Framework: Collaborative Delivery Framework
Supplier:
Company Number:

Geographical Area: Midlands
Project Name: Bourn and Lower Rea - Appraisal
Project Number:

Contract Type: Professional Service Contract
Option: Option C

Contract Number:

Stage: SOC_to_OBC

Revision	Status		Originator		Reviewer		Date

PROFESSIONAL SERVICE CONTRACT under the Collaborative Delivery Framework
CONTRACT DATA

Project Name Bourn and Lower Rea - Appraisal

Project Number [redacted]

This contract is made on 21 January 2023
between the *Client* and the *Consultant*

- This contract is made pursuant to the Framework Agreement (the "Agreement") dated 01st day of April 2019 between the *Client* and the *Consultant* in relation to the Collaborative Delivery Framework. The entire agreement and the following Schedules are incorporated into this Contract by reference

- Schedules 1 to 22 inclusive of the Framework schedules are relied upon within this contract.

- The following documents are incorporated into this contract by reference
  BLR OBC - PSC scope - Final for contract

Part One - Data provided by the *Client*

Statements given in all Contracts

1 General

The *conditions of contract* are the core clauses and the clauses for the following main Option, the Option for resolving and avoiding disputes and secondary Options of the NEC4 Professional Service Contract June 2017.

Main Option	Option C	Option for resolving and avoiding disputes	W2

Secondary Options

X2: Changes in the law

X7: Delay damages

X9: Transfer of rights

X10: Information modelling

X11: Termination by the *Client*

X18: Limitation of liability

X20: Key Performance Indicators

Y(UK)2: The Housing Grants, Construction and Regeneration Act 1996

Y(UK)3: The Contracts (Rights of Third Parties) Act 1999

Z: *Additional conditions of contract*

The *service* is Production of an Outline Business Case for the appraisal of Flood Risk Mitigation measures along the Bourn and Lower Rea.

The *Client* is [redacted]

Address for communications [redacted]

Address for electronic communications [redacted]

The *Service Manager* is [redacted]
Address for communications [redacted]

Address for electronic communications [redacted]

The Scope is in
BLR OBC - PSC scope - Final for contract

The *language of the contract* is English

The *law of the contract* is
the law of England and Wales, subject to the jurisdiction of the courts of England and Wales

The period for reply is 2 weeks

The *period for retention* is
6 years following Completion or earlier termination

The following matters will be included in the Early Warning Register

Early warning meetings are to be held at intervals no longer than 2 weeks

2 The *Consultant's* main responsibilities

The *key dates* and *conditions* to be met are	
conditions to be met	*key date*
'none set'	'none set'
'none set'	'none set'
'none set'	'none set'

The *Consultant* prepares forecasts of the total Defined Cost plus Fee and *expenses* at intervals no longer than 4 weeks

3 Time

The *starting date* is 03 January 2023

The *Client* provides access to the following persons, places and things

access	*access date*
Sharepoint/Asite	03 January 2023

The *Consultant* submits revised programmes at intervals no longer than 4 weeks

The *completion date* for the whole of the *service* is 19 December 2025

The period after the Contract Date within which the *Consultant* is to submit a first programme for acceptance is 4 weeks

4 Quality management

The period after the Contract Date within which the *Consultant* is to submit a quality policy statement and quality plan is 4 weeks

The period between Completion of the whole of the *service* and the *defects date* is 26 weeks

5 Payment

The *currency of the contract* is the £ sterling

The *assessment interval* is Monthly

The *Client* set total of the Prices is [redacted]

The *expenses* stated by the *Client* are as stated in Schedule 9

The *interest rate* is 2.00% per annum (not less than 2) above the Base rate of the Bank of England

The locations for which the *Consultant* provides a charge for the cost of support people and office overhead are All UK Offices

If Option C is used

The *Consultant's share percentages* and the *share ranges* are:

share range				*Consultant's share percentage*
less than		*80 %*		*0 %*
from	*80 %*	*to*	*120 %*	*as set out in Schedule 17*
greater than		*120 %*		*as set out in Schedule 17*

6 Compensation events

These are additional compensation events

1. 'not used'

2. 'not used'

3. 'not used'

4. 'not used'

5. 'not used'

8 Liabilities and insurance

These are additional *Client's* liabilities

1. 'not used'

2. 'not used'

3. 'not used'

The minimum amount of cover and the periods for which the *Consultant* maintains insurance are

EVENT	MINIMUM AMOUNT OF COVER	PERIOD FOLLOWING COMPLETION OF THE WHOLE OF THE *SERVICE* OR TERMINATION
The *Consultant's* failure to use the skill and care normally used by professionals providing services similar to the *service*	**£5,000,000** in respect of each claim, without limit to the number of claims	12 years after Completion
Loss of or damage to property and liability for bodily injury to or death of a person (not an employee of the *Consultant)* arising from or in connection with the *Consultant* Providing the Service	**£15,000,000** in respect of each claim, without limit to the number of claims	12 years after Completion
Death of or bodily injury to the employees of the *Consultant* arising out of and in the course of their employment in connection with the contract	*Legal minimum* in respect of each claim, without limit to the number of claims	*For the period required by law*
The *Consultant's* total liability to the *Client* for all matters arising under or in connection with the contract, other than the excluded matters is limited to	**£5,000,000**	

Resolving and avoiding disputes

The *tribunal* is litigation in the courts

The *Adjudicator* is	'to be confirmed'
Address for communications	'to be confirmed'
Address for electronic communications	'to be confirmed'
The *Adjudicator nominating body* is	The Institution of Civil Engineers

Z Clauses

Z1 Disputes
Delete existing clause W2.1

Z2 Prevention
The text of clause 18 Prevention is deleted.
Delete the text of clause 60.1(12) and replaced by:
The *service* is affected by any of the following events
• War, civil war, rebellion, revolution, insurrection, military or usurped power;
• Strikes, riots and civil commotion not confined to the employees of the *Consultant* and sub consultants,
• Ionising radiation or radioactive contamination from nuclear fuel or nuclear waste resulting from the combustion of nuclear fuel,
• Radioactive, toxic, explosive or other hazardous properties of an explosive nuclear device,
• Natural disaster,
• Fire and explosion,
• Impact by aircraft or other aerial device or thing dropped from them.

Z3 Disallowed Costs

Add the following in second bullet of 11.2 (18) add:
(including compensation events with the Subcontractor, i.e. payment for work that should not have been undertaken).
Add the following additional bullets after 'and the cost of ' :
• Mistakes or delays caused by the *Consultant's* failure to follow standards in Scopes/quality plans
• Reorganisation of the *Consultant's* project team
• Additional costs or delays incurred due to *Consultant's* failure to comply with published and known guidance or document formats
• Exceeding the Scope without prior instruction that leads to abortive cost
• Re-working of documents due to inadequate QA prior to submission, i.e. grammatical, factual arithmetical or design errors
• Production or preparation of self-promotional material
• Excessive charges for project management time on a commission for secondments or full time appointments (greater than 5% of commission value)
• Any hours exceeding 8 per day unless with prior written agreement of the *Service Manager*
• Any hours for travel beyond the location of the nearest consultant office to the project unless previously agreed with the *Service Manager*
• Attendance of additional individuals to meetings/ workshops etc who have not been previously invited by the *Service Manager*
• Costs associated with the attendance at additional meetings after programmed Completion, if delay is due to *Consultant* performance
• Costs associated with rectifications that are due to *Consultant* error or omission
• Costs associated with the identification of opportunities to improve our processes and procedures for project delivery through the *Consultant's* involvement
• Was incurred due to a breach of safety requirements, or due additional work to comply with safety requirements
• Was incurred as a result of the *Client* issuing a Yellow or Red Card to prepare a Performance Improvement Plan
• Was incurred as a resulting of rectifying a non-compliance with the Framework Agreement and/or any call off contracts following an audit

Z4 Share on termination
Delete existing clause 93.3 and 93.4 and replace with:
93.3 In the event of termination in respect of a contract relating to services there is no *Consultant's* share'

Z6 The Schedule of Cost Components

The Schedule of Cost Components are as detailed in the Framework Schedule 9.

Z7 Consultant's share
Delete existing clauses 54 and 93.3 and replace with:
54.1 The *Service Manager* assess the *Consultant's* share of the difference between the Aggregated Total of the Prices and the Aggregated Price for Service Provided to Date.
The difference is divided into increments falling within each of the *share ranges* . The limits of a share range are the Aggregated Price for Service Provided to Date divided by the Aggregated Total of the Prices, expressed as a percentage.
The *Consultant's* share equals the sum of the products of the increment within each share range and the corresponding *Consultant's share percentage* .
54.2 If the Aggregated Price for Service Provided to Date is less than the Aggregated Total of the Prices, the *Consultant* is paid its share of the saving. If the Aggregated Price for Service Provided to Date is greater than the Aggregated Total of the Prices, the *Consultant* pays its share of the excess.
54.2A If, prior to Completion of the whole of the service, the Price for Service Done to Date exceeds 111% of the total of the Prices, the amount in excess of 111% of the total of the Prices is retained from the *Consultant* .
54.3 If, prior to the Completion Date, the Price for Service Provided to Date exceeds 110% of the total of the Prices, the amount in excess of 110% of the total of the Prices is retained from the *Consultant* .
54.4 The *Service Manager* makes a preliminary assessment of the *Consultant's* share at Completion of the Whole of the *service* using forecasts of the final Aggregated Price for Service Provided to Date and the final Aggregated Total of Prices.
This share is included in the amount due following Completion of the whole of the *services* .
54.5 The *Service Manager* makes a final assessment of the *Consultant's* share, using the final Aggregated Price for Service Provided to Date and the final Aggregated Total of the Prices. This share is included in the final amount due.
93.3 If there is a termination except if Z4 applies, the *Service Manager* assesses the *Consultant's* share after certifying termination. The assessment uses as the Aggregated Price for Service Provided to Date the sum of
• the total of
– the Defined Cost which the *Consultant* has paid and
– which it is committed to pay for work done before termination
and
• the total of
– the Defined Cost which the *Consultant* or *Contractor* has paid and
– which it is committed to pay
in the *partner contract* before the date the termination certificate is issued under this contract.
The assessment uses as the Aggregated Total of the Prices the sum of
• the total of
– the lump sum price for each activity which has been completed and
– a proportion of the lump sum price for each incomplete activity which is the proportion of the work in the activity which has been completed

and
• the total of
– the lump sum price for each activity which has been completed and
– a proportion of the lump sum price for each incomplete activity which is the proportion of the work in the activity which has been completed
in the partner contract before the date the termination certificate is issued under this contract.

Add:
11.2(25) The Aggregated Total of the Prices is sum of
• the total of the Prices and
• the total of the Prices in the partner contract

11.2(26) The Aggregated Price for Service Provided to Date is the sum of
• the Price for Service Provided to Date and

Z23 Linked contracts
Issues requiring redesign or rework on this contract due to a fault or error of the *Consultant* will neither be an allowable cost under this contract or any subsequent contract, nor will it be a Compensation event under this contract or any subsequent contract under this project or programme.

Z24 Requirement for Invoice

Add the following sentence to the end of clause 51.1:
The Party to which payment is due submits an invoice to the other Party for the amount to be paid within one week of the *Service Manager's* certificate.
Delete existing clause 51.2 and replace with:
51.2 Each certified payment is made by the later of
• one week after the paying Party receives an invoice from the other Party and
• three weeks after the assessment date, or, if a different period is stated in the Contract Data, within the period stated.
If a certified payment is late, or if a payment is late because the *Service Manager* has not issued a certificate which should be issued, interest is paid on the late payment. Interest is assessed from the date by which the late payment should have been made until the date when the late payment is made, and is included in the first assessment after the late payment is made

Z25 Risks and insurance
The *Consultant* is required to submit insurances annually as Clause Z4 of the Framework Agreement

Secondary Options

OPTION X2: Changes in the law

The *law of the project* is the law of England and Wales, subject to the jurisdiction of the courts of England and Wales

OPTION X7: Delay damages

X7 only Delay damages for Completion of the whole of the *service* are [redacted] per day

OPTION X10: Information modelling

The period after the Contract Date within which the *Consultant* is to submit a first Information Execution Plan for acceptance is 2 weeks

OPTION X18: Limitation of liability

The *Consultant's* liability to the *Client* for indirect or consequential loss is limited to

£1,000,000

The *Consultant's* liability to the *Client* for Defects that are not found until after the *defects date* is limited to

£5,000,000

The *end of liability* date is 6 years after the Completion of the whole of the *service*

OPTION X20: Key Performance Indicators (not used with Option X12)

The *incentive schedule* for Key Performance Indicators is in Schedule 17

A report of performance against each Key Performance Indicator is provided at intervals of

3 months

Y(UK)2: The Housing Grants, Construction and Regeneration Act 1996

The period for payment is 14 days after the date on which payment becomes due

Y(UK)3: The Contracts (Rights of Third Parties Act) 1999

term *beneficiary*

term *beneficiary*

Part Two - Data provided by the *Consultant*

Completion of the data in full, according to the Options chosen, is essential to create a complete contract.

1 General

The *Consultant* is

Name

Address for communications

Address for electronic communications

The *fee percentage* is

The *key persons* are

Name (1)
Job
Responsibilities
Qualifications
Experience

Name (2)
Job
Responsibilities
Qualifications
Experience

Name (3)
Job
Responsibilities
Qualifications
Experience

Name (4)
Job
Responsibilities
Qualifications
Experience

Name (5)
Job
Responsibilities
Qualifications
Experience

Name (6)
Job
Responsibilities
Qualifications
Experience

Name (7)
Job
Responsibilities

Qualifications
Experience

The following matters will be included in the Early Warning Register

3 Time

The programme identified in the Contract Data is

To be submitted within 2 weeks of contract award

5 Payment

The *activity schedule* is

NGSA CDF Hub D_BournLowerRea OBC_Activity Schedule_Revised Draft_09-11-22_Phase Split_plus Base Extra Over.xlsx

Resolving and avoiding disputes

The *Senior Representatives* of the *Consultant* are

Name (1) [redacted]
Address for communications
[redacted]

Address for electronic communications
[redacted]

Name (2)
Address for communications

Address for electronic communications

X10: Information Modelling

The *information execution plan* identified in the Contract Data is

To be submitted within two weeks of the Contract Date

Y(UK)1: Project Bank Account

The *project bank* is

N/A

named suppliers are

Contract Execution

Client **execution**

Signed as a Underhand by **[PRINT NAME]** for and on behalf of the [redacted]

[redacted]

Consultant **execution**

Signed as a Underhand by **[PRINT NAME]** for and on behalf of [redacted]

[redacted]

Security Marking: Enter / delete as necessary

[redacted]

NEC4 Professional Service Contract (PSC)

Scope

Project / contract information

Project name	**Bourn and Lower Rea Flood Risk Management Scheme - Outline Business Case (OBC)**
Project SOP code	
Contract number	
Date	24th November 2022

Assurance

Author	[redacted])	Date: 24th November 2022
Consulted	Senior User – [redacted]	Date:
Reviewed	Project Executive – [redacted]	Date:
Checked prior to issue	Commercial Services Manager	Date:

Revision History

Revision date	Summary of changes	Version number
May 2022	First issue (EA review)	P01
July 2022	Second issue (Addressed comments following EA review)	P02
November 2022	Final issue for contract	P03

This Scope shall be read in conjunction with the version of the Minimum Technical Requirements current at the Contract Date. In the event of conflict, this Scope shall prevail. The *service* is to be compliant with the following version of the Minimum Technical Requirements:

Document	Document Title	Version No	Issue date
LIT 13258	Minimum Technical Requirements	V11	May 2021
801_14	Environmental Sustainability Design and Management Minimal Technical Requirements	V03	Dec 2015
801_14_SD01	Cultural Heritage and Archaeology Standards Minimum Technical Requirements	V01	Dec 2015
801_14_SD02	Landscape and Environmental Design Minimum Technical Requirements	V02	Dec 2015

1 Overview

1.1 Background

This Outline Business Case (OBC) will seek to set out the appraisal and outline design of the preferred way forward for a flood risk management scheme on The Bourn and Lower River Rea in south Birmingham (Figure 1). The scheme aims to reduce flood risk to around 200 residential homes and 300 businesses in part of the city. The preceding Strategic Outline Case (SOC) for the project identified two primary options that could be taken forward –

1. A flood storage scheme, consisting of three main intervention areas within the Bourn catchment. This scheme was identified as the economically preferred option and would deliver the majority of the identified Outcome Measure 2's (OM2), whilst also providing a number of environmental enhancements.

2. Flood storage on the Bourn (as outlined above) supplemented with an additional flood storage area at Calthorpe Park, further downstream, on the River Rea. This scheme would deliver a number of further Reporting Outcomes (RO) but, critically, would also support future development within the Rea Valley Urban Quarter area of Birmingham City Centre. Whilst the benefits of that regeneration would primarily be realised and owned by other partners, such a scheme would support the route to net zero, enable development of a blue/green infrastructure network across the south of the city centre, open up sections of the, currently canalised, River Rea, provide additional environmental, amenity and health & wellbeing value and begin to reduce some of the long-term maintenance liabilities for the *Client*. The majority of funding for works at Calthorpe Park (circa £15m) would need to come from partners (to make this project economically viable) and discussions to that effect are ongoing.

The preferred way forward identified within the SOC was Option 2 (as outlined above), with such an approach not only delivering significant flood risk benefits but also resulting in the realisation of a wide variety of other strategic outcomes that are supported by the *Client* and key strategic partners across the catchment.

Whilst this scheme offers a unique set of opportunities, there are also risks in pursuing Option 2 given that the funding for such an approach would need to come from third parties and is not yet available or committed. The broad array of benefits and links to sustainable economic growth do, however, align closely with the National Flood and Coastal Erosion Risk Management Strategy for England (June 2022) and so a recommendation has been made by the West Midlands Area Leadership Team to take forward Option 2 in a proportionate and managed way.

As such, the *Consultant* should recognise the risk of abortive work and look to work to a programme that manages that risk whilst the *Client* engages with strategic partners to establish a clear and committed funding strategy.

It is anticipated that certain activities will be managed in a phased approach, with a clear decision point being set out within the programme at which time a determination about the appropriate way forward will be made.

Throughout the scope activities that are likely to benefit from a phased approached have been highlighted (in Blue), with it anticipated that the *Consultant* will set a clear programme and activity schedule to support a phased approach that appropriately manages risk. Where activities are included within this scope but not highlighted, it is assumed they will be programmed as standard and undertaken across the entirety of the study area.

Development of a funding strategy will be the responsibility of the *Client,* unless otherwise instructed throughout development of the OBC. The Strategy will both outline how and when external funding will be secured and provide a sufficient level of certainty regarding future contributions. The programme submitted by the *Consultant* should take account for reasonable timings and decision points, to allow for flexibility in the approach following a determination of the likely funding picture.

1.2 Catchment Context

The River Rea catchment is made up of a number of heavily urbanised watercourses situated to the south of Birmingham City (Figure 1). Rising in the Waseley Hills, the River Rea runs from Longbridge, through a number of residential communities before reaching the city centre in Digbeth, a short distance from the iconic Bull Ring shopping centre.

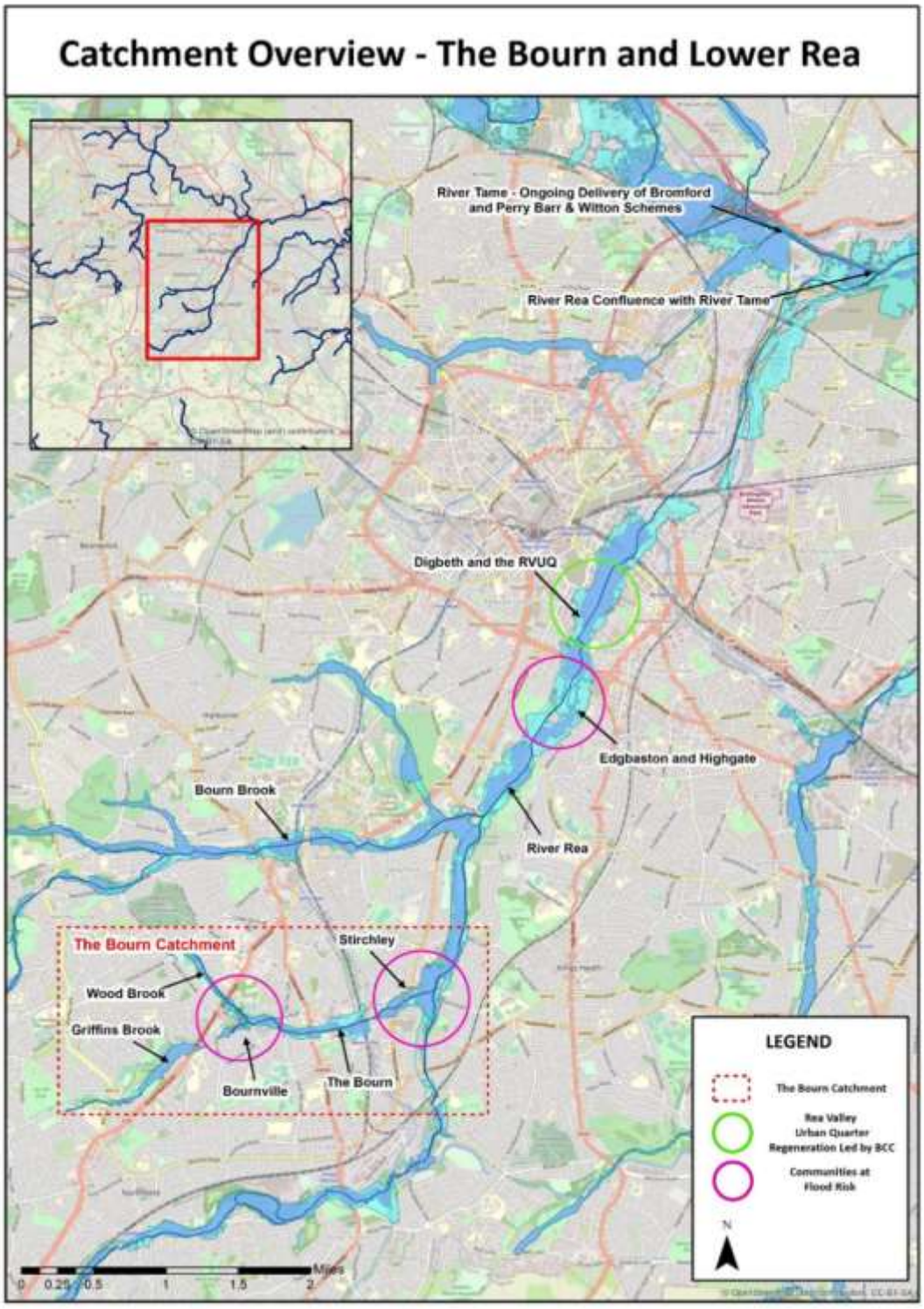

Figure 1 – Catchment Overview Plan

Along with the River Rea, the main tributary of interest for this OBC is The Bourn. Initially comprising two small tributaries (the Griffins Brook and Wood Brook) The Bourn is formally recognised from their confluence, a small distance upstream of the Cadburys Bournville manufacturing site. The Bourn then continues through the heavily populated area of Stirchley before joining the River Rea. The Bourn catchment and River Rea (from Stirchley to its confluence with the River Tame) form the study area for this OBC.

The lower reaches of the River Rea are heavily modified, with historic works (dating back to the 1920's) resulting in a canalised, brick lined channel from Canon Hill Park to the south of Digbeth, through to its confluence with the River Tame in the region of Spaghetti Junction. Further upstream, the River Rea and The Bourn are semi-natural in nature but are still inhibited by intense development and the introduction of manmade features such as road culverts and weirs. There are no formal flood defence assets that impact on the study reach, but it is acknowledged that the brick lined channel does operate as a de-facto defence providing additional capacity and increased conveyance during flood events.

The nature of the catchment is such that the onset of fluvial flooding following intense storms can be rapid, with encroachment into the floodplain increasing the number of receptors at risk. Whilst flooding in the catchment has been recorded throughout the century, the past two decades have seen an increase in convective summer storms, exacerbated by urban heat island effects, resulting in a series of significant flood events.

Surface water and sewer flooding is also a risk within the study area, as would be expected in an urbanised catchment. Whilst surface water flood mapping and historic events highlight this risk, impacts tend to be focussed on highway and curtilage flooding, but this will need to be considered in more detail during OBC development.

Flooding in 2008, 2012, 2016 and 2018 impacted a number of communities throughout the catchment. With anticipated climate change impacts (and an increasing urban population) we are likely to see an increase in both the likelihood and impact of similar events in the future. Currently, the onset of flooding occurs in a 10% Annual Exceedance Probability (AEP) event. Early onset of flooding to properties in Bournville and Stirchley is evident in these lower magnitude events, with the areas of Highgate, Edgbaston and Digbeth impacted in larger events. Of significance, the onset of flooding in the lower reaches, through the Digbeth area, increases significantly in a "Do Nothing" scenario (Table 1).

Table 1 – Overview of Property Numbers at Risk

Residential Properties

Return Period (%)	**20% AEP**	**10% AEP**	**5% AEP**	**2% AEP**	**1.33% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**
Do nothing	108	150	174	242	264	271	289	364
Do minimum	0	23	52	66	93	99	209	427
Do something	0	0	0	20	33	39	62	427

Non-residential Properties

Return Period (%)	**20% AEP**	**10% AEP**	**5% AEP**	**2% AEP**	**1.33% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**
Do nothing	284	305	316	343	348	365	387	450
Do minimum	0	1	2	23	28	35	104	383
Do something	0	0	0	4	8	8	23	224

In recognition of both the increasing level of flood risk in the catchment and the economic opportunities afforded by existing business interests and future development prospects, the *Client* started working with a number of partners in 2014. The resulting Rea Catchment Partnership (RCP) developed potential

management options for those areas at increased risk of flooding as well as funding initiatives linked to the opportunities afforded by the catchment's proximity to Birmingham City Centre.

The formation of the partnership resulted in a number of Initial Assessments and modelling studies being undertaken to determine the level of risk, to explore the options available for managing that risk and to establish the funding mechanisms required to enable scheme delivery. Previous flood risk management schemes in the Selly Park area of the city have already been delivered in partnership with third party contributors as a result of the groups work.

The Bourn and Lower Rea Flood Risk Management scheme is now being brought forward to address some of the remaining areas of flood risk in Bournville, Stirchley, Edgbaston and Digbeth. Consultancy support is required to determine the most efficient and effective methods of flood mitigation within the catchment described.

1.3 Previous Studies

1.3.1 In undertaking the *service* the *Consultant* shall take account of the previous studies detailed in the table below and produce a short technical summary explaining how best use will be made of historical data.

Report	Date	Format	Outcomes of study
River Rea Landscape Visioning Study	2022	Digital Format	A landscape visioning and engagement study for the whole of the River Rea catchment with case studies focussing on intervention areas for this scheme.
Bourn and Lower Rea SOC + Appendices	October 2021	Digital format	Identification of two primary flood risk management options as set out above.
FMP/TUFLOW River Rea Option Model – BWB 2020	2020	Digital format	Option modelling exercise to test storage options across catchment using EA baseline model.
Structural Survey of Engineered Section	2019	Unknown	Outcomes of study to be provided by the *Client.*
Capita Flood Risk Optioneering Report – Digbeth	Circa 2018	Digital format	Initial high level review of scale of flood risk intervention required to reduce flood risk in RVUQ region.
FMP/TUFLOW River Rea Baseline Hydraulic Model 2017	2016/17	Digital format	Update to existing hydraulic model for the River Rea and tributaries to support scheme development.
The Bourn Initial Assessment	Circa 2015	Digital format	Initial assessment of flood risk management options across the Bourn catchment – focussed on flood risk reduction in Stirchley.
Hydrology Review Reports	Various	Digital format	Hydrological review records for the Bourn Brook and Bourn – see details in modelling section of scope.
Ground Investigation Report	Circa 2014	Digital format	Analysis and high level findings from initial ground investigation exercise in Manor Farm Park.

1.3.2 The previous studies have been undertaken by or for the *Client* using reasonable skill and care and have been accepted. The *Consultant* shall review the information provided by the *Client* and notify the *Client* of any deficiencies in its suitability for use on the project. Following this review, and completion of any work required to rectify the deficiencies identified, the *Consultant* shall take the risk of any deficiencies in existing data quality and quantity which have not been notified to the *Client*.

1.4 Objective

As set out above, in the background information, this project aims to reduce flood risk through Bournville, Stirchley, Edgbaston and Digbeth. The project should also seek opportunities for supporting the regeneration through the Rea Valley Urban Quarter (RVUQ) area of Birmingham City Centre by reducing the currently constraining level of flood risk. The development of the OBC aims to reduce the risk to nearly 200 homes and 300 businesses.

This project aligns well with national and local strategies, these have been covered in more detail in Section 1.2 of The Bourn and Lower Rea SOC.

The objectives of this contract are to:

- Produce an OBC that supports the reduction of flood risk to existing property whilst also investigating how flood risk infrastructure in the upper catchment can support sustainable economic growth in the RVUQ area of Birmingham.

- Provide other relevant supporting information to the *Client* regarding each option considered. This includes options engineering and an assessment of potential environmental impact and cost.

- Identify the preferred flood risk management way forward following a phased approach and accounting for discussions between the *Client* and partners regarding future funding.

- Provide outline designs for the preferred flood risk management way forward (accounting for the above).

- Undertake a sustainability appraisal (or appropriate equivalent) proportionate to the scheme, to enable the collection of evidence to underpin an effective options evaluation.

Whilst developing and assessing options to reduce flood risk, it is important that the *Consultant* gives due consideration to the *Client's* wider sustainability commitments. These are set out in the EA2025 Action Plan, e:Mission 2030 Strategy, the Defra 25 Year Environment Plan and the requirements in its business case templates and associated guidance, "LIT 55124" (published on 06/01/2020). These are in line with the principles of sustainability as described by the United Nation's Sustainable Development Goals.

2 The service

2.1 Outcome Specification

2.1.1 The *Consultant* shall demonstrate sustainability leadership through fully considering and contributing to achieving the *Client*'s environment and sustainability ambitions and targets. These are set out in the EA2025 Action Plan, e:Mission 2030 Strategy, the Defra 25 Year Environment Plan and are in line with the principles of sustainability as described by the United Nation's Sustainable Development Goals.

2.1.2 The *Consultant* shall design the scheme considering the environmental sensitivities and opportunities of the sites and involving key environmental specialists as appropriate within the *Consultant* and the *Client's* organisation.

2.1.3 The *Consultant* shall ensure the optioneering process fully considers and addresses sustainability including carbon reduction as strategic outcomes. The *Client's* business case template further requires separate option appraisals of sustainability benefits and whole-life carbon to compare with the economic appraisal and promotes a preference for the most sustainable option, with consideration of nature based solutions.

2.1.4 The *Consultant* shall ensure the optioneering process fully considers environmental mitigation and opportunities to further conserve and enhance as per the *Clients* legal and policy obligations but to also contribute to the *Clients* ambitions. This includes delivery against OM4 targets, and maximising opportunities for Biodiversity Net Gain (BNG), with 10% being the minimum allowable target, but must also consider wider sustainability opportunities. The *Consultant* shall ensure the optioneering process avoids where possible, minimises and compensates or offsets any adverse environmental effects.

2.1.5 The *Consultant* shall produce an outline design which seeks to provide the optimum economic, technical, social and environmental/sustainable outcomes, supported by evidence that will enable the *Client* to produce an OBC.

2.1.6 The *Consultant* shall produce an appraisal report and outline design that seeks to enable the *Client* to achieve efficiency targets set for this commission and future stages of the project using the Combined Efficiency Reporting Tool (CERT).

2.1.7 The *Consultant* shall ensure that the options and final solution take into consideration all relevant guidance and legislation and seek to minimise long-term asset/land management and maintenance costs and carbon.

2.1.8 The options will also demonstrate that the *Consultant* has learnt from best practice and demonstrate how optimum flood risk reduction, natural processes, carbon reduction, recreation, good ecological water quality and visual amenity can be combined.

2.1.9 This *Client* must consider planning permission and all other necessary permissions/licences being obtained at detailed design stage.

2.1.10 The *Consultant* shall demonstrate that consideration has been given to a long list of potential options, identified an appropriate shortlist, appraised these to identify a preferred option and developed this option, its impacts, planning and Environmental Impact Assessment (EIA) requirements scoped to a level that it can be priced. The *Consultant* shall develop a series of options to meet the above objectives.

2.1.11 The *Consultant* shall assume that the options shortlisted in the OBC will be aligned with the strategy identified in the SOC. However, the *Consultant* shall not assume that the preferred option will necessarily be the same as that identified at the SOC stage.

2.1.12 The *Consultant* shall compile the supporting technical documentation required for the *Client* to obtain a screening opinion from the local planning authority.

2.1.13 AD: The *Consultant* should refer to Section 6.1.6 of the Scope regarding sustainability requirements.

2.1.14 AD: Drawings of flood risk management measures shall be plans and cross sections in DWG format. 3D models are not required at this stage.

2.2 Constraints and Assumptions

Reservoir Engineering:

2.2.1 AD: Panel engineer to be provided by the *Consultant*, in accordance with LIT 11194 in order to fulfil the duties as set out in the Reservoirs Act, 1975.

2.2.2 AD: The defences at Weoley Hill Park will not constitute a reservoir, therefore the design will be undertaken by a River Engineer provided by the *Consultant*.

River Engineering

2.2.3 AD: The location of the sites for flood storage have already been identified. This shall be reviewed by the *Consultant*, but no allowance is included within the fee for full assessment of alternative sites.

Engineering Desk Based Studies

2.2.4 AD: Service drawings will be provided by the *Consultant* in the form of General Arrangement Drawings, provided in CAD format.

Hydraulic Modelling

2.2.5 AD: An appropriate allowance is to be made for incorporation of outline designs into the hydraulic model. Should additional testing and refinement result in stability issues, beyond those that can be reasonably anticipated, a discussion with the *Client* will be required to determine appropriate next steps. Any further modelling agreed shall be subject to a compensation event (CE).

2.3 *Consultant* Project Management

2.3.1 In managing the *service* the *Consultant* shall follow all the requirements as set out in the Collaborative Delivery Framework (CDF) schedules and the relevant content of the Minimum Technical Requirements (MTR).

2.3.2 In managing the *service* the *Consultant* shall:

- Contribute monthly to the updates to the project risk register.
- Provide input to project efficiency CERT Form.

- Attend progress meetings and prepare/record minutes within a week for the *Client* to issue.
- Produce monthly financial updates and forecasts meeting the *Client's* project reporting timetable together with progress reports. Monthly financial updates and forecasts to meet EA deadlines provided by no later than the 10th day of each month, or otherwise agreed at the project start up meeting.
- Deliver a monthly progress report in the *Client's* standard template giving progress against programme, deliverables received and expected and financial and carbon summary against programme.
- Attend project board meetings as required.
- Ensure quarterly input into framework performance assessment/environmental performance measures.
- Ensure the *Consultant's* environmental lead provides monthly progress and risk reviews to the *Client* and attends progress meetings, as invited.
- Maintain and show how accurate and up to date information on the whole-life cost and carbon of options is driving optimum solutions at all stages of design development.
- Capture lessons learnt relevant to scheme delivery for the EA PM to include in the scheme lessons learnt log to be appended to the OBC. Attend a lessons learned workshop at the commencement of the study organised by the *Client*.

2.3.3 The contract will be administered using FastDraft.

2.4 Outputs and Deliverables

2.4.1 The *Consultant* shall provide input to product descriptions for key outputs and deliverables that the *Consultant* shall produce during the appraisal stage, agree the list of products with the *Client* and submit the *service* description for the *Client's* approval before commencing work on the service.

2.4.2 AD: The *Consultant* shall produce certain key deliverables for each of the disciplines as set out in the table below.

Table 2 – Key deliverables from each discipline

Discipline	**Key deliverables**
Reservoir Engineering	1. 1 no. Initial reservoir engineering feasibility study in a technical note 2. Outline design drawings, no more than 4 per site (PDF format) 3. 1 no. technical memorandum explaining design rationale
River Engineering	1. 1 no. Initial River engineering feasibility study 2. Outline design drawings, no more than 4 per site (PDF format) 3. 1 no. technical memorandum explaining design rationale
Ground Investigation	1. 1 no. GI Scope 2. 1 no. Conceptual Engineering Assessment Report 3. 1 no. Detailed desk based assessment to support the Outline Business Case

	4. 4 no. Interpretative Reports (One for each site) 5. 1 no. Ground Investigation Report (GIR)
Hydrology	1. FEH Calculation Report 2. Interim Hydrology Report 3. Final Hydrology Report
Hydraulic Modelling	1. 1 no. Baseline and with scheme tabulated 1D stage and flow data 2. 1 no. Baseline and with Scheme hydraulic model reporting and model files
Economic Appraisal	1. 1 no. Economic Reporting (full details can be found at Section 5.1.11)
Environmental Assessment	1. 1 no. Data gap analysis technical note and data register. 2. 1 no. Site visit file note. 3. 1 no. Preliminary Environmental Assessment (PEA) 4. 1 no. WFD Baseline Assessment 5. 1 no. Environmental Site Appraisal Plan (ESAP) 6. 1 no. Cultural heritage desk-based assessment 7. 1 no. Population and health: opportunities assessment 8. 1 no. Arboricultural Survey and Assessment (to BCC requirements) 9. 1 no. Sustainability Opportunities Register (and Sustainability Appraisal or appropriate equivalent) 10. 1 no. Carbon Optimisation Report 11. 1 no. CEEQUAL Scoping note 12. 1 no. Natural Capital Baseline Report
Option Development	1. 1 no. Business Case Report
Stakeholder Engagement	1. 1 no. Stakeholder Engagement Plan and Action Tracker
Health and Safety	1. 1 no. H&S design tracker

3 Site Investigation

3.1 Topographic Survey

3.1.1 AD: The *Consultant* shall assess the requirements for topographic surveys and advise the *Client* of this as part of their programme and issue as a compensation event for any additional third party fees.

3.2 Ground Investigation

3.2.1 AD: It is believed that there may be some high-level ground investigation data for the Manor Farm Park site within the Bourn catchment, but this data has not been received by the *Consultant*. It is understood that there is no ground investigation survey information for the other three sites, that the *Consultant* has received, however open-source ground investigation information is available surrounding the sites from the British Geological Survey (BGS).

3.2.2 **AD: The *Consultant* shall scope two phases of ground investigation (set out below in sections 3.2.3 – 3.2.10). These will broadly consist of -**

1. **Detailed ground investigation for areas within the Bourn catchment supported by a high level, interim GI survey of Calthorpe Park**

2. **Detailed ground investigation survey of Calthorpe Park (and any residual requirements along The Bourn) if a determination is made that Option 2 (as set out above) is the approach to be taken forward at the programmed decision point.**

3.2.3 AD: The *Consultant* shall produce a conceptual engineering assessment report for Calthorpe Park to assess the high-level geotechnical feasibility for the scheme. This shall include terrain evaluation and geohazards assessment (Geomorphology) but will exclude river geomorphology (hydro-geomorphology).

3.2.4 AD: The *Consultant* shall specify high level requirements for ground investigation surveys required at Calthorpe Park to be able to assess the suitability of the proposed options and agree a subsequent Scope with the *Client*.

3.2.5 The *Consultant* shall produce a detailed desk study for the remaining three sites (i.e. those in the Bourn catchment), including contaminated land assessments and purchasing of historical mapping data.

3.2.6 The *Consultant* shall specify a detailed ground investigation required for the remaining three sites (I.e. those in the Bourn catchment) to be able to inform detailed design.

3.2.7 AD: The *Consultant* shall have a hold point decision workshop, based on the findings of the conceptual engineering assessment report and upon receiving the findings of the high-level ground investigation undertaken to determine if the proposed solution at Calthorpe Park is viable.

3.2.8 AD: The *Consultant* shall, have a hold point decision workshop for the remaining three sites (i.e. those in the Bourn catchment) post detailed desk study, to confirm scheme viability.

3.2.9 AD: Following the hold point decision workshop for Calthorpe Park, a detailed desk study including contaminated land assessment shall be undertaken.

3.2.10 AD: The *Consultant* shall undertake the scoping of a second phase of ground investigation for Calthorpe Park if required, to sufficient detail to enable construction of the proposed solutions.

3.2.11 AD: The *Consultant* shall ensure that the environmental risks and opportunities associated with the ground investigation, including the collection of environmental evidence to support Appraisal and Assessment, are identified and addressed.

3.2.12 AD: In scoping the ground investigation works the *Consultant* shall include the necessary works to facilitate efficient and sustainable materials management planning and re-use within the project.

3.2.13 AD: The *Consultant* shall identify any contaminated land within the area of the project and specify testing within the ground investigation scope such that it can be classified properly for disposal.

3.2.14 AD: The *Consultant* shall clearly communicate the scope of the required ground investigation to the CDF Lot 2 contractor for the Lot 2 contractor to undertake.

3.2.15 AD: The *Consultant* shall supervise the ground investigation undertaken by the CDF Lot 2 contractor. The supervision will be subject to a compensation event.

3.2.16 AD: The *Consultant* shall schedule the testing required for the interpretation and the design of the project.

3.2.17 AD: The *Consultant* shall produce a geotechnical interpretative report per site (4 no.) summarising the findings of the ground investigation, including soil properties and groundwater regime, risk of contamination and suitability for material re-use. The second phase of ground investigation at Calthorpe Park (if required) shall be issued separately as an addendum to the interpretative report.

3.3 Services Search

3.3.1 The *Consultant* shall obtain services data from utility companies and shall ensure services data is requested from relevant landowners. This shall include direct costs of obtaining data. This shall be incorporated into the appraisal, including preparation of plans.

3.3.2 The *Consultant* will arrange for a non-intrusive survey to detect key utilities (e.g. GPR etc.) to inform site investigation (SI) and or options appraisal.

The *Consultant* shall determine the extent of the survey and produce a specification for the survey in accordance with the *Client's* guidance and Principal Designer discussion; defining type and purpose of survey including extents and available information and considering phasing requirements as outlined through this document.

3.3.3 The *Consultant* shall incorporate outputs from this survey in the appraisal, including the revision of plans.

Engineering Desk Studies

3.3.4 AD: The *Consultant* shall obtain services data from utility companies and shall ensure services data is requested from relevant landowners. This shall include direct costs of obtaining data. This shall be incorporated into the appraisal including the preparation of plans.

3.3.5 AD: The *Consultant* shall review the desk-based services information and produce a technical note on locations of services likely to impact on design. If this memo makes recommendations for physical survey works, these are not included in this Scope.

3.3.6 AD: The *Consultant* shall obtain LiDAR information for the site and prepare 4 no. GIS plans showing the topography, one for each site identified within the preferred way forward set out in the SOC.

3.3.7 AD: The *Consultant* shall use the findings of the desk-based information to produce an initial feasibility study to review the viability of the proposed flood storage areas within the SOC.

4 Hydrology and Hydraulics

4.1 General

4.1.1. The existing modelling is identified in the table in section 1.2. The extents of the modelling and assumptions made are within the model report and cover the entire catchment under consideration within the one hydrological and hydraulic model. As such, it is not anticipated that this be split into discrete areas but reviewed, modified and run in its current format (I.e. for the catchment covering all four sites identified for consideration).

4.1.2. The *Consultant* shall verify the model with quality and extent checks.

4.1.3. The *Consultant* shall provide the *service* in accordance with the Modelling Technical Scope, included in Appendix 2.

4.1.4. Additional runs shall be allowed for to enable robust sensitivity analysis of key parameters (Manning 'n' values, flow, downstream boundary, and key hydraulic structure co-efficient).

4.1.5. The output shall be designed to interface with the economic analysis enabling depths and durations of flooding to be determined.

Hydrology

Background

4.1.6. AD: In July 2010, Royal Haskoning produced a strategic level ISIS-TUFLOW model of the River Rea and its major tributaries (referred to as the South Birmingham Model). Since then, the model has undergone many hydraulic updates, but little in the way of hydrological updating.

4.1.7. AD: The original River Rea modelling undertaken by Royal Haskoning in 2009 utilised the Flood Estimation Handbook (FEH) Rainfall-Runoff (RR) hydrological model. To achieve good calibration at the gauge near the downstream end of the catchment in Calthorpe Park (28039 Rea @ Calthorpe) a custom unit hydrograph (UH) was derived from flow hydrographs, translated from observed stage at the gauge for a number of observed events. This unit hydrograph was then applied to each of the boundaries in the model, with the exception of Bartley due to the presence of a reservoir which represents a significant portion of the catchment areas for that boundary. When the model was calibrated, the custom unit hydrograph helped to achieve a good fit for the timing of the flood peak, but it was necessary to scale the majority of boundaries by +90-107% using the parameter Percentage Runoff (PR) to match the observed peak flow values.

4.1.8. AD: No statistical analysis was undertaken at Calthorpe gauge. Design hydrographs were derived by applying a design rainfall to the custom UH for each FEH-RR unit. This approach was justified by applying a 2 year rainfall event over the catchment and comparing the peak flow at Calthorpe with the median flow (QMED); a good fit was found. The suite of design events was then produced by applying appropriate design storms to the catchment. No further reconciliation with the gauge at Calthorpe was undertaken.

4.1.9. AD: A hydrological review was undertaken by CH2M in 2014 with a focus on only the performance of The Bourn tributary (The Bourn Hydrology Review, CH2M, 2014). The hydrological approach for this tributary was revised resulting in a change from FEH-RR to ReFH1.

4.1.10. AD: A hydrological review was undertaken by CH2M in 2014 at the time the Revitalised Flood Hydrograph) methodology had been released but this was before the URBAN extension. A revision of boundaries on The Bourn did not give a good fit to anecdotal evidence therefore the original approach was maintained with refinement to the design storm parameters across all boundaries. (The Bourn Hydrology Review, CH2M, September 2014), (The Bourn revised hydrology verification, CH2M, November 2014).

4.1.11. AD: In 2017, CH2M undertook another review of the hydrological approach in advance of a Initial Assessment being developed for the Bourn Brook. (Please note that The Bourn and the Bourn Brook are different watercourses). At this time ReFH URBAN had been released and the decision was made to adopt it for the Bourn Brook catchment. (Bourn Brook FEH Calculation record 2015-06-19).

4.1.12. AD: More recently consultants BWB applied observed rainfall to the River Rea model and compared peak flow with observed flow at Calthorpe gauge as well as assessing the modelled flood extent against observations made during the event. The model performance was deemed satisfactory.

Proposed Way Forward

4.1.13. AD: Whilst unique, the current hydrological approach to the River Rea was not incorrect at the time. However, hydrological methods have been revised a number of times since the initial hydrology was undertaken in 2009 and the use of FEH-RR is no longer recognised as the most appropriate hydrological model. Whilst the application of design flows previously used is not unreasonable, current guidance strongly advises the use of gauged data when it is available to provide increased confidence in design flows. Statistical analysis of the gauged record at Calthorpe would provide a Flood Frequency Curve for a suite of return periods against which design peak flows could be reconciled. This would give higher levels of confidence in the final design flows.

4.1.14. AD: It is anticipated that as part of the OBC the hydrological approach is to be updated and revised to conform to current industry best practise. A full revision should not be avoided due to the desire to maintain the status quo due to the volume of work currently being delivered using the existing results. It must be recognised that hydrology and modelling is constantly evolving with respect to both methods and data and revising the analysis does not negate what was undertaken previously but ensures that the ongoing appraisal and design of schemes is future proofed in the best way the current data allows.

4.1.15. AD: The current hydrological approach calibrates well at the Calthorpe gauge and matches anecdotal evidence for observed flooding, therefore any revision to the analysis would be looking to achieve the same. A full revision will provide clear provenance to the origin of the design flows.

4.1.16. AD: The *Consultant* shall update the model hydrology in line with current Environment Agency best practice for flood risk assessment.

Full Hydrology Revision Requirements

Schematisation

4.1.17. AD: No changes are proposed to the catchment areas of the inflow boundaries. An exercise will be undertaken to update the catchment schematic to combine the updated representation of The Bourn (figure 13, CH2M 2017) with the wider catchment schematic (figure 37, CH2M,

2017). The location of the inflows to the model will be sensed checked by the hydrologist as a few questions regarding the locations of lateral inflows have been questioned in the model review.

Boundaries

4.1.18. AD: A full revision of the hydrology shall be provided and will be looking to achieve a similar response to design/observed rainfall using ReFH1 URBAN as is currently achieved using FEH-RR (custom hydrograph). The shape of the ReFH unit hydrograph is much closer to the custom UH derived in the original analysis which was trying to achieve a longer Time base (Tb) for the falling limb than the FEH-RR could provide. Initial investigations using one boundary, Lateral 6, show that the same 100 year design hydrograph peak and volume can be achieved using the ReFH1 unit if the time-to-peak (Tp) is shortened, and the hydrograph is scaled by a factor of 1.85. This was done before adding the URBAN model to the ReFH1 unit, which will be essential for the revision, and which will have a similar effect of shortening Tp and increasing runoff and therefore requiring less manual manipulation of these parameters.

Flood Frequency Analysis

4.1.19. AD: Statistical analysis (Single-Site, Enhanced Single-Site and Pooled) will be undertaken using the gauged record at Calthorpe gauge. The NRFA quotes the data at Calthorpe as being suitable for QMED and Pooling. Spot gauging's and the AMAX series will be used to verify the choice of Flood Frequency Curve (FFC). Consideration will also be given to the current FFC and the ReFH URBAN FFC before the preferred choice of FFC is presented.

Non-Stationarity

4.1.20. AD: Following the Environment Agency Interim Guidance on non-stationarity in fluvial flood frequency estimation, it is necessary to detect and take into account non-stationarity in the flood frequency estimation where the gauge at Calthorpe has been utilised. Whilst the current hydrology only uses the data at Calthorpe to provide a QMED estimation for verification of the 2-year design flood peak and not for the full suite of return periods, this guidance still applies. The data available from the National River Flow Archive for Calthorpe gauge (28032) suggests that the site fits the four criteria listed below for the detection of non-stationarity (n-s):

i. Subject site is located close to a peak flow rated gauge
ii. The gauge does not have any flow bypass issues, and consists of good quality AMAX data
iii. The AMAX data available at the gauge has length, N ≥ 40 years
iv. No known reason of step changes in the AMAX data period, e.g. reservoir, land use changes etc.

4.1.21. AD: Should n-s be identified, a full revision of the flood frequency curve considering n-s analysis is required

4.1.22. AD: The *Consultant* shall update the model hydrology in line with current Environment Agency best practice for flood risk assessment.

Calibration / Verification

4.1.23. AD: It is known that the current hydrological response of the model boundaries calibrates well to observed data at Calthorpe and has been verified against recorded depth data in known flooded communities, therefore it is expected that the revised boundaries will need to recreate a similar hydrographs shape to maintain good performance for the calibration runs.

4.1.24. AD: The events suggested for calibration are September 2008 and June 2016 with May 2018 used for verification.

Design Flow Reconciliation

4.1.25. AD: The *Consultant* shall reconcile the peak flows resulting from the application of a design storm over the catchment to the peak flow values to the preferred FFC.

Reservoir Safety

4.1.26. AD: Derivation of Probable Maximum Flood (PMF) for each reservoir and as a cascade where appropriate.

Hydraulic Modelling General Requirements

4.1.27. AD: The OBC requires the development of 'Do Minimum' and 'Do Nothing' baseline models followed by the development of two 'Do Something (With Scheme)' option models. The "With Scheme" option testing will be an iterative, hydraulic design process intended to optimise the hydraulic performance and flood risk benefit of each option.

4.1.28. AD: The two baseline models and two finalised 'Do Something' models will be used to simulate a suite of ten selected Annual Exceedance Probability (AEP) events over three climate change epochs, providing the input data for the economics business case. The design storms to be simulated are as follows:

Epoch		2020s									
%AEP		50	20	10	5	2	1.33	1	0.5	0.2	0.1
Scenario	Do Nothing*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Do Minimum	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Do Something	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Epoch		2050s									
%AEP		50	20	10	5	2	1.33	1	0.5	0.2	0.1
Scenario	Do Nothing*								Y	Y	Y
	Do Minimum				Y	Y		Y	Y	Y	Y
	Do Something								Y	Y	Y
Epoch		2080s									
%AEP		50	20	10	5	2	1.33	1	0.5	0.2	0.1
Scenario	Do Nothing*						Y	Y	Y	Y	Y
	Do Minimum						Y	Y	Y	Y	Y
	Do Something				Y	Y	Y	Y	Y	Y	Y

Hydraulic Modelling Delivery
Site Inspection

4.1.29. AD: A site inspection is required to ground truth key elements of the hydraulic model. The size and scale of the River Rea model and the urban nature of the study area, means that it is not possible to exhaustively ground truth the model. The site visit will therefore be a best endeavours exercise, targeted to focus on key hydraulic controls and locations where modelling analysis for scheme design is required.

Method Statement

4.1.30. AD: The *Consultant* will produce a method statement process, providing a detailed plan for model build and simulation activities ahead of any model build activity. This will include specific information on all planned changes to the incoming model(s) to be carried out by the *Consultant*. The input statement and the model build decisions therein will be reviewed by the *Consultant* project leads and will be available to the *Client* to ensure key decisions are agreed prior to carrying out the work, thus minimising project risk.

Baseline Model Updates Phase 1 (Essential Model Fixes)

4.1.31. AD: The ([redacted] review of the existing River Rea (2017) model indicates that a number of key updates are required, notably:

- Reduction of the 2D model grid size as best practice.
- Correction to the schematisation of model inflow units.
- Improvement is required to the accuracy of the 1d-2d link GIS elements.
- 1D model corrections including; cross section panel markers, addition of interpolate sections, addition of spill units and improvement of culvert schematisation.

4.1.32. AD: This list is not exhaustive, and it is anticipated that additional updates may be required following those listed being implemented.

4.1.33. AD: The update to the model is noted to be a high-risk activity; the model stability is poor, and it is anticipated that model troubleshooting activities will be required to improve general model performance and to ensure the model runs and is stable with updates in place. This piece of work is of critical importance given the need to adjust the model during the options phase to optimise storage solutions, which is likely to cause model instabilities.

4.1.34. AD: Model updates will be targeted to ensure that only tasks relevant to the project requirements are carried out.

4.1.35. AD: It is assumed that there is no requirement to specify the collection of any new topographic survey data except that of the flood storage areas, or a need to allow for the integration of such data into the model. Any such requirements would constitute scope change and a compensation event.

Baseline Model Updates Phase 2 (Implementation of other Flood Alleviation Schemes in the hydraulic model)

4.1.36. AD: The following schemes shall be reviewed and updates from as built survey / sensitivity testing incorporated accordingly:

- Selly Park North and South FRMS,
- First Avenue FRMS,
- Longmore Street, and
- River Tame flood alleviation schemes.

Model Recalibration and Flow Reconciliation

4.1.37. AD: Based on an initial high level review of the hydrology work to date [redacted]) it is assumed that new hydrology analysis will be derived for the present study, with a new re-calibration of the model to historic events being required, along with flow reconciliation of the design flows to statistical estimates.

Baseline Design Storm Simulations

4.1.38. AD: The updated hydraulic model will be utilised to simulate a suite of ten design storm events for both the Do Minimum and the 'Do-Nothing' scenario as specified in Section 4.1.28 above. The specific definition of each of these scenarios will be agreed within the model input statement.

4.1.39. AD: Model sensitivity testing will be carried out to determine the effect of the adjustment of key model parameters on modelled water levels at key locations. Parameters to be tested will include model flow, downstream boundary, material roughness.

4.1.40. AD: Baseline modelling deliverables shall comprise:

- Model results in the form of tabulated 1D stage and flow data as well as 2D depth and water level GIS grids, to be issued to the Economics Appraisal Team.
- Baseline reporting and model files will be issued for review by the *Client*.

Initial Option Modelling

4.1.41. AD: Exploratory model simulations will be carried out by the *Consultant* for the four proposed attenuation storage reservoirs separately, in order to understand the relative performance of the flood attenuation structures at each site.

Option 1 Hydraulic Design

4.1.42. AD: Option 1 will comprise three flood attenuation reservoirs to be implemented at the following locations: Manor Farm Park, Valley Parkway and Weoley Hill Park.

4.1.43. AD: High level concept designs are available for each site, as produced by the *Client* during production of the SOC, however a hydraulic design process will be carried out to optimise flood benefit and determine the most effective combination of orifice control, cut & fill and embankment construction, for the three sites in combination.

4.1.44. AD: The optimised design model will be used to simulate a suite of ten design storm events as specified in Section 4.1.28 above, and the results will be issued to the Economics Appraisal Team.

Option 2 Hydraulic Design

4.1.45. **Hydraulic modelling of Option 2 (and subsequent analysis) should be informed by the phased programme to be developed to support the OBC and be undertaken in-line with the decision point discussed above. It is recognised that there may be efficiency in undertaking the modelling exercises simultaneously, in which case this should be outlined within the activity schedule and programme.**

4.1.46. AD: Option 2 will be an extension of the Option 1 arrangement with an additional flood storage reservoir added at the Calthorpe Park location to provide a total of four storage reservoirs within the model. Optimisation of the Calthorpe Reservoir arrangements, including; orifice control, cut & fill and embankment construction will be added to the optimised arrangement for the three Option 1 sites.

4.1.47. AD: The optimised design model will be used to simulate a suite of ten design storm events as specified in Section 4.1.28 above, and the results will be issued to the Economics Appraisal Team.

Final Design Hydraulic Modelling

4.1.48. See Section 4.1.43

4.1.49. AD: The performance of the two options will be reviewed with the *Consultant* engineering discipline leads, and with the *Client*. Following review, adjustments will be made as required to both of the option arrangements to finalise the option appraisal exercise.

Dam Safety Hydraulics

4.1.50. See Section 4.1.43

4.1.51. AD: Dam safety analysis will be carried out with the simulation of the 1 in 10,000 Year event and the Probable Maximum Flood (PMF) event in order to inform the embankment design at all four reservoir locations. This will include the outline hydraulic design of the reservoir overflow weirs.

With Scheme Hydraulic Modelling Deliverables

4.1.52. AD: Model results in the form of tabulated 1D stage and flow data as well as the 2D depth and water level GIS grids will be issued to the Economics Appraisal Team.

4.1.53. AD: A combined Baseline and “With Scheme” Report will be issued for client review along with the final model files. There will be provision for *Consultant* responses to one set of combined review comments. It is assumed that there will be no requirement for any significant update of the modelling work following the client review. Regular technical liaison will be carried out with the *Client’s* risk and evidence team throughout the project programme to minimise the risk of any additional work following the final model issue.

5 Economics Appraisal

5.1.1 It is anticipated that the economic appraisal be undertaken following the programme decision point and a determination regarding which preferred option is to be taken forward in the OBC.

5.1.2 The *Consultant* shall undertake an economic appraisal in line with FCERM – Appraisal Guidance (FCERM-AG), supplementary guidance and the HM Treasury 'Green Book'. This will include a valuation of the key benefits, (including, economic and environmental, carbon assessment and whole life costs) in order to produce a cost benefit analysis that will be considered when determining the selection of a preferred option.

5.1.3 Costs will be the whole life expenditure including, design, investigation, construction, operation and maintenance. Costs can be devised in the most efficient but accurate manner and Early Supplier Engagement (ESE) input is required. The *Client* will provide support and costs where possible to complete this estimate.

5.1.4 Carbon will be whole-life emissions of an asset including embodied (construction), operation, maintenance and end of life emissions. The values will be calculated from the carbon tool (OI 120_16) to help optimise all options.

5.1.5 Risk and Optimism Bias allowances shall be calculated in accordance with Risk Guidance for Capital Flood Risk Management Projects. The *Consultant* shall attend risk workshops facilitated by others.

5.1.6 Selection of the preferred option shall be undertaken in accordance with the FCERM-AG decision rules and local choices including consideration of the most sustainable and lowest carbon options following the *Client's* business case template and guidance whilst also supporting delivery of wider strategic outcomes.

5.1.7 The assessment shall include for sensitivity tests to look at the effects of any changes to key parameters / beneficiaries and to demonstrate the robustness of any key assumptions made.

5.1.8 The *Consultant* shall produce, and maintain through the project, the FCRM Partnership Funding Calculator for Flood and Coastal Erosion Risk Management Grant in Aid (The PF calculator). The PF calculator shall be updated at the request of the *Client* or when evidence obtained during the project suggests a significant change is likely. The *Consultant* shall inform the *Client* of any expected significant change in scheme choice or affordability at the earliest opportunity as the project develops.

5.1.9 The *Consultant* shall use this data to assist the *Client* in identifying suitable sources of external funding.

5.1.10 AD: Subject to relevant compensation events, the *Consultant* shall provide additional economics support to the *Client* to aid wider external funding discussions for the Bourn and Lower Rea FRMS.

Economic, Sustainability and Carbon Appraisal Deliverables

5.1.11 The *Consultant* shall provide the results of this section of the study in an economics report which shall feed into the economics appendix of the OBC. This will provide a clear view of the process in order that the economic lead for the review team can review the process. As a minimum this will include, but not be limited to:

- Overview of methodology adopted.
- Parameters quantified and standards used (e.g. Multi-Coloured Manual).
- Parameters considered and not used together with reasons.
- Key receptors/ major beneficiaries.
- Wider benefits.
- Assumptions made.
- How the decision rules have been applied.
- What sensitivity tests have been applied and why.
- Treatment of climate change, carbon reduction and sustainability benefits.
- FCERM-AG spreadsheets and PF calculator.

5.1.12 AD: The *Consultant* shall provide the following return period event economic assessment(s): 2YR, 5YR, 10YR, 20YR, 50YR, 75YR, 100YR, 200YR and 1000YR (See

5.1.13 Figure 2).

Epoch -->		2020s								2050s								2080s							
Q uplift -->		10								11								22							
Return period -->		2	5	10	20	50	75	100	200	1000	2	5	10	20	50	75	100	200	1000	2	5	10	20	50	75	100	200	1000
Scenario	Do Nothing*	Y	Y	Y	Y	Y	Y	Y	Y	Y								Y	Y						Y	Y	Y	Y
	Do Minimum	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y		Y	Y	Y						Y	Y	Y	Y
	Do Something	Y	Y	Y	Y	Y	Y	Y	Y	Y								Y	Y				Y	Y	Y	Y	Y	Y

*based on discussions with the EA, it may be necessary to include additional Do Nothing model runs to represent changes in channel roughness, defence failures and blockages.

Figure 2 – Indicative economic scenarios

5.1.14 AD: The *Consultant* shall provide, in addition to the standard return period events, economic assessment for the 500YR return period event.

5.1.15 AD: The *Consultant* shall run two iterations of the economic assessment and provide the final iteration to the *Client*.

6 Environmental Assessment

6.1.1 The *Consultant* shall confirm in the activity schedule the expected environmental outputs agreed through engagement with NEAS. The activities identified shall take into account proportionality whilst supporting the achievement of the *Client*'s wider aspirations.

6.1.2 The *Consultant* shall give due consideration of the environment and sustainability risks and opportunities throughout the design evolution of the project to maximise the delivery of *Client* and project objectives.

6.1.3 The *Consultant* shall ensure that the project level assessment sits within the context of any previous strategic environmental assessment and supporting information for the area and brings forward all relevant information and conclusions.

6.1.4 The *Consultant* shall establish and understand the baseline and the legal and policy context to identify the key environmental/sustainability risks and opportunities. This shall support the options appraisal and justify the need for any future environmental assessment activity.

6.1.5 The *Consultant* shall report the findings of the scoping exercise, as required, which will form an Appendix to the OBC with relevant summary details incorporated into the relevant section(s) of the OBC main text.

6.1.6 AD: The *Consultant* shall report on the CEEQUAL assessment in accordance with the Hub D workload plan.

General Environmental Project Requirements

6.1.7 AD: The *Consultant* shall carry out all work related to environmental aspects of the Scope in accordance with the Minimum Technical Requirements 801_14 Environmental sustainability, design and management and associated guidance documents - 801_14 SD01 Cultural heritage and archaeology and 801_14 SD02 Landscape and environmental design.

6.1.8 AD: Prior to the commencement of work on all environmental deliverables, the *Consultant* shall produce product descriptions for each deliverable in agreement with the *Client*. Product description requirements for landscape deliverables can be found in 801_14 SD02 Landscape and environmental design.

Environmental baseline: Review of existing information, gap analysis and recommendations

6.1.9 AD: The *Consultant* shall complete a full review of the SOC/previous environmental reporting and readily available online information, where relevant, for the short-listed options and their associated study areas. The *Consultant* shall use this information to inform the review of the options, objectives, scope what sustainability means locally and inform the baseline assessment for the environmental and sustainability deliverables.

6.1.10 AD: The *Consultant* shall as a minimum include the following aspects in their review:

- Habitats and protected species (including Tree Preservation Orders)
- Invasive and non-native species
- Water environment (Water Environment Regulations)
- Cultural heritage
- Landscape and visual amenity
- Noise, vibration and air quality
- Contaminated land
- Amenity

- Social and community impacts
- Environmental assessment requirements
- Legal and policy context, including consents
- Stakeholders

6.1.11 AD: The *Consultant* shall undertake a gap analysis to identify any additional information required to inform the assessment of options for the OBC. The *Consultant* shall provide a file/technical Note capturing the key findings and a data register. The register will record all information and provide comment on the quality and potential use of each dataset.

6.1.12 AD: The *Consultant* shall propose means of resolving / advancing areas of missing data/information, including data collection, and surveys/site assessments. Should any missing data/information arise from this exercise, the collection of this data will be subject to a compensation event.

6.1.13 AD: Following agreement with the *Client,* the *Consultant* shall contact relevant external organisations (e.g. statutory bodies, councils, local stakeholders) to request the identified new information or gaps. The *Consultant* shall keep the *Client* informed regarding any such consultation with external parties, both in advance and following any correspondence.

6.1.14 AD: The Consultant should identify environmental risks and opportunities in relation to the project, including any missed during the SOC stage. This will be based on the SOC baseline information, the *Consultant's* knowledge of the study area, FRM problems and any additional data obtained during this review.

6.1.15 AD: The *Consultant* shall also undertake a one day site visit to all key locations relating to the short-listed options. The site visit will be attended by the environmental and landscape leads from the *Consultant* environmental team. The *Client* will also attend the site visit and will confirm attendees.

6.1.16 AD: The output of the site visit, including observations, will be captured in a file note or report, including recommendations for additional work such as further surveys.

6.1.17 AD: It is assumed that assessments/surveys will be undertaken for the storage location extents identified within the shortlist of the SOC. Any additional site assessments/surveys will be subject to a compensation event.

Environmental baseline: surveys and site assessments

6.1.18 **Environmental surveys (and subsequent assessments) should be informed by the phased programme to be developed to support the OBC and be undertaken in-line with the decision point discussed above. It is recognised that there may be efficiency in undertaking certain surveys and analysis simultaneously, in which case this should be outlined within the activity schedule and programme.**

6.1.19 AD: The environment related surveys and site assessment deliverables are:

- Preliminary Environmental Assessment (PEA), to include an extended Phase 1 habitat survey, scoping of the follow up ecological surveys and Biodiversity Net Gain (BNG) baseline assessment.
- Water Frameowrk Directive (WFD) baseline assessment, including site assessment.
- Environmental Site Appraisal Plan (ESAP), including landscape site assessment
- Cultural heritage desk-based assessment

- Population and health: opportunities assessment
- Arboricultural survey and assessment

PEA and extended Phase 1 habitat survey

6.1.20 AD: The *Consultant* shall undertake a Preliminary Ecological Appraisal (PEA) and document the findings of a desk-top study (biological records, designated sites) and an extended Phase 1 Habitat (JNCC, 2010) which will identify the ecological opportunities and constraints related to the short-listed options and make recommendations for further survey.

6.1.21 AD: The *Consultant* shall undertake an extended Phase 1 survey of locations likely to be affected by flood risk management options. This should include, as appropriate:

- Biodiversity Net Gain (BNG) Baseline/Condition Assessment and ecological connectivity (Biodiversity Metric 3.0 tool) and supporting botanical species list.
- Check for evidence or habitat of value to protected species (fisheries, otter, water vole, badger, reptiles).
- Check for evidence of invasive species (INNS – Himalayan balsam, Japanese knotweed etc)
- HSI (Habitat Suitability Index Assessment for Great Crested Newts), which were identified as a potential constraint.
- PBR (Potential Bat Roost Assessment) of trees within the boundary of the proposed options.

6.1.22 AD: The output of the above task will be captured in suitable plans and a report.

6.1.23 AD: The output shall also include a biodiversity net gain calculation (Biodiversity metric latest approved version) of the baseline situation (as existing).

Water Framework Directive (WFD) Baseline Assessment

6.1.24 AD: The *Consultant* shall identify the current status of the relevant waterbodies and any potential risks to the waterbodies and opportunities for improving the status of relevant waterbodies. This will be informed by a site assessment.

6.1.25 AD: The output of this task will be captured in a suitable short report or file note.

Landscape Assessment and Environmental Site Appraisal Plan (ESAP)

6.1.26 AD: The *Consultant's* landscape lead shall undertake a site visit to identify the landscape and visual baseline conditions and identify relevant constraints and opportunities.

6.1.27 AD: The *Consultant* shall refer to the Landscape Visioning work undertaken (River Rea Landscape Vision, P20407-00-001-GIL-0700-03 River Rea Report).

6.1.28 AD: The *Consultant* shall present the relevant environmental opportunities and constraints related to the short-listed options in an ESAP. This should capture sustainability related opportunities. The *Consultant* should refer to the Client's MTR 801_14 SD02.

Cultural Heritage Desk-Based Assessment

6.1.29 AD: The *Consultant's* heritage and archaeology lead shall undertake a site visit to assess the baseline conditions and identify relevant constraints and opportunities.

6.1.30 AD: The *Consultant* shall undertake a Cultural Heritage Desk-Based Assessment of the short-listed options. The *Consultant* shall note the content of the *Client's* Operating Instruction entitled "Cultural Heritage and Archaeology" (OI S01_14_ SD01)

Social Value Opportunities Assessment

6.1.31 . AD: The *Consultant* shall identify opportunities for improving amenity, public space and wider social benefits that the project could provide, including engagement with local stakeholders. This will be informed by a site assessment and by the previously completed River Rea Landscape Visioning study (2022).

6.1.32 AD The *Consultant* shall refer to the Landscape Visioning work completed in 2022 (River Rea Landscape Vision, P20407-00-001-GIL-0700-03 River Rea Report).

6.1.33 AD: The output of this task will be captured in a suitable short report or file note.

Arboricultural survey and assessment

6.1.34 AD: The *Consultant* shall prepare a brief and specification for arboricultural (tree) survey and assessment, for locations where trees may be adversely impacted by identified options.

6.1.35 AD: Any subsequent survey and assessment will be instructed by the *Client* with the *Consultant* procuring the survey/assessment, with likely deliverables comprising 1) the tree survey, including schedules of trees and scoring according to health, age etc. and 2) the assessment, which includes tree removal plans and root protection plans. The tree survey should be compliant with Birmingham City Council requirements- Capital Asset Value for Amenity Trees (CAVAT).

Input to option appraisal and development

6.1.36 AD: As per Section 8 of the Scope, Environmental Activities to cover:

- Input to design development of options – covering all environmental and social aspects. (Sustainability Appraisal)
- Update to multi-criteria option appraisals
- Identification of enhancement opportunities (e,g. landscape, biodiversity, water environment, amenity, social etc.)
- Identification of environmentally preferred option (including but not exclusively WFD compliance; BNG assessment; Sustainability Appraisal)
- Preparation of working draft PEIR (or alternative reporting) setting out the key issues and opportunities relating to the options/preferred option and alternatives considered – to inform draft OBC
- Input to preferred option design development

Stakeholder Consultation and Engagement

6.1.37 AD: As per Section 9 of the Scope, Environmental Activities to cover:

- Regular meetings - NEAS, FBG etc – 1 no. biweekly
- Regular meetings - external parties etc – 5 no. meetings
- Input to working groups – Environment teams feeding into and contributing to wider working group meetings
- Input to any public consultation - Environment teams feeding into and contributing to public consultation
- Initial scoping consultation with key stakeholders - options – No additional meetings allowed for this

Preferred way forward option development and appraisal

The activities in this section will follow the agreement on preferred way forward, pending detailed ground investigation and funding discussions with partners as per the phasing programme to be submitted by the *Consultant*.

6.1.38 AD: The environment related deliverables to be prepared in relation to the preferred way forward, in support of the OBC are:

- Landscape vision – based upon, and building on, work already undertaken.
- Indicative Landscape Plan (ILP).
- Habitat creation and restoration plan.
- Scoping consultation letter – preferred option
- EIA screening letter (and scoping opinion request if required) to local planning authority (LPA) – preferred option
- Preliminary Environmental Information Report (PEIR).
- WFD compliance assessment.
- Biodiversity Net Gain calculations.
- Environmental Action Plan (EAP) to support GI

Landscape Vision

6.1.39 AD: The *Consultant* shall undertake any supplementary Landscape Visioning work required to build upon the existing River Rea Landscape Vision, P20407-00-001-GIL-0700-03 River Rea Report). The *Consultant* will refine relevant components of the wider landscape vision for the specifics of this scheme based on opportunities identified in consultation with BCC and other key stakeholders. This will provide a landscape context within which the scheme outline design will be completed.

Indicative Landscape Plan (ILP)

6.1.40 AD: The *Consultant* shall prepare an ILP for the scheme. The ILP is a development of the ESAP and is based on the preferred option. The ILP should be informed by the landscape vision and incorporate Biodiversity Net Gain requirements and be prepared so that it can be used for engaging Local Planning Authority (LPA) planners and in public consultation. The ILP shall be appended to the PEIR.

Habitat Creation and Restoration Plan

6.1.41 AD: The *Consultant* shall prepare a Habitat Creation and Restoration Plan for the scheme. This should build on the opportunities identified in the ESAP, linking to the Biodiversity Net Gain (BNG) calculations and WFD assessment, and describe how these will be delivered. This should feed into the Indicative Landscape Plan.

Scoping consultation letter to stakeholders

6.1.42 AD: During the preferred way forward development stage, key stakeholders will be contacted for their views on the key environmental issues and opportunities relating to the preferred option by issuing a scoping consultation letter. This letter will be issued by the *Client* but drafted by the *Consultant*.

6.1.43 The *Client* will be responsible for managing and storing all sensitive and personal data in accordance with GDPR requirements.

EIA Screening (and Scoping) Letter to LPA

6.1.44 AD: During the preferred way forward development stage, the Local Planning Authority (LPA) will be contacted for their views on whether the scheme requires an EIA. This will be done by issuing a "Screening" letter to the LPA. This letter will be issued by the *Client* but drafted by the *Consultant*.

6.1.45 AD: Later in the preferred way forward development the project team will seek guidance from the LPA as to the appropriate content/Scope of the scheme EIA. This will be done by issuing a "Scoping Opinion" letter to the LPA. This letter will be issued by the *Client* but drafted by the *Consultant*.

Preliminary Environmental Information Report (PEIR)

6.1.46 AD: The *Consultant* shall prepare a PEIR using the *Client's* current template. Work on the PEIR should commence once the preferred option is identified. The PEIR is to record the environmental appraisal process leading to the identification of the preferred option and identify the key issues, risks and opportunities that the project should consider further as the preferred option proceeds to the detailed design/Full Business Case (FBC) stage.

Water Framework Directive (WFD) Compliance Assessment

6.1.47 AD: The *Consultant* shall prepare a WFD compliance assessment for the scheme. This is linked to the WFD baseline assessment and assesses the implications of the preferred option on the relevant waterbodies as well as identifying mitigation requirements to satisfy legislation.

Biodiversity Net Gain (BNG) Assessment

6.1.48 AD: The *Consultant* shall undertake biodiversity net gain calculations (using the latest approved Biodiversity Metric) for the preferred way forward and identify any actions needed to achieve the required target.

Ground Investigation Environmental Action Plan (GI EAP)

6.1.49 AD: The *Consultant* shall prepare an Environmental Action Plan for the appropriate phases of GI as outlined in Section 3. This should summarise what is needed, in terms of objectives, actions and responsibilities, to ensure that the GI minimises environmental impacts and complies with legislation. This document shall be issued for *Client* approval prior to the GI commencing on site.

7 Sustainability

7.1 General

7.1.1 AD: In developing and appraising options, the *Consultant* shall give due consideration and regard to the *Client's* sustainability targets. Those identified for the portfolio of projects to be delivered across the Midlands Hub comprise:

- Net zero carbon: we will deliver lower carbon projects using fewer materials, circular and natural solutions and offsets.
- Net biodiversity gain: we will increase the value of habitats that are affected by the projects we deliver. This project should seek to maximise opportunities for BNG delivering a minimum of 10%.
- Communities and plan (social value): through the delivery of our projects, we unlock additional wider benefits associated with place, jobs, economic value and wellbeing
- CEEQUAL: we will use CEEQUAL to systematically address sustainability issues across the programme.

7.2 Sustainability baseline: review and gap analysis

7.2.1 AD: The *Consultant* shall first identify the most relevant issues locally related to sustainability and scope the *services* needed to support the OBC through gap analysis. This work will set a baseline to assess the likely most sustainable option against (as required by the current "Write a Business Case" guidance, published on 06/01/2020).

7.2.2 AD: The *Consultant* shall convene a workshop with the *Client* attending, plus other relevant external parties invited by the *Client*, to discuss the findings of the review and agree next steps.

7.2.3 AD: The output of the review and workshop will be captured in a file note.

7.3 Option Appraisal: Sustainability Assessment

7.3.1 AD: The *Consultant* shall convene a "sustainability challenge" workshop with the *Client* attending, plus other relevant external parties invited by the *Client*. The *Consultant* shall prepare for the Sustainability Workshop by completing an assessment of the relative sustainability of considered options. This work will deliver on the next steps from the previous sustainability gap analysis and may include some quantitative assessments of options.

7.3.2 AD: The sustainability workshop will be used to rank elements of the scheme options in terms of sustainability, including capturing trade-offs (what is sacrificed to deliver the measure). The workshop will confirm the overall likely most sustainable option. **This workshop will be undertaken at the same time as the short list assessment workshop to support in the selection of a preferred option – held shortly before the key decision point to be set out within the phased programme.**

7.3.3 AD: The output of the workshop will be captured in a "Sustainability Opportunities Register" this will capture ideas and opportunities suggested and assign action owners.

Preferred way forward: update and summary of sustainability appraisal

7.3.4 AD: The *Consultant* shall convene a second "sustainability challenge" workshop with the *Client* attending, plus other relevant external parties invited by the *Client*. The workshop will be used to review the sustainability of the preferred way forward (following the decision point) and identify remaining issues. The output of the workshop will be captured in writing and issued to the *Client*.

7.3.5 AD: The *Consultant* shall then provide a Sustainability Opportunities Register capturing how sustainability has been considered throughout the development of the options and in selection of the preferred way forward and its development. The reporting shall identify which of the short-listed options is considered to be the most sustainable. If relevant, an explanation as to why the most sustainable option was not selected is to be included. The relevant sustainability issues associated with the preferred option will be included in the reporting.

7.4 Carbon

7.4.1 AD: The *Consultant* shall ensure that carbon reduction opportunities are identified and implemented within the design and development of options throughout the project and form a key part of the sustainability challenge workshops and option appraisal processes.

Carbon Assessment of Short List

7.4.2 AD: The *Consultant* shall use the *Client's* Carbon Modelling Tool to assess the carbon implications of the short listed options. This will identify carbon differentials between the various options being considered and facilitate the selection of the preferred scheme option. It is vital that output of this task highlights the main sources of carbon and that the whole project team (*Client*, *Consultant* and CDF Lot 2 supplier / ESE contractor) then seek opportunities to reduce emissions.

7.4.3 AD: The output of this work will be captured in a file note or similar document.

Carbon Planning / Calculator Tool and Carbon Optimisation Report

7.4.4 AD: The *Consultant* shall provide a Carbon Optimisation Report for the outline design using the *Client's* standard template. The Carbon Optimisation Report should record the measures taken during the development of the outline design to minimise the carbon footprint and demonstrate how the target carbon reduction will be achieved. The *Consultant* shall use the *Client's* Carbon Planning Tool used to assess the preferred option and also to quantify carbon savings made during the preferred option development process. The *Consultant* shall consider what recommendations / opportunities remain to explore during the FBC stage and include this in the reporting.

This task will be undertaken following the programmed decision point and confirmation of the preferred way forward.

7.4.5 AD: The output of this task will be captured in a Carbon Optimisation Report, appending Carbon Planning Tool outputs as appropriate.

7.5 CEEQUAL

CEEQUAL Scoping

7.5.1 AD: The *Consultant* will facilitate a CEEQUAL scoping exercise. This will include convening a workshop with key members of the project team and with the *Client* to scope "assessment issues" (assume 20-25 required based on value of project), writing up a scoping note and establishing the data gathering mechanisms to be used throughout OBC stage.

7.5.2 AD: The output of this task is a CEEQUAL scoping note.

CEEQUAL Assessment

7.5.3 AD: The *Consultant* will set up and utilise a CEEQUAL spreadsheet with the relevant assessment criteria to track and report progress. This shall be issued to the project team and *Client* to support the collation of supporting evidence.

7.5.4 AD: The *Consultant* will develop and scope the individual criteria within the selected assessment issues for agreement with the *Client.*

7.5.5 AD: The *Consultant* will identify specific criteria to target achievement of Very Good rating as a minimum.

7.5.6 AD: The Consultant will facilitate a CEEQUAL workshop with the project team and *Client* to ensure relevant members of the team are aware of the actions and evidence required.

7.5.7 AD: The *Consultant* will provide a qualified CEEQUAL assessor to undertake the evidence collation and assessment and evidence gathering throughout the project.

7.5.8 AD. The *Consultant* shall be responsible for uploading evidence and commentary to the BREEM Projects online platform.

7.5.9 AD: The *Consultant* shall provide all evidence to the *Client* upon request to enable programme-level verification.

7.6 Natural Capital

Natural Capital Assessment: Preferred Way Forward

7.6.1 AD: The *Consultant* shall provide a natural capital assessment which utilises the logic chain approach as provided below and will align with the Environment Agency 'Value environmental improvements that deliver environmental benefits and outcome measure 4 (OM4) guidance'.

7.6.2 AD: The *Consultant* shall develop a natural capital baseline, based upon the outcomes of the UK Habitats Plan. The natural capital baseline will focus on the quantity, quality and location of habitats. From the natural capital baseline, a qualitative overview of ecosystem services, associated with existing assets will be provided.

7.6.3 AD: The *Consultant* shall review the following ecosystem services: food production, wood production, fish production, water supply, flood regulation, erosion protection, water quality regulation, carbon storage, air quality regulation, cooling and shading, noise reduction, pollination, pest control, recreation, aesthetic value, education, interaction with nature and sense of place (including health and wellbeing).

7.6.4 AD: The *Consultant* shall produce a qualitative assessment of the four storage locations using an ecosystem services matrix. This will indicate where impacts (beneficial and adverse) are likely because of scheme options and will allow for a targeted quantification exercise.

7.6.5 AD: The *Consultant* shall quantify the impacts on ecosystem service provision, where data allows, following the outcomes of the BNG assessment (and associated losses and gains of habitat types).

7.6.6 AD: The *Consultant,* using Defra's Enabling a Natural Capital Approach (ENCA) guidance, will identify suitable biophysical evidence for quantification and will direct the use of selected tools (such as ORVal for recreational enhancements). Following on from the above quantification, a valuation (monetary) exercise will be possible, (data allowing) for services such as carbon sequestration, as an example. This valuation has the ability to contribute to Outcome Measure 1.

8 Option Development

8.1.1 The *Consultant* shall undertake an options appraisal, which will include a review of the previous work to ensure that no opportunities have been missed, to prepare a long list of options. The long list shall not be constrained by previous work and will be agreed with the *Client* at an options meeting, where the *Client* will invite representation from area FCRM, the ESE contractor's representative, NEAS, MEICA, Field Services and the Principal Designer. The *Consultant* shall screen and assess this long list of options using the information from the SOC as a basis for technical, environmental, sustainability, carbon and economic suitability, as considered appropriate.

8.1.2 Following this screening, the *Consultant* shall prepare a short list of viable options for the *Client's* approval, giving reasons for including or excluding each of the long list options. The most sustainable option shall be included in the short list, it is understood that the preferred way forward identified in the SOC is most likely to proceed.

8.1.3 Options appraisal shall include engagement with the ESE contractor on pricing, buildability and maintainability and the *Client* including Field Services and Area FCRM.

8.1.4 The *Consultant* shall analyse and appraise the carbon footprint of options as outlined in Section 7.

8.1.5 The *Consultant* shall seek options that support the e:Mission 2030 sustainability targets.

8.1.6 The *Consultant* shall use these outputs to support in the selection of a preferred option. The *Consultant* shall facilitate design workshops and attend risk workshops to produce a risk register that will be subsequently owned by the *Client*.

8.1.7 The *Consultant* shall develop the business case for the preferred option and the outline design including provision of specifications, drawings and documentation required for ESE.

8.1.8 The *Client* shall draft the Scope for the next stage of the project (OBC-FBC).

Reservoirs & River Engineer Input / Design

It is anticipated that any flood storage area is highly likely to be designated as a "reservoir" under the Reservoirs Act 1975. To provide confidence in the option development work completed, the *Consultant* shall:

8.1.9 AD: Ensure that the study is overseen by suitable resources (E.g. All Reservoir Panel or Supervising Engineer Panel Engineer)

8.1.10 AD: The *Consultant* shall allow for design reviews at key stages of the OBC by the ARPE and a technical memo to be produced to be submitted alongside the OBC.

8.1.11 AD: The study is to be completed to a level of detail normally associated with analysis at options short-list stage. The study considers the proposed Flood Storage Reservoirs/Intervention locations identified within the SOC.

8.1.12 AD: The *Consultant* shall undertake a site visit to the areas identified within the SOC.

8.1.13 AD: The *Consultant* shall undertake desk-based studies to enable an initial feasibility review of the options within the SOC. This should include - services searches, geotechnical desk study, topography review based on LiDAR and environmental constraints.

8.1.14 AD: The Consultant shall liaise with the *Clients* MEICA, H&T team and assets team to establish design requirements and prepare a basis of design document for acceptance.

Reservoir Options Assessment

8.1.15 AD: **Upon selection of the Preferred Option (I.e. following the decision point in the phased programme)** The *Consultant* shall develop a concept design and concept drawings for a storage option sufficient to facilitate capital cost estimation by the *Client*. Concept design drawings will be produced of possible outlet arrangements and general dam arrangements related to the identified potential flood storage locations. At this stage, the *Consultant* shall establish whether a cut off is likely to be required and outline expectations around import of fill material.

Reservoir Outline Design

8.1.16 AD: **Upon selection of the Preferred Option (I.e. following the decision point in the phased programme)**, the *Consultant* shall develop the engineering concept to an outline design. This will include consideration of the items below and production of no more than 4 drawings per site:

- Development of reservoir layout / dam general arrangement / spillway
- Development of reservoir cross section
- Development of layout of control structure
- Determination of site footprint and estimation of total working areas.
- Assessment of trash screen requirements, debris load etc.
- Monitoring requirements – drainage, telemetry etc.
- Maintenance access requirements
- MEICA requirements – Power supply, telemetry, CCTV, monitoring
- Production of outline design drawings
    - Layