumping of the sewer system into Scopwick Beck</p>  |  | Since 2011, Anglian Water costs relating to ground water have totalled to over £2M. |

|                               |     |     |     |
|-------------------------------|-----|-----|-----|
| Barton and Barrow Upon Humber | TBC | TBC | TBC |
|-------------------------------|-----|-----|-----|

### 3.2 Summary description of the investment proposal

Briefly describe the investment proposal.

- What is the proposed investment (project and sub-projects)?

The table below summarises the planned activities up until submission of the Full Business Case. Additional activities and more long-term activities are yet to be confirmed and will be reviewed once initial learnings have taken place. Actual costs associated with each action are still TBC at this stage (overall expenditure costs are detailed further in Appendix 5A).

| Activity                            | Description   | Tasks (short term)  |
|-------------------------------------|---|---|
| <b>Project Management</b>           | Establish an effective partnership involving all stakeholders and beneficiaries, making use of inter-agency skills to deliver the agreed outcomes.  | <ul style="list-style-type: none"> <li>• Recruitment of 1 x Project Manager, 1 x National Flood Forum Community Engagement Officer</li> <li>• Assess the need / desire to recruit 2 x project support officers</li> <li>• Subject to the above assessment, consider commencement of recruitment of 2 x project support officers</li> </ul>  |
| <b>Strategic Groundwater review</b> | Undertake a strategic review of groundwater, as both a risk and resource, across Greater Lincolnshire, focusing particularly on the three trial sites of Barrow and Barton-upon-Humber, Grimsby and Scopwick. | <ul style="list-style-type: none"> <li>• Capability assessment of the existing Lincolnshire Limestone and Lincolnshire Chalk and Spilsby Sandstone groundwater models to understand how they can be adapted to meet the requirements of the proposed integrated catchment model. This work has been started by consultants Wood and Atkin to review what further input data would be needed and what further parameters can be incorporated into the modelling.</li> <li>• Gap analysis undertaken by consultants Wood and Atkins to produce a scope of works for what further data is needed, scoping for borehole installation sites and the integrated catchment modelling.</li> </ul> <p><b>Atkins Consultant</b></p> <ul style="list-style-type: none"> <li>• Identify areas of concern</li> <li>• Identify areas based on model results and “on the ground” knowledge (known areas of GW flooding)</li> <li>• Review model calibration for groundwater flooding events in those areas</li> <li>• Identify tasks to improve model calibration where needed</li> <li>• Plan sub model approach</li> <li>• Identify likely refinement to improve high GW level and high flow calibration</li> <li>• Consider need for refinement tasks such as higher resolution model grid, high resolution topography, detailed drainage and networks</li> </ul> |

|  |   |  |
|--|---|--|
|  |   | <ul style="list-style-type: none"> <li>Consider approach to return period analysis, event modelling and need for linking with hydraulic models.</li> </ul> <p><b>Woods Consultant:</b></p> <ul style="list-style-type: none"> <li>Share and review previous recommendations for enhanced monitoring locations alongside incidents and Drift geology understanding</li> <li>Review UKCP18 rainfall, potential evaporation and sea level rise projections for climate change. Run multiple projections through the regional model to inform expansion and frequency of future wet spots</li> <li>Develop scope and costs of higher resolution shorter time step linked model incorporating Lidar-based drainage and better representation of shallow geological connections focussed on Grimsby</li> </ul> |
| <b>Catchment Assessment</b>            | Having regard to the findings of the gap analysis, refine the existing groundwater models within Lincolnshire.  | <ul style="list-style-type: none"> <li>Refinement of Lincolnshire Limestone and Lincolnshire Chalk and Spilsby Sandstone models</li> <li>The development of appropriate scenarios (1000+) to gain greater understanding of potential changes in groundwater. Scenarios will have regard to at least the following factors, reductions / increases in abstraction, climate change, input from a weather generator</li> <li>Running of model using the developed scenarios</li> <li>Validation of model outputs using observed data</li> </ul>   |
| <b>Groundwater Research</b>            | The undertaking of research to gain a greater understanding of the risk of salinisation from groundwater flooding in the Lincolnshire Fens  | <ul style="list-style-type: none"> <li>Spatially quantify the salinity across the catchment</li> <li>Assess groundwater seasonal changes over 24 months</li> <li>Quantify the connectivity of the groundwater system to surface water, seawater and the rate of groundwater recharge</li> <li>Predict the risk of a drying climate, rising sea-levels and increased irrigation to the salinisation of soils from groundwater.</li> </ul>   |
| <b>Pipeline Schemes</b>                | Identification of future potential pipeline groundwater schemes   | <ul style="list-style-type: none"> <li>Having regard to our newfound understanding of groundwater as both a risk and resource across Greater Lincolnshire, we will review lessons learnt to help inform and develop a potential pipeline of future groundwater related projects.</li> </ul>  |
| <b>Catchment Assessment</b>            | Identify and assess opportunities to sustainably manage flood risk from groundwater across Greater Lincolnshire on completion of the modelling work, whilst maximising additional benefits for water quality and water resources. | <ul style="list-style-type: none"> <li>Identify and confirm the 3 trial sites and further list of future pipeline sites</li> </ul>   |
| <b>Managing groundwater flood risk</b> | Delivery of proportionate place-based solutions that manage the risk of groundwater flooding in test locations, including Barrow and Barton-upon-Humber, Grimsby and Scopwick.  | <ul style="list-style-type: none"> <li>Work with Water Resources East, the agri-food sector and environmental organisations to identify and appraise opportunities to manage groundwater effectively through a range of measures that reduce flood risk, deliver water quality and water resource benefits e.g., keeping the chalk streams at healthy levels, agricultural land making appropriate use of groundwater.</li> </ul>  |



|                                    |  |  |
|------------------------------------|--|--|
|                                    |  | <ul style="list-style-type: none"> <li>• Develop and deliver sustainable operations for IDBs, AW and farmers, enabling the management of groundwater through innovative techniques and transferring excess water to areas of need. This may possibly include wellfield operations, sustainable pumping regimes, water transfer and on-farm storage opportunities.</li> <li>• Work with natural processes to identify and deliver natural flood management options in both rural and urban setting, particularly on or near the chalk streams and limestone catchments across Greater Lincolnshire.</li> </ul>  |
| <p><b>Options appraisal</b></p>    | <p>Having regard to the outputs of the catchment assessment model outputs, the identification of proportionate place-based measures / works within trial sites of Barrow and Barton-upon-Humber, Grimsby and Scopwick.</p>   | <ul style="list-style-type: none"> <li>• Confirm project trial sites</li> <li>• Optioneering and assessment of options. For example, we would like to explore the opportunity to convert abandoned allotments in Grimsby into wetland habitats – the assessment and gap analysis work will provide further information and potential benefits to implementing this.</li> <li>• Confirmation of options and production of Full Business Case</li> </ul>   |
| <p><b>Community Engagement</b></p> | <p>To develop a community-led approach to flood resilience by proactively engaging and empowering individuals and groups to gain a greater understanding and ownership of groundwater flood risk and to develop and implement sustainable solutions through working in partnership, and where opportunities exist to integrate with wider issues around environmental land management; health and wellbeing; water as a resource; the creation of new biodiverse environments; creating resilient people and places; and sustainable water level management.</p> | <ul style="list-style-type: none"> <li>• Develop communications plan through the comms and engagement steering group. Share with the wider partnership.</li> <li>• Regular review of stakeholder groups</li> <li>• Establish a system of recording Stakeholder interaction</li> <li>• Once the trial sites have been confirmed, undertake stakeholder analysis for each site</li> <li>• Establish a community engagement plan for each trial site</li> <li>• Readiness Assessment to understand local concerns regarding flood risk</li> <li>• Work with local communities to gain a greater understanding of flood risk, focusing particularly on groundwater flooding</li> <li>• Raise awareness of groundwater, groundwater flood risk and the Greater Lincolnshire Groundwater Project within agreed trial sites</li> <li>• Act as a conduit for local communities, enabling them to voice their opinions, ideas, and / or concerns during the scoping, design, implementation and evaluation of potential measures / works</li> <li>• Empower local communities to take ownership of and implement sustainable solutions to groundwater flooding</li> </ul> |
| <p><b>Monitoring program</b></p>   | <p>Implementation of telemetric groundwater monitoring sensors across Greater Lincolnshire, focusing particularly within the three sites of Barrow and Barton-upon-Humber, Grimsby and Scopwick.</p>   | <ul style="list-style-type: none"> <li>• Engagement of suitable contractor and obtaining of all necessary approvals / consents</li> <li>• Installation of groundwater monitoring sensors</li> <li>• Monitoring of groundwater monitoring sensors and usage of data gathered to inform evaluation of model outputs</li> </ul>   |

Long term actions are still to be determined and will be reviewed following initial works and learnings.

### 3.3 Description of how the proposed solution was optimised

Briefly describe how the proposal presented in Section 3.2 has been optimised.

- What stakeholder and community engagement has been undertaken?
- How has the investment been optimised in terms of value, scale, location, timing, carbon, equality analysis etc?

*(See Guidance Document Aspect 3)*

GLGP investment optimisation to date, has been undertaken through engagement with the project Partners, a number of whom also represent Stakeholders. The Partnership is made up of different organisations, including, 3 Lead Local Flood Authorities, businesses, IDB's, 2 Local Resilience Forums and academic institutions. As such, the proposal incorporates the opinions, expertise and skills from a wealth of organisations and the combination of measures will reflect this. Engagement has occurred through meetings of the full partnership, partnership steering groups and technical works undertaken.

This partnership collaboration has led to a focus on 3 potential trial sites located in each of the three local authority boundaries that the partnership covers. Further pipeline sites will also be identified, through partnership collaboration that may be utilised as the project progresses.

To date, initial rapport building, and community engagement has been undertaken within the village of Scopwick by the National Flood Forum. This community engagement has built upon work previously initiated by the Scopwick Groundwater Task and Finish Group and has enabled the GLGP to gain a greater understanding of the communities concerns regarding groundwater / flood risk.

Further engagement and technical works (including but not limited to carbon assessments, calculation of cost-benefit ratios for proposed measures / works) are required to further optimise our approach for the Full Business Case and longer-term activities. For example, work is currently being carried out to review all groundwater issues across the Greater Lincolnshire area and how the current catchment groundwater models can be refined to improve the understanding and subsequently management of groundwater. This work will identify our trial sites and place based packages of work to be undertaken to ensure the realisation of the projects ambitions.

Due to the phasing and reliance of work packages optimisation cannot occur for later activities until earlier works have been completed.

### 3.4 Description of: Invest less and invest more

At a programme level there may be the opportunity/need to scale-up or down individual projects to best achieve the programme objectives and investment commitments. Please describe how the proposal in Section 3.2 could be scaled up or down in costs, and the impact these would have on potential benefits arising from the project. Indicatively a reduction or increase of expenditure of 20% should be considered.

*(See Guidance Document Aspect 3)*

#### 3.4.1 Invest less

The below table outlines the impact of scaling down the project:

| Action   | Impact  |
|--|---|
| <b>Community engagement</b>  | Project adopts a top-down communication approach rather than a collaborative approach.  |
| <b>Reduced number of trial sites (2 not 3)</b>   | The 3 trial sites have been selected due to their location and varying groundwater flood risks – reducing this to 2 would not seem sufficient in exploring a mix of resilient opportunities.                      |
| <b>Reduce the on the ground monitoring programme including reducing the number of new boreholes</b>                | This would result in lower groundwater level monitoring certainty and potentially unnecessary flood warnings or missed opportunities to warn. Less data would be collected.                                       |
| <b>Reduce the number of groundwater models reviewed (2 to 1)</b>   | Reduces the learning opportunities for integrated water management, and for the delivery of practical solutions on the ground that enable benefits to flood risk management, water resources and the environment. |
| <b>Reduce the number of practical solutions that are delivered during the project</b>                              | Missed opportunity to put learnings into practice and monitor their benefits. Reduces the number of practical actions communities can put in place to build local resilience to groundwater flooding              |
| <b>Reduce the no of stakeholders the project engages with</b>  | Reduces the understanding and learning of the broad range of groundwater risks and opportunities.   |
| <b>Reduce the scope to only look at management of flood risk (not water resources, environmental improvements)</b> | Project will not integrate with wider issues around environmental, health and wellbeing, water as a resource, sustainable water level management.   |

#### 3.4.2 Invest more

The below table highlights the impacts of investing more in specific activities proposed under GLGP:

| Action  | Impact   |
|---|--|
| <b>Community Engagement</b>   | Increased resource for community engagement will result in less 'top-down', more collaborative working and embedding of resilience.                              |
| <b>Increase number of trial sites (5 not 3)</b>   | Increased community engagement, and investigation into varying groundwater issues. However, increasing the number of sites may not achieve any greater insights. |
| <b>Increase the on-the-ground monitoring programme including increasing the number of new boreholes</b> | More groundwater monitoring across more communities and increased amount of evidence collected.  |

|   |  |
|---|--|
| <b>Increasing the number of practical solutions that are delivered during the project</b> | Additional communities will benefit from additional resilience measures.                               |
| <b>Increase the no of stakeholders the project engages with</b>                           | More collaborative working, increased awareness of issues and improved knowledge of local environment. |

### 3.5 Investment costs

Briefly summarise the total present value (discounted) costs.

- What are the present value costs and the timeframe of the assessment?

Whole project costs are presented in the following table. These costs are in line with those estimated in the Expression of Interest and exclude Partner in-kind contributions and optimism bias. They are discounted using the standard 3.5% HM Treasury rate.

The below table shows the project costs.

| Costs per year (£K) | Year 1 (£KPV) | Year 2 (£KPV) | Year 3 (£KPV) | Year 4 (£KPV) | Year 5 (£KPV) | Year 6 (£KPV) | TOTAL (£KPV) |
|---------------------|---------------|---------------|---------------|---------------|---------------|---------------|--------------|
|                     |               |               |               |               |               |               |              |
|                     |               |               |               |               |               |               |              |
|                     |               |               |               |               |               |               |              |
|                     |               |               |               |               |               |               |              |

As individual activities are developed there will be greater refinement and certainty of the costs based on feasibility, procurement and delivery options.

### 3.6 Investment benefits framework including learning and innovation

Describe the Benefits

- What are the learning benefits the project is expected to deliver?
- What are the benefits of the project in terms of 'value at risk'?
- What are the benefits of the project in terms of 'value potential'?

*(See Guidance Document Aspect 4)*

#### 3.6.1 Learning benefits

Table 1 Benefits Framework: Learning Benefits

| Ref | Benefits Category | Description   | Approach to capturing change   |
|-----|-------------------|---|--|
| 1.1 | Learning on cost  | <ul style="list-style-type: none"> <li>• Reduction of uncertainty and greater cost certainty of integrated water management solutions that will help protect local community infrastructure, including roads, drainage networks and communications infrastructure from groundwater flooding</li> <li>• Greater cost certainty for adapting existing groundwater models</li> </ul> | <p>Qualitative - Using available funding in the most cost-effective and proportionate manner</p> <p>Quantitative – Managing incomings, outgoings, invoices</p> |

|     |   |   |  |
|-----|---|---|--|
|     |   |   | <p>and making sure they align with FCERM 3 Form submissions. Cross-referencing the quotes with realised costs</p> <p>Economic justification for similar projects within the future.</p>  |
| 1.2 | Learning on benefits                                  | <ul style="list-style-type: none"> <li>• Greater understanding of groundwater as both a risk and resource across Greater Lincolnshire</li> <li>• Identification of potential pipeline schemes in Greater Lincolnshire</li> <li>• Effectiveness of solutions to managing groundwater and potential synergies of solutions</li> <li>• Appreciation of how-to better work with communities to manage groundwater</li> <li>• Better understanding of how groundwater interacts with the natural environment</li> <li>• Learning about how groundwater level data can be obtained and used via innovative means</li> </ul> | <p>Qualitative – Understanding what, when and where solutions to groundwater can be / should be implemented, ensuring the most appropriate use of available resources.</p> <p>Quantitative – Levels of community engagement. Properties protected. Increased groundwater data. Number of groundwater schemes / biodiversity net gain increase.</p> |
| 1.3 | Learning on management and governance (project level) | <ul style="list-style-type: none"> <li>• Learning on how to make effective decisions with changing stakeholders throughout the development / delivery of the project</li> <li>• Partnership collaboration and coordination in managing groundwater flood risk over the long-term programme (including across political boundaries)</li> <li>• How to collectively and effectively manage project risk over the next six years</li> <li>• Capacity and capability of project partners to deliver project objectives</li> </ul>   | <p>Qualitative – Regular partnership updates on current and completed activities and learning</p> <p>Quantitative – Realisation of the state of project objectives. Release of funding associated with risks. Programme forecasting and reporting</p>  |

|     |   |  |   |
|-----|---|--|---|
| 1.4 | Learning on skills, tools (methods and mechanisms) and capacity needed to implement actions and combinations of actions | <ul style="list-style-type: none"> <li>• Understanding and improving the emergency response capacity and capability to groundwater flooding amongst partners and communities</li> <li>• Learn how to effectively engage with local communities to enhance preparedness to groundwater</li> <li>• Learning on approaches to monitoring of success of groundwater flood risk solutions</li> <li>• Learning on how to measure resilience to groundwater</li> <li>• Learning the resources required to deliver engagement / integrated water management solutions</li> </ul> | <p>Qualitative –<br/>Community feedback / surveys<br/>Training and exercising scenarios</p> <p>Quantitative –<br/>People, time, resources required to deliver actions</p>   |
| 1.5 | Learning on management and governance (wider lessons learned)   | <ul style="list-style-type: none"> <li>• Potential options that could be feasible for assisting in the understanding and mitigation of groundwater flooding</li> <li>• Transferable learning for similar communities and environments elsewhere on a local, regional and national scale.</li> <li>• Co-creation of practical solutions with local communities</li> </ul>   | <p>Qualitative –<br/>Success in transferability of lessons learnt</p> <p>Quantitative –<br/>Number of times lessons are disseminated.<br/>Number of similar communities benefiting from the lessons identified.</p> |

### 3.6.2 Value at Risk

Despite being a potential significant source of localised flood risk, particularly within the unconfined chalk aquifers of southern England, the assessment and mitigation of groundwater flood risk has only recently begun in earnest since the widespread groundwater flooding experienced across much of the chalk aquifers of southern England during the autumn of 2000/2001 and winter of 2003. These events resulted in prolonged and extensive damages and followed an unusual 30-year groundwater flood free period (Cobby et al. 2009; Environment Agency 2001; Marsh 2007).

As the characteristic feature of groundwater flooding events is its relatively long duration when compared with other sources of flooding and when considering the above and the fact that the impacts of groundwater can occur before water levels reach the ground surface, for instance the flooding of basements or critical infrastructure, the accurate calculation of value at risk for groundwater flooding is more complex, under researched and underfunded in comparison to other local sources of flood risk.

As outlined in other sections of the Outline Business Case, a key component of the GLGP is the reviewing and subsequent revision of the Lincolnshire Chalk and Spilsby Sandstone and Lincolnshire Limestone groundwater models. This work will enable the GLGP to ascertain, amongst other aspects, the number of properties at risk of flooding from groundwater across Greater Lincolnshire, potentially focusing on the 3 proposed trial sites of Barton and Barrow-upon-Humber, Grimsby and Scopwick. As such a detailed economic analysis, including options appraisal, has therefore not been undertaken at this moment in time.

However, this is not to say that indicative value at risk benefits / Estimated Annual Damages (EAD) cannot be provided. For instance, in 2010 a preliminary assessment of flood mitigation options for

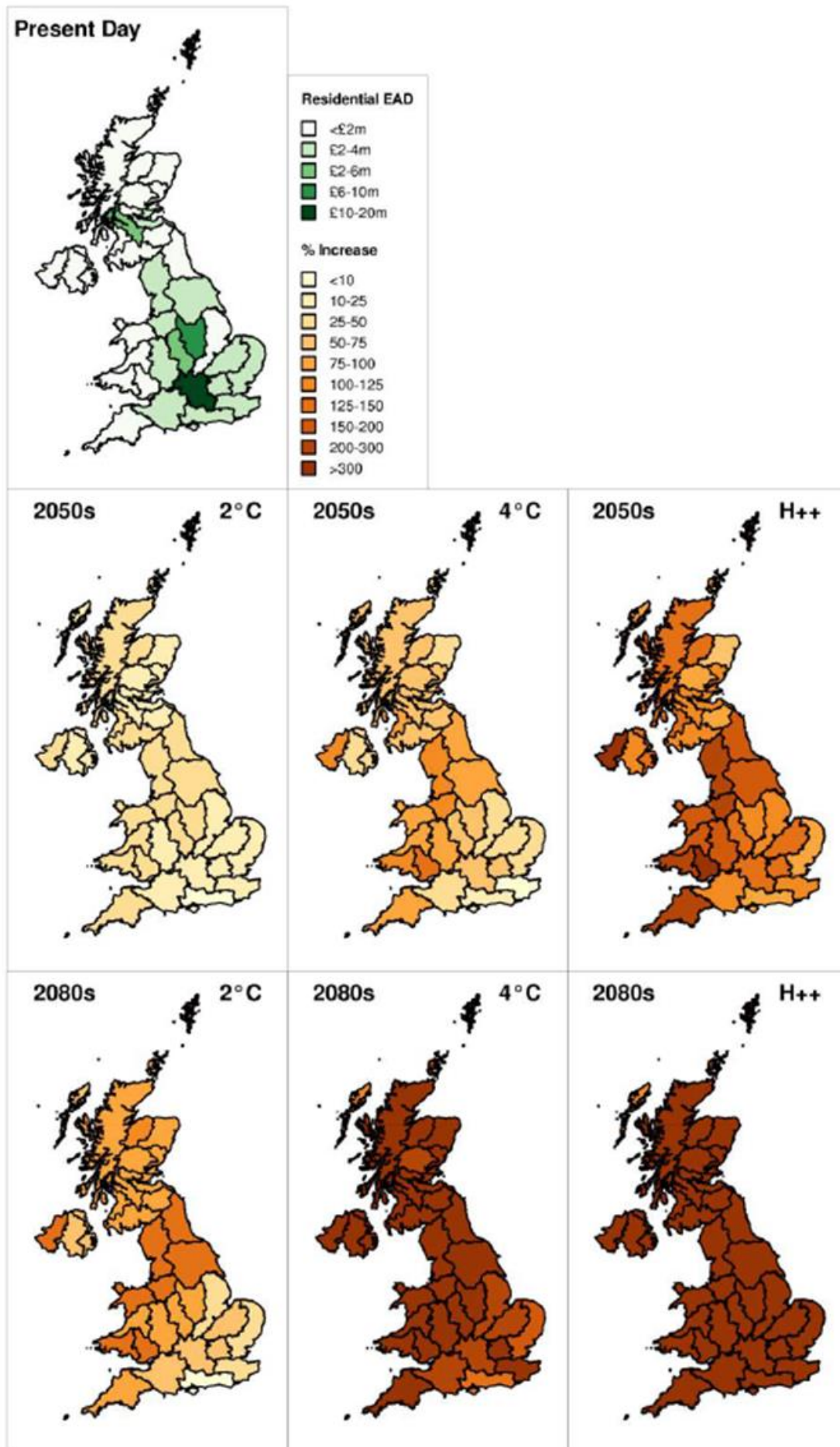
Westoby Lane and areas adjacent to Midby Drain in Barrow-upon-Humber, North Lincolnshire was commissioned. A hydrological groundwater model was constructed and identified 56 properties as being at risk of a 1% annual exceedance groundwater flood event. 12 flood alleviation options were proposed with 6 being taken forward for further economic analysis using a timescale of 100 years. Damages were discounted over this timescale in line with Treasury Green Book Guidance.

A summary of the economic analysis is provided below:

- Direct damages ranged from 0.19 to 92 (£k)
- Indirect damages ranged from 0.17 to 50 (£k)
- Present value damages ranged from 77 to 5,421 (£k)
- Present value benefits ranged from 2,539 to 5,683 (£k)
- Benefit cost ratios ranged from 16.87 to 3.82

In addition to the above, the Third UK Climate Change Risk Assessment published in July 2021 provides EAD for three types of groundwater flooding: Clearwater flooding (from chalk and limestone aquifers); Clearwater flooding (from other aquifers); and flooding from Permeable Superficial Deposits (PSD). Analysis for the whole of England suggests that up to approximately 360,000 residential and 170,000 non-residential properties could be at risk of groundwater flooding. Regarding EAD, the analysis indicates that groundwater flooding is a small proportion ranging from £54m to £95m. For a more localised scale, the outputs of the Second UK Climate Change Risk Assessment are provided below, which estimates that:

- The 'present day' EAD for residential properties across Greater Lincolnshire is <£2m
- The EAD for residential properties across Greater Lincolnshire in 2080, under a 4°C temperature rise, may increase by 150-200%





Although the above values cannot directly provide economic justification for undertaking resilience activities within all the proposed trial sites (please note that the proposed trial sites may change following validation of the revised groundwater model outputs), they do nonetheless support observed impacts of groundwater flooding across Greater Lincolnshire, and hence strengthen the rationale for continued development of the GLGP. It should be noted however, that these values relate solely to residential / non-residential properties and do not consider all the costs associated with groundwater flooding, for instance flooding of agricultural land, disruption of transport infrastructure etc, and thus are likely an underestimation of value at risk.

To support the economic justification of the OBC, work is currently on-going to undertake an outline economic case based on existing model outputs, various assumptions, and current Multi-Coloured Handbook approaches, although it should be noted that any outputs derived from this analysis will be subject to significant uncertainties as currently the Lincolnshire Chalk and Spilsby Sandstone and Lincolnshire Limestone models are calibrated for low flows and not indicating groundwater flood risk.

Unfortunately, due to delays in obtaining model licences and contractor availability, it is not possible to provide outputs of this economic analysis as part of OBC submission. What follows is a summary of the approach that shall be taken, including assumptions that shall be made.

- The analysis will quantify the expected annual damage and 50-year present value damage to residential and non-residential buildings and agricultural land within the 3 proposed trial sites of Barton and Barrow-upon-Humber, Grimsby and Scopwick.
- The following sources of information will be utilised as part of the analysis:
  - The National Receptor Dataset (2014) which has been cleaned to remove upper floor properties and those not representing habitable dwellings and commercial buildings, excluding critical infrastructure. On site verification has not been conducted as part of this outline assessment
  - Ordnance Survey MasterMap to identify parcels of land classified as agricultural land
  - Crop Map of England 2020 has been used in conjunction with Ordnance Survey MasterMap to identify areas of crop that may be damaged by groundwater flooding, for instance cereal crops are more likely to be impacted by groundwater flooding than land used for grazing
  - Outputs from the Lincolnshire Chalk and Spilsby Sandstone and Lincolnshire Limestone models
- The Multi-Coloured Handbook simplified benefit:cost appraisal tool shall be utilised to gain an initial understanding of scheme feasibility.
- Assumptions include:
  - o Existing model outputs provide information regarding return periods. If return periods do not form part of model outputs, then the assumption is that, based on expert groundwater modelling judgement, indicative return periods can be inferred.
  - o The quantification of indirect damages for groundwater flooding is uncertain. FCDPAG3 guidance states that a partial measure of disruption resulting from flooding can be given by the cost of renting an equivalent home to that which was flooded together with the cost of accelerating the drying out process. Multi-Coloured Handbook values for the likelihood and duration of seeking alternative accommodation and the duration of humidifier use shall be utilised having regard to costs associated with the use of dehumidifiers and the average rental price for Lincolnshire, North East Lincolnshire and North Lincolnshire, values of which shall be derived from the Residential Rental Price Index
  - o Advice regarding the intangible benefits of flooding such as increased stress, loss of memorabilia etc., is outlined in DEFRA research project FD2005 “The Appraisal of Human-Related Intangible Impacts of Flooding” which stated that the willingness to pay

to avoid the health impacts associated with flooding were about £150 - £200 per household per year. More recent research has suggested that the intangible costs of flooding may be of the same magnitude of direct costs or approximately 40% of direct costs (Lantz et al. 2012; Alfieri, Feyen and Di Baldassarre 2016). Here intangible damages shall be calculated as 40% of direct damages.

- o The estimate of benefits of GLGP shall assume that: (a) agricultural land more susceptible to impacts of groundwater flooding shall be protected up to groundwater flood events with a 4% annual chance; (b) agricultural land less susceptible to impacts of groundwater flooding may not receive any benefits; and (c) residential and non-residential properties shall be protected up to groundwater flood events of between a 1% and 2% annual chance.
- o A value of 0.10m shall be utilised to account for thresholds of residential properties and 0.00m for commercial properties. These values were chosen following guidance provided by the GRACE project

Once greater clarity has been obtained regarding groundwater flood risk and all trial sites confirmed, an detailed economic assessment, including option appraisal and calculation of cost-benefit ratios will be made as part of the Full Business Case. This will likely require innovation in of itself, as traditional Multi-Coloured Handbook approaches to estimating benefits do not provide an appropriate valuation of resilience-focused benefits, and likely do not adequately reflect the specifics of groundwater flooding outlined above. To resolve this challenge, the GLGP may, subject to resource availability, develop and trial an alternative approach to calculating value at risk and resilience benefits by working with experts in the field of groundwater and economics.

As part of the GLGP, the University of Lincoln will be conducting research to determine the risk of salinisation from groundwater flooding within the Lincolnshire Fens. This research will help the GLGP understand the broad range of issues associated with groundwater flooding, thereby enabling a more comprehensive integrated water management solution to be developed. Subject to resource availability and timescales, an economic assessment of this risk may be undertaken.

Notwithstanding the above, the GLGP has, based on flooding realised within the proposed trial sites, been able to identify value at risk benefits (Table 2), although it should be noted that the full extent of these risks is currently uncertain. The standard of protection that will be delivered by the GLGP has yet to be determined, but will nevertheless be place specific, having regard to the principles of strategic investment pathways.

Table 2 Benefits Framework: Value at Risk Benefits

| Ref           | FCERM_AG AST Category | Sub-category             | Description  | Approach to capturing change                                      |
|---------------|-----------------------|--------------------------|--|---|
| Value at Risk |                       |                          |  |   |
| 2.1.1         | Economic              | Residential property     | Reduction in damage from internal / external flooding. (Loss, repair, asset replacement)                         | Number of properties, location, value, depth, duration, frequency |
| 2.1.2         |                       | Non-residential property | Reduction in damage from internal / external flooding. (Loss, repair, asset replacement)<br>Business profit loss | Number of properties, location, value, depth, duration, frequency |
|               |                       | Emergency costs          | Emergency services costs avoided   | Number of callouts related to groundwater                         |

|       |               |                                |  |  |
|-------|---------------|--------------------------------|--|--|
|       |               |                                | Local authority emergency response costs reduced   | flooding and associated costs  |
|       |               | Infrastructure                 | Reduction in loss of critical infrastructure functionality. Damages avoided due to reductions in repair or replacement of assets. Disruption avoided / minimised to operations, services and revenues    | Retained functionality to critical infrastructure. Previous whole lifecycle asset costs.                               |
|       |               | Transport                      | Reduction in road / rail closures and material damage<br>Reduced disruptions to services, operations and revenues<br>Damages avoided in terms of repair or replacement of assets                         | Highway's authority data. Retained functionality of transport infrastructure. Previous whole lifecycle asset costs.    |
|       |               | Agriculture                    | Damages avoided to flooding of land / crops – costs to business  | Engagement and ongoing liaison with farmers  |
|       |               | Land use                       | Damages avoided to public green spaces<br>Reduction of waterlogged land  | Number of complaints regarding waterlogged public space / land.  |
|       |               | Indirect effects on businesses | Reduced disruption due to flooding of businesses – impacts on local supply chain<br>Reduction in staff absences due to groundwater flooding / high groundwater related health or property complications. | Reduction in enforced closure to business / staff absenteeism  |
| 2.2.1 | Environmental | Regulating services            | Reduction in economic, environmental and political impacts of soil erosion<br>Reduction in risk of salinisation of groundwater resources   | Increase / decrease of health status of watercourses in line with Water Framework Directive                            |
| 2.2.2 |               | Biodiversity                   | Reduction in potential impacts on species including protected species  | Increase / decrease of health status of watercourses in line with Water Framework Directive<br>Changes within land use |
|       |               | Change in status under WFD     | Deterioration of waterbodies avoided through reduced sewer   | Reduction in reported combined sewer overflows   |

|       |                                |                       |   |   |
|-------|--------------------------------|-----------------------|---|---|
|       |                                |                       | overflows into watercourses<br>Reductions of surface water flows / agricultural land runoff   | Increase / decrease of health status of watercourses in line with Water Framework Directive |
|       |                                | Historic environment  | Damages avoided to repair historic sites and assets. Disruption minimised to operations, revenues and service provided. Reduced risk of repeated wetting and drying of buried archaeology | Number of reported flood events / concerns raised regarding waterlogged land                |
|       |                                | Hazard                | Reduction in the likelihood of secondary hazards e.g., landslips contaminated water supply  | Number of recorded landslips.   |
| 2.3.1 | Social (individual and family) | Way of life           | Negative impacts of long duration flooding avoided where use of toilets, showers etc are restricted   | Uplift to direct damage, numbers of people and feedback on benefit                          |
|       |                                | Health and well-being | Reduced contact with contaminated flood water<br>Reduced disruption to health and wellbeing caused by flooding and possible future flooding   | Uplift to direct damage, numbers of people and feedback on benefit                          |
|       |                                | Fears and aspirations | Reduced feeling of isolation, helplessness<br>Reduced disruption to health and wellbeing caused by flooding and possible future flooding  | Uplift to direct damage, numbers of people and feedback on benefit                          |
| 2.4.1 | Social (Community)             | Community             | Negative impacts avoided for services and facilities  | Community engagement and feedback   |
|       |                                | Political systems     | Reduction in required investigations and resource expenditure   | Reduction of complaints / concerns raised   |
|       |                                | Fears and aspirations | Negative impacts avoided. Reduction in the disruption to health and wellbeing communities are facing due to groundwater flooding  | Community engagement and feedback   |

*[Note: Insert sub-categories and additional rows as necessary] Refer to the OBC Guidance Document for example sub-categories.*

## 3.6.3 Value Potential

Table 3 Benefits Framework: Value Potential

| Ref                    | FCERM_AG AST Category | Sub-category                             | Description   | Approach to capturing change   |
|------------------------|-----------------------|--|---|--|
| <b>Value Potential</b> |                       |  |   |  |
| 3.1.1                  | Economic              | Residential and non-residential property | Increased attractiveness as a place to live with benefits for property values. Potentially creating a more desirable work location.                             | Community survey. Correspondence with elected members / Parish / Town Councils   |
| 3.1.2                  |                       | Emergency costs                          | Enhanced preparedness of local communities, businesses, Category 1 / 2 responders due to greater understanding of groundwater flooding and associated responses | Community surveys. Correspondence with elected members / Parish / Town Councils. Discussions with Category 1 / 2 responders and after-action reports |
|                        |                       | Infrastructure and Transport             | Reliability of infrastructure improved  | Highway's, Water & Sewerage providers, telecoms, gas, electric, rail reported issues / operational responses   |
|                        |                       | Agriculture                              | Increased confidence in sustainability of business<br>Improvements to variations of land usage (e.g., more diverse crop types / rotations)                      | Surveys with beneficiaries via National Farmers Union, National Flood Forum  |
|                        |                       | Land use                                 | Improvements to variations of future land uses  | Changes in land use classification   |
|                        |                       | Indirect effects on businesses           | Potential benefits from enabling economy growth and resilience to future perturbations  | Economic reports / updates via the Greater Lincolnshire  |

|       |                                |  |   |   |
|-------|--------------------------------|--|---|---|
|       |                                |  | Potential increases in desire to invest   | Local Enterprise Partnership  |
| 3.2.1 | Environmental                  | Biodiversity                           | Potential for biodiversity net gain   | Environmental surveys and increased environmentally minded visitations  |
|       |                                | Change in status under WFD             | Healthier waterbodies   | Environmental surveys.<br>Standard water quality checks   |
|       |                                | Regulating services                    | Improved soil health<br>Biodiversity net gain<br>Potential carbon capture and storage via wetlands<br>Increases in usable green spaces  | Environmental surveys<br>Community surveys  |
| 3.2.2 |                                | Landscape                              | Improved condition of habitat<br>Increased amount of natural habitat<br>Increases in usable green spaces  | Changes in health status of watercourses in line with Water Framework Directive<br>Changes within land use<br>Community surveys |
| 3.3.1 | Social (individual and family) | Way of life                            | Increased sense of place  | Community surveys   |
| 3.3.2 |                                | Skills and competencies                | Greater understanding of groundwater and its importance for the natural environment<br>Increased confidence / capabilities of local communities to engage and lead on projects relating to groundwater / flooding | Community surveys   |
|       |                                | Recreation                             | Greater enjoyment of the natural environment / outdoor space  | Reports of improved health and wellbeing<br>Community surveys   |
|       |                                | Political systems/inclusion/engagement | Increased confidence / capabilities of local communities to engage  | Community surveys   |

|       |                      |  |   |                   |
|-------|----------------------|--|---|-------------------|
|       |                      |  | and lead on projects relating to groundwater / flooding   |                   |
|       |                      | Health and well-being                  | Increase in mental well-being of those previously at risk<br>Potential increases in physical wellbeing  | Community survey  |
|       |                      | Fears and aspirations                  | More positive mental health from greater community and environmental connection<br>Households are better able to plan for uncertainties associated with groundwater / groundwater flooding, taking control of decisions and how they react. | Community survey  |
| 3.4.1 | Social (Community)   | Community                              | Public realm enhancements improving sense of place<br>Communities taking ownership and help to shape their own resilience to groundwater flooding   | Community survey  |
|       |                      | Political systems/inclusion/engagement | Increased ability / engagement / willingness to engage in other aspects / policy concerns   | Community surveys |
|       |                      | Fears and aspirations                  | Communities are better able to plan for uncertainties associated with groundwater / groundwater flooding, taking control of decisions and how they react.   | Community surveys |
| 3.5.1 | Knowledge and Skills | Technology                             | More optimism about innovative solutions for other flood-related issues   | Community survey  |
| 3.5.2 |                      | Holistic flood risk management         | Confidence to deliver holistic flood risk   | Community survey  |

|  |  |  |                                      |  |
|--|--|--|--------------------------------------|--|
|  |  |  | management in high groundwater areas |  |
|--|--|--|--------------------------------------|--|

[Note: Insert sub-categories and additional rows as necessary] Refer to the OBC Guidance Document for example sub-categories.

### 3.7 Comparison of costs and benefits

Describe the economic justification for the investment.

- What are the costs and the benefits (quantitative)?
- What is the benefit cost ratio?
- What are the additional qualitative benefits?
- How sensitive is the justification?

(See Guidance Document Aspect 4)

Table 4: Economic appraisal (quantitative)

| Options           | PVc<br>£k                    | PVb<br>£k   | BCR |
|-------------------|------------------------------|---|-----|
| Proposed Solution | Total project costs<br>£8001 | Direct building and agricultural damages and indirect/intangible damages avoided in 3 trial sites XXX |     |

The comparison of costs and benefits in Table 4 above suggests that all project costs (£7.5M PV) can be attributed to delivering avoided damages in the 3 trial sites (£XXX PV). Although this suggests a benefit:cost ratio of., this is not an appropriate comparison for the following reasons:

- Costs for many activities will lead to benefits that are transferable to improve resilience in other locations both within Greater Lincolnshire and beyond.
- Because of the innovative nature of the project, some costs may not lead to useful outcomes and so cannot be attributed to avoiding damage. These could be termed innovation costs.

In both these cases, it is not possible at this stage to estimate the costs or benefits required to give a more accurate economic appraisal in Table 4.

### 3.8 Sensitivity of the benefits to the level of investment

Describe the 'do less' and 'do more' options and the impact on the benefits arising from the project. The purpose of this is to understand the sensitivity of the benefits to the level of investment and the optimal selection of the combination of actions. Indicatively the sensitivity should consider +/- 20% change the level of investment. Describe the economic justification for the investment.

(See Guidance Document Aspect 3)



Table 5: Do Less

| Options  | PVc<br>£k |
|--|-----------|
| Do Less  |           |
| <b>Description of the reduction in benefits</b>  |           |
| <ul style="list-style-type: none"> <li>• Less exploration of the variation in social, environmental and economic contexts for groundwater resilience</li> <li>• Fewer houses protected</li> <li>• Fewer communities get improved resilience</li> </ul> |           |

Table 6: Do More

| Options   | PVc<br>£k |
|---|-----------|
| Do More   |           |
| <b>Description of the increase in benefits</b>  |           |
| <ul style="list-style-type: none"> <li>• Less 'top-down' communication and more innovative delivery and embedding of resilience</li> <li>• More exploration of the variation in social, environmental and economic contexts for groundwater resilience</li> <li>• Better groundwater monitoring and investigation into innovative groundwater monitoring technologies</li> <li>• More approaches or refinement of approaches to modelling and mapping</li> <li>• More houses protected</li> <li>• More communities get improved resilience</li> <li>• Improved evaluation of groundwater resilience</li> <li>• Greater collaboration with the other Resilience Innovation projects which are also refining aspects of evaluating resilience.</li> </ul> |           |

### 3.9 Critical Success Factors

Critical Success Factors (CSFs) are outcomes that are crucial (not desirable) to the successful delivery of the investment. Describe the critical success factors for the project.

- What outcomes of the investment are crucial to meeting the objectives of the flood and coastal resilience innovation programme?
- What outcomes of the investment are crucial at project and local level?

Table 7 Critical Success Factor

| Ref | Critical Success Factor   | Measurement criteria  |
|-----|---|---|
| 1   | Ensure learning and feedback is embedded during every aspect of the project                     | <ul style="list-style-type: none"> <li>• Learning log, reporting on change, success/challenges</li> <li>• Feedback – stakeholders and communities, National EA team / other FCRIP projects</li> </ul>         |
| 2   | Understanding current and future groundwater flooding and resource across Greater Lincolnshire. | <ul style="list-style-type: none"> <li>• Identification of pipeline sites</li> <li>• Review /revise current groundwater models</li> </ul>   |
| 3   | Improved community resilience to groundwater flood risk within identified trial sites           | <ul style="list-style-type: none"> <li>• Reduction in flood damage in communities involved with the project</li> <li>• Better response infrastructure</li> <li>• Community feedback and evaluation</li> </ul> |

|   |  |  |
|---|--|--|
| 4 | Identify flood risk management techniques that are sustainable, transferable and affordable. | <ul style="list-style-type: none"><li>• Quantative (future costs/cost benefit ratio) and qualitative</li><li>• No of homes with reduced risk (reduce risk banding)</li><li>• Environmental net gain/ positive carbon impact</li><li>• Outcomes worth promoting, report/studies</li></ul> |
|---|--|--|

## 4 Commercial Case

### 4.1 Summary of procurement strategy and timescales

Describe the procurement strategy and timescales.

- How will the selected procurement process demonstrate value for money?
- What supplier engagement – market testing - has taken place and how has this influenced and shaped the procurement strategy?
- What are the key tender evaluation criteria and how has innovation been addressed?
- Is this compliant with your organisations procurement procedures?
- What is the planned tender (and approval) timescale?

*(See Guidance Document Aspect 5)*

A system of procurement has been established and agreed by the partnership providing a consistent approach across delivery partners.

As partnership lead, Lincolnshire County Council will be responsible for leading on all procurement and adhere to its Contract and Procurement Procedure Rules that detail spending requirements of the Council and form part of the larger Council Constitution. For any spend in excess of the Find a Tender Service (FTS), (formerly OJEU) procurement thresholds, the requirements of the Public Contracts Regulations 2015 (PCRs) will be strictly adhered too

The method for tendering and scoring for outsourced work will enable value for money and improve cost estimates for similar work as the project progresses. Tenders and quotes are obtained through the Council's e-procurement system (ProContract) and therefore the processes are fully auditable. Suppliers invited to respond will be given an adequate period in which to prepare and submit a Tender, consistent with the urgency and complexity of the contract requirement. A minimum of at least four weeks will be allowed for straightforward and simple requirements. If more complex procurement are required, a longer period may be more appropriate. The PCRs lays down minimum specific time periods for submission of documents which will be followed.

Value for money is a prime consideration which will be balanced against the risks associated with driving innovation. It is anticipated all tendering/quotation exercises will be assessed against both price and quality factors, with the importance of each factor determined on a activity-by-activity basis to help achieve the best commercial outcomes. The balance of quality and price will always aim to drive value for money, ensure quality and achieve innovation and improvement where possible which will be achieved via a bespoke/tailored approach to each project within the programme.

To date procurement has taken place to establish contracts with Wood and Atkins to provide a capability assessment of the Lincolnshire Chalk and Spilsby Sandstone, and Lincolnshire Limestone Groundwater models.

## 4.2 Contractual terms and risk allocation

Describe the form of contract, or contracts, and how risks will be shared.

- What form of contractual arrangement is proposed?
- How will key risks be managed and shared during and post delivery?

Procurement for services will be undertaken by Lincolnshire County Council as the lead Partner, and on behalf of the Partners.

Contracts will be procured for the following:

- The supply of goods;
- Execution of works;
- The delivery of services;

Existing procurement frameworks will be used where applicable.

Contracts for GLGP will adhere to the Lincolnshire Council Standard Contract and Procurement Procedure Rules

Direct awards will typically only be used when a service or product is provided by a unique supplier with no competitors and the value is below £25k. However, one of its advantages is the reduced time taken to procure a service, allowing the project to commence on time. Value for money will be demonstrated through the financial benefit of having a supplier in place faster.

Where bespoke contracting arrangements are required (non-framework awards), contracts will be produced by Legal Lincs (the Council's legal department). As a public sector organisation, these contracts strive for a fair balance of risk and reward for all parties to the contract and offer protection to the public purse through suitable and proportionate performance management frameworks. A range of escalating sanctions will be in place to help all parties understand any consequences from a failure to deliver on their contractual obligations and contracts will also detail any monitoring and reporting requirements to help ensure performance remains on track.

Describe any commercial issues related to innovation and how these are addressed in the procurement strategy

- How are Intellectual property rights addressed in the contract to ensure public availability and use of the learning, evidence and project outputs?
- How are the innovation and performance risks addressed during delivery and post delivery?

## 4.3 Innovation and commercial issues

The following risks and issues related to innovation projects summarise our proposed mitigation:

- Not allowing sufficient time: Innovation typically requires time, and excessive pressure to deliver results can be counter-productive and lead to fewer innovative

outcomes. Sufficient time and budget is being integrated into sub-project programming to manage this risk.

- Experimenting too late: The project will need to test ideas in order to refine them. The project plan and route map will allow sufficient time for experimentation to incorporate findings in the early stages of development.
- Not meeting the requirements of the target audience: Stakeholder and community engagement will ensure innovation will match with stakeholder and community needs and preferences.

Project progress meetings led by Project Manager will monitor and assess risks. There will be a standard agenda item to review the risk register.

Intellectual Property Rights (IPR) clauses will be checked for their appropriateness. New contracts will use a Lincolnshire Council Standard Contract that specifically addresses IPR. IPR of technologies created or developed for GLGP will be owned by the party developing them. To enable transferring learning and benefits, third parties grant rights to Lincolnshire County Council to prepare reports containing high level evaluation and explanation of the technologies and the outcome of services, as agreed between the parties, and to share these reports with others.

## 5 Financial Case

### 5.1 Summary of Project Cost and Whole Life Cost

Summarise the Whole Life Cost of the project (and separately provide a more detailed cost breakdown in Appendix 5A including a breakdown of cost per resilience action).

Table 8: Project Cost

| Cost heading  | Cash Cost (k)     |
|---|-------------------|
| <b>Costs up to OBC</b>  |                   |
| Costs up to OBC   | £203,414          |
| Sub-Total (A)   | £203,414          |
| <b>Full-Business Case Development Cost</b>                                |                   |
| Staff costs   | £110,000          |
| External consultant costs   | £477,000          |
| Environmental   | £120,000          |
| Other <sup>2</sup>  | £0                |
| Contingency/risk allowance 5%   | £258,055          |
| Sub-total (B)   | £965,055          |
| <b>Construction, supervision and delivery costs of resilience actions</b> |                   |
| Construction  | £2,162,533        |
| Supervision   | £k                |
| Land purchase and compensation  | £k                |
| Other   | £k                |
| Contingency/risk allowance  | £2,260,956        |
| Sub-total (C)   | £4,423,489        |
| <b>Monitoring, learning, evaluation and dissemination</b>                 |                   |
| Monitoring  | £1,105,609        |
| Evaluation, learning and dissemination                                    | £k                |
| Other   | £k                |
| Contingency/risk allowance  | £1,130,478        |
| Sub-total (D)   | £2,211,745        |
| <b>Inflation</b>  |                   |
| Inflation allowance   | £108,402          |
| Sub-total (E)   | £108,402          |
| <b>Total Project Value</b>  |                   |
| <b>Total Project Value for approval (A+B+C+D+E)</b>                       | <b>£8,001,000</b> |

Table 9: Whole Life Cost

| Cost heading                                       | Cash Cost     |
|--|---------------|
| <b>Total Project Value from table above (F)</b>    | <b>£8001k</b> |
| <b>Post-project cost</b>                           |               |
| Future operation, monitoring and maintenance costs | £k            |

<sup>2</sup> Add further rows as necessary for 'Other'.

|                                    |               |
|------------------------------------|---------------|
| Future capital replacement costs   | £k            |
| Optimism bias for future costs     | £k            |
| Sub-total (G)                      | £8001k        |
| <b>Total Whole-Life Cost</b>       |               |
| <b>Total Whole-Life Cost (F+G)</b> | <b>£8001k</b> |

## 5.2 Financial risks and optimism bias

Describe how the costs have been derived and how the risk contingencies and optimism bias estimated.

- How have the risk contingencies and optimism bias been derived?
- How have post-project costs and optimism bias been derived?

Project costs have been estimated by Partners and are based on experience of delivering similar work. Optimism bias has been kept at 60% for OBC due to uncertainty that still exists. Following the gap analysis and assessment of the groundwater models this uncertainty will reduce and by FBC there will be further clarity regarding whole life project costs.

Post project funding has not been included, as currently we are unable to identify what future requirements might be. These will be re-examined during the development of the FBC.

Funding options for maintaining the actions after the initial 6 year funding period include (but are not limited to) self-funding, partnership funding, grant funding (for example for capital replacement costs), commercial sources, community funding/volunteers, maintenance by a willing landowner.

## 5.3 Funding sources and contributions

Describe all funding sources and contributions.  
Appendix 5B Contributions

*(See Guidance Document Aspect 6)*

Table 10: Funding sources and contributions

| Source of funding          | £k                                 | Comments   |
|----------------------------|------------------------------------|--|
| Resilience Innovation Fund | £7,551                             | This includes optimism bias at 40%   |
| Contribution 1             | £450 over 6 years from 25 Partners | Work in kind.<br>Committed staff time from all Partners equivalent of £3k per annum. |
| <b>Total funding</b>       | <b>£8,001</b>                      |  |

## 5.4 Expenditure and Funding Profile (2021-2027)

Complete the expenditure profile for the project (2021-2027)

Table 11: Expenditure Profile (2021-2027)

| Costs per year (£k)  | 2021-2022 | 2022-2023 | 2023-2024 | 2024-2025 | 2025-2026 | 2026-2027 | Total (£k)  |
|--|-----------|-----------|-----------|-----------|-----------|-----------|-------------|
| Full-Business Case Development Cost                                |           |           |           |           |           |           |             |
| Construction, supervision and delivery costs of resilience actions |           |           |           |           |           |           |             |
| Monitoring, learning, evaluation and dissemination                 |           |           |           |           |           |           |             |
| <b>Total</b>   |           |           |           |           |           |           | <b>8001</b> |

Table 12: Funding Profile (2021-2027)

| Costs per year (£k)                | 2021-2022 | 2022-2023 | 2023-2024 | 2024-2025 | 2025-2026 | 2026-2027 | Total (£k)  |
|------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-------------|
| Funding Allocation (Defra)         |           |           |           |           |           |           | 7,551       |
| Funding Allocation (Contributions) |           |           |           |           |           |           | 450         |
| <b>Total</b>                       |           |           |           |           |           |           | <b>8001</b> |

## 5.5 Future funding and financing

Describe how future maintenance, operation, monitoring and asset costs will be secured.

- How will future costs be secured after the project implementation?

*(See Guidance Document Aspect 6)*

Funding options for maintaining the actions after the initial 6 year funding period include (but are not limited to) self-funding, partnership funding, grant funding (for example for capital replacement costs), commercial sources, community funding/volunteers, maintenance by a willing landowner.

Opportunities for financial contributions from partners – and commitment to those contributions – will be sought during the development phase(s) of the project, as will



opportunities for commercial funding, for example from beneficiaries of the practical actions. It is expected that in-kind contributions will be made by funding and non-funding partners alike. For example, to date partners have provided officer time and specialist advice to develop the Expression of Interest and OBC and it is expected that this will continue throughout the programme. Furthermore, volunteers will be sought to take part in certain activities, such as 'citizen scientists' assisting with the monitoring of actions on the ground.

In addition, some of the non-Governmental organisation partners are expert at fundraising by alternative means. These partners include the Lincolnshire Chalk Streams trust, Lincolnshire Rivers Trust, and the Lincolnshire Wildlife Trust.

## 6 Management Case

### 6.1 Governance and partnership arrangements

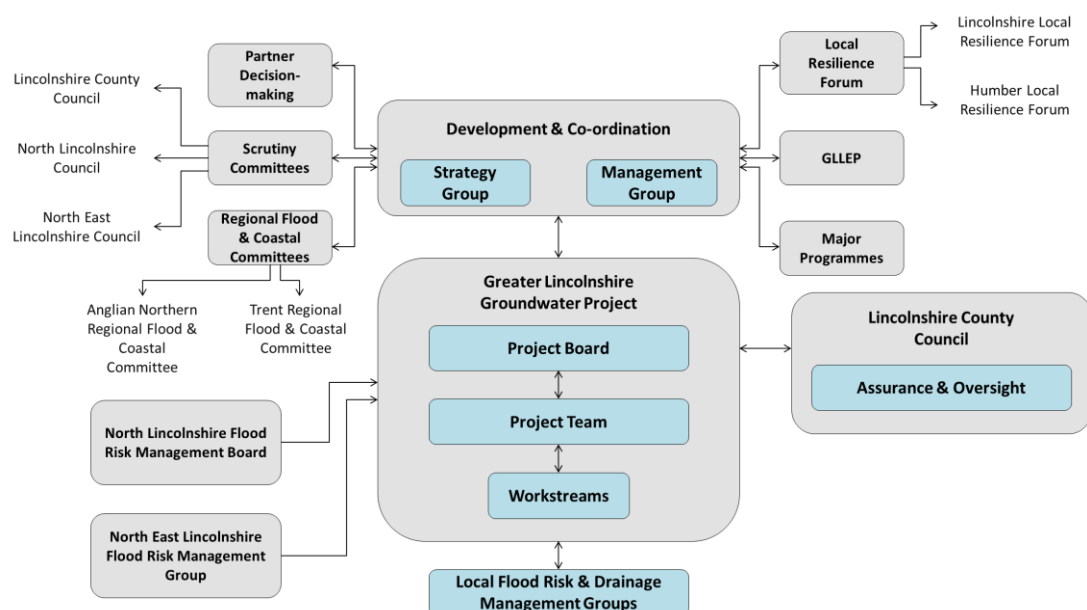
“Put simply, governance is concerned with the way in which decisions are taken and implemented, and decision-makers are held to account” (FRS17186, 2021)

Briefly describe the governance and partnership arrangements proposed for delivery.

- Who are the partners and contributors (financial, knowledge, technology)?
- What is the relationship with wider stakeholders and the local community?
- What are the management arrangements, and are these set-out in a Memorandum of Understanding (MoU), or Terms of Reference( ToR) or similar?
- What leadership commitments are in place to realise the investment ambitions?

(See Guidance Document Aspect 7)

The GLGP has established a partnership making use of stakeholder inter-agency skills and expertise to deliver the agreed outcomes of the project. The partners will form a Project Board, which will operate in accordance with the agreed governance structure. The partnership aligns with, and will work within a wider flood risk and water management structure across Greater Lincolnshire, as illustrated below:



The Project Board will be made up of relevant political members from Lincolnshire, North East Lincolnshire and North Lincolnshire County Councils, representatives from key partners, LCC’s project executive, senior users, senior suppliers and an LCC Strategic Finance Manager (see governance structure).

The terms of reference and governance structure (see appendix 6A) have been produced to facilitate collaborative, joined up working across all partners whilst ensuring clear mechanisms are implemented to report and monitor progress against delivering the agreed project objectives.

It is anticipated all delivery activities will be carried out by contracted suppliers, for example, GLGP partner NNF have been contracted to employ a Community Engagement Officer for the purpose of the project and Wood and Atkins have been contracted to review existing groundwater models and complete gap analysis work.

Project progress will be reported to the Board by the Project Manager in accordance with the monitoring mechanisms outlined in the governance structure; this includes but is not limited to regular Board meetings, political scrutiny and due financial diligence.

Evidence about the costs and benefits of the resilience actions will be gathered through monitoring by the project manager, and will form part of the regular reporting to the Board. Learnings will be discussed at monthly project progress meetings and collated and reported by the Project Manager including back to the EA.

Learning from the overall project will be identified, captured and shared through the Board by means of summative project assessments throughout the life of the programme. If deemed necessary by the Board, impartial assessments and peer review will be utilised to validate such learning. Sharing can be by many means, for example multi-agency meetings, publicity or professional literature.

## 6.2 Project management, roles and responsibilities

Briefly describe the project management arrangements for the investment.

- What of the project roles and responsibilities?
- What Quality Plan arrangements are in place to manage the investment and deliver innovation?
- What Safety, Health, Environment and Well-being (SHEW) arrangements are in place?

*(See Guidance Document Aspect 8)*

Roles and responsibilities for the project are outlined in the project terms of reference, including the project board, project team and workstreams.

Project management roles and responsibilities include:

- Project Board: responsible for the overall direction of the project
- Project Executive: overall control of the project,
- Project Manager: manages the project on a day-to-day basis on behalf of the project board, coordinating the activities of the Project Team and reporting progress of delivery, risks and issues, interdependences and budgets.

The Project Team will comprise of a full time Project Manager (recruitment for which is currently underway), 2 project support officers and workstream leads. They will be responsible for:

- Provide a key linkage between the Greater Lincolnshire Groundwater Project and the national Environment Agency (EA) team;
- Co-ordinating workstreams and ensuring that all undertaken work aligns with the strategic direction set by the Project Board (PB)

- Liaise with individual workstreams to manage and report upon project delivery, timescales, costs, quality, risks
- Monitoring progress and reporting to the Project Board
- Managing risks and issues and reporting them to the Project Board where required
- Managing lessons learnt and change controls
- Responsible for overseeing and distributing lessons reports;
- Oversee an integrated programme of delivery across Greater Lincolnshire;
- Work alongside the PB to determine the projects evaluation criteria. All criteria must be consistent with criteria developed by the EA.

### 6.3 Skills and capacity

Describe the technical knowledge, skills and expertise in place to drive and manage innovation; and the capabilities and resource commitments in place to deliver the proposed resilience measures.

- What knowledge, skills and expertise you have in place?
- What knowledge, skills and expertise remain to be acquired and how will this be done?

*(See Guidance Document Aspect 8)*

All project partners have extensive experience of leading and delivering complex asset management and community engagement projects. The partnership is made up of representatives from a number of different organisations, providing access to a wide range of varying skills, knowledge and expertise.

The majority of GLGP activities will be delivered by contractors. The Lead Local Flood Authorities will lead the bulk of the work, with support from Anglian Water and relevant Drainage Boards leading on any monitoring, instrumentation and technology to deliver smart catchment monitoring, and the Lincolnshire Chalk Steams project, Lincolnshire Wildlife Trust and Lincolnshire Rivers Trust leading on environmental baseline and monitoring work.

Further specialist skills will be accessed via contract agreements with suppliers, for example, the GLGP currently hold contracts with Wood and Atkins to provide the capability assessment and gap analysis work on the groundwater models. The large number of partners that make up the GLGP mean that where additional skills and capacity are identified the partnership can respond in sourcing specialist contractors.

### 6.4 Programme

Describe the overall route-map for delivery including a detailed programme to Full-Business Case, and the outline programme to 2027 for implementation and completion of the project.

- What are the key milestones?
- What is the critical path and what time allowances are included for risk?
- What are the key dependencies with stakeholders and the local community?
- When are the key evaluation and learning points?

*(See Guidance Document Aspect 9)*

The overall route-map for delivery including a detailed programme to Full-Business Case, and the outline programme to 2027 for implementation and completion of the project is outlined below and in Appendix 6C. It is currently anticipated that the Full-Business Case

shall be submitted for approval by end of April 2024, with the following being key milestones:

- May 2022 – Confirmation of evaluation questions for GLGP
- June 2022 – Recruitment of a suitable Project Manager to co-ordinate delivery of the GLGP
- July 2022 – Commencement of research by University of Lincoln regarding the risk of salinisation from groundwater flooding in the Lincolnshire Fens
- August 2022 – Completion of Phase 1 (Scoping) - Review of groundwater models
- November 2022 – Completion of Phase 2 (Pre-modelling) – Review of groundwater models
- December 2022 – Installation of additional groundwater monitoring sensors across Greater Lincolnshire
- January 2023 – Completion of initial rapport building and community engagement within the identified trial sites of Barton and Barrow-upon-Humber, Grimsby and Scopwick
- March 2023 – Completion of Phase 3 (Groundwater Modelling) - Review of groundwater models
- July 2023 – Commencing the identification of potential future groundwater schemes
- January 2024 – Partnership approval of Full-Business Case
- March 2024 – LCC Executive approval of Full-Business Case.

Notwithstanding the above, it is important to note that the timescales outlined are potentially overestimates as uncertainty, due to contractor availability, still exists regarding the work required to review, revise and validate the Lincolnshire Chalk and Spilsby Sandstone and Lincolnshire Limestone groundwater models. The GLGP is currently in the process of obtaining greater clarity regarding timescales. Once this has been obtained the programme will be reviewed with the aim of bringing forward the target date for Full-Business Case completion, if, upon guidance of groundwater modelling experts, such an ambition is appropriate.

Referencing the above comment regarding uncertainty, the GLGP has currently assigned risk allocations to the following activities:

| Reference | Activity  | Risk Allocation (Months) | Likelihood of Realisation |
|-----------|---|--------------------------|---------------------------|
| 3         | Recruitment of Project Manager  | 3                        | Medium                    |
| 4         | Approval of Outline Business Case   | 1                        | Medium                    |
| 5         | Indicator Data Collection & Confirmation of Evaluation Questions                  | 1                        | Low                       |
| 9         | Recruitment of Project Officers (If Necessary)                                    | 3                        | Low                       |
| 14        | Procurement of Suitable Contractor for Groundwater Monitoring Sensor Installation | 1                        | Low                       |
| 15        | Installation of Groundwater Monitoring Sensors                                    | 3                        | Low                       |
| 19        | Production of Full-Business Case  | 2                        | Medium                    |

|    |  |   |           |
|----|--|---|-----------|
| 20 | Community Involvement / Empowerment During Optioneering Process                          | 2 | Medium    |
| 26 | Partnership Approval of Full-Business Case   | 1 | Low       |
|    |  |   |           |
| 31 | Assurance of Full Business Case  | 1 | Low       |
| 32 | Procurement of Suitable Contractor and Resources to Implement Measures / Work Identified | 2 | Medium    |
| 33 | Implementation of Proportionate Place Based Measures                                     | 2 | Uncertain |

For ease of representation the critical path of the project has been displayed within a separate Gantt Chart (n = 60 months).

As outlined previously within the Outline Business Case, the key dependency of the project is the reviewing, revising and validation of the Lincolnshire Chalk and Spilsby Sandstone and Lincolnshire Limestone groundwater models. Without which the identification of proportionate, place-based measures will be severely compromised due to a relatively limited understanding of groundwater flood risk across Greater Lincolnshire. This is because existing groundwater models have been designed to predict / demonstrate low flows within groundwater and hence are not currently suited for assessing groundwater flood risk.

In addition to the above, another key dependency will be the engagement and empowerment of stakeholders and local communities, and as such engagement is programmed to commence in earnest during the revision of the groundwater models and will continue throughout the development of the Full-Business Case (including optioneering).

Evaluation of progress, and the identification, dissemination and integration of lessons identified will be undertaken by the Project Manager, with support from the Project Team, as often as deemed necessary. For the avoidance of doubt this process will align with FCRIP reporting requirements and the governance arrangements of the Joint Lincolnshire Flood Risk and Management Partnership alongside governance arrangements of North East Lincolnshire Council and North Lincolnshire Council. It is likely that key evaluation and learning points will be identified following the completion of the following activities:

- January 2023 – Completion of initial rapport building and community engagement within the identified trial sites of Barton and Barrow-upon-Humber, Grimsby and Scopwick
- March 2023 – Completion of Phase 3 (Groundwater Modelling) - Review of groundwater models
- April 2024 – Submission of Full Business Case
- February 2025 – Completion of research by University of Lincoln regarding the risk of salinisation from groundwater flooding in the Lincolnshire Fens
- July 2024 – October 2026 – During and following implementation and monitoring of proportionate place-based measures
- March 2027 – Identification of potential future groundwater schemes

## 6.5 Communications, stakeholder and community engagement

Describe the Communications and Engagement Plan going forward.

- How will communications be managed?
- How will stakeholders be engaged going forward?
- How will the community be engaged going forward?

*(See Guidance Document Aspect 2)*

A Communication steering group has been established which will develop best practice and hold and develop the communication and engagement plan. The Communication and Engagement Plan will be revisited and updated on a regular basis, and when new workstreams are established.

The overriding aim of our communication and engagement is to ensure that all relevant stakeholder's and communities play a key role in the design, implementation, maintenance and embedding of the project's outputs. A stakeholder mapping exercise was undertaken through the Theories of Change engagement to identify partners and stakeholders in the development of the project. Stakeholder mapping will be used again in identifying the 3 trial sites. Detailed Stakeholder and Community plans will then be developed for each trial site to encourage and enable involvement, provide consistency and help manage goals and expectations.

It is anticipated that GLGP will use the EA's web platform Engagement HQ to host digital communications with communities and stakeholders, and the wider public. This will provide consistency in messaging across our trial sites and allow partners/workstream leads access to digital tools for engagement activities. The Community and Engagement steering group will work with GLGP partners to ensure assurance sign off before information is uploaded to Engagement HQ. Partners will signpost enquiries to this website.

Communication plans will be adapted and evolve over time as the project processes. Plans will be evaluated and may change dependant on review on effective communication channels.

Future key areas for engagement with stakeholders and communities will include:

- Mapping of stakeholder and communities for individual trial sites and producing stakeholder and community engagement plans for each.
- Exploring different community engagement approaches to ensure inclusivity and maximise active involvement
- Regular review of stakeholder and community plans, objectives and success criteria
- Branding and engagement materials, key messaging and effective communication channels
- Coordinate engagement between the trial sites, any future pipeline sites and other flood resilience projects and activities.

The Project Manager, in liasion with the Communication and Engagement steering group will manage internal Partnership communications. The monthly partnership steering group meeting will provide project updates and allow partners the opportunity to discuss any

concerns, opportunities, and share lessons learnt. Further communication channels, including TEAMS channels, sharing of reports and learnings, a dedicated partner pages on the Engagement HQ website will provide the opportunity for partners to work collaboratively.

## 6.6 Risk and change management

Describe the approach to the assessment and management of risk and uncertainty.

- What are the key delivery risks (time, money, reputation) and how will these be managed?
- What are the key delivery uncertainties associated with the innovation and implementation?
- How will these uncertainties be managed?
- How will future changes be agreed and communicated?

*(See Guidance Document Aspect 10)*

Table 13 Key risks to fulfilling the investment objectives:

| Ref | Key Risks  | H/M/L | Owner                       | Counter Measures and approach   |
|-----|--|-------|-----------------------------|---|
| 1   | Capacity and resources of partners/ contractors throughout the 6 years | M     | Lincolnshire County Council | Contracted suppliers will undertake most of required works, managed by a full time Project Manager and supported with a proposed 2x project officer.  |
| 2   | Maintaining the engagement of partners throughout the 6-year project   | M     | Lincolnshire County Council | Provision of regular project updates, actively involving partners in the development of the project and ensuring partners are brought in as and when appropriate times  |
| 3   | Slippage in programme /scope creep/delays in delivery of actions       | M     | Lincolnshire County Council | Regular tracking and review of the programme by PM and early indications raised by partners. Forward planning and understanding of risks for each phase so that any delays are more likely to be mitigated. Reporting by exception if required to the Project Board |
| 4   | Increased costs associated with supplier resource                      | M     | Lincolnshire County Council | Quantify and plan project around maybe a most likely, best case and worse case spend profiles.  |
| 5   | Ability to sustain implemented Measures / Works                        | L     | Lincolnshire County Council | Identification of innovative funding sources for maintenance<br>The designing of measures / works to be proportionate / sustainable, having due regard to future funding / maintenance requirements   |



## 6.7 Contract management

Describe the key contract management proposals.

- Who will be responsible for day-to-day contract management?
- How will interfaces and dependencies between individual contracts be managed?

GLGP partners all have experience of managing the delivery of operational contract and performance management for large programmes.

The Project Manager, with support from the Project Team will be responsible for day to-day contract management, scheduling in regular reviews of contract progression and outputs. This activity will be supported by the procurement team at LCC, in line with LCC's Standard Contract and Procurement Procedure Rules.

The Project Team will identify and assess any third-party dependencies, with input from the wider GLGP partners. Resources will be prioritised, responsibilities allocated, and strategies put in place to monitor progress. The route map will be developed following the initial desk-based research and gap analysis to take account of interfaces and communicated to the partners to pre-empt activities and solutions to minimise risk.

## 6.8 Assurance

Describe the assurance plan for the business case.

- What checks have and will be applied?
- Have partners approved the Business Case?

Useful references and existing industry guidance:

- "A Guide to Integrated Assurance", Association for Project Management, 2014

The outline business case has been produced by lead partner Lincolnshire County Council in collaboration with the GLGP partners, by way of feedback and review. It has been approved by the GLGP partners and signed off by the Project Executive prior to submission.

The business case has also been approved by the LCC's internal executive board. The draft OBC was submitted with papers to the Senior Management Team for review and approval and sign off was provided by the Service Director and lead member for flooding.

## 6.9 Innovation and learning: monitoring, evaluation and dissemination

Describe the proposals for monitoring, evaluation and dissemination of innovation and learning.

- What are the proposals and arrangement for sharing and exchange with the Programme?
- What are the proposed arrangements for monitoring the innovation and learning?
- How will the evidence be recorded and the evaluation be managed?
- What are the arrangements and plan for dissemination through the life of the project?

*(See Guidance Document Aspect 11)*

Proposals for monitoring, evaluation and dissemination are detailed in Section 2.9 and Appendix 6D.

## 6.10 Contingency plans

Describe the options available if the proposal is unaffordable, fails to win community support and/or other necessary approvals.

- Is a scaled down investment proposal possible?
- Can the phasing of the work be amended?
- Can the location of the proposals be adjusted?
- Are alternative and/or additional contributions (financial, knowledge, technology) available?

A scaled-down investment proposal was presented in Section 3.4.1, with suggested reduced benefits.

Phasing of GLGP is sequential:

1. The Conducting of academic research into the risk of salinisation of groundwater flooding in the Lincolnshire Fens and undertaking of a gap analysis and subsequent revision, including output validation, of the Lincolnshire Chalk and Spilsby Sandstone and Lincolnshire Limestone groundwater models. During this process initial community engagement will be undertaken within the potential trial sites of Barton and Barrow-upon-Humber, Grimsby and Scopwick, which have been preliminary selected based on observed flooding across Greater Lincolnshire.
2. Based on the outputs of the revised models, 3 trial sites (and potential future sites) will be confirmed.
3. The development and assessment of proportionate place-based measures within the confirmed trial sites. Throughout this process local communities shall be empowered and actively encouraged to take part in the development of measures, whilst simultaneously having regard to model outputs.
4. The implementation and delivery of packages of work in collaboration with stakeholders, including local communities, within the trial sites as identified through the assessment work, specifically suited to managing groundwater both in terms of flood risk and as a resource.
5. Throughout the development and implementation of the project, progress will be monitored, lessons shall be identified, shared and implemented and performance evaluated all of which shall contribute to, in addition to the above, the development of potential pipeline groundwater related projects.

If necessary, the 3 trial locations could be changed, although these were identified by the Partners and the desk-based analysis. Other pipeline sites will be identified during this phase.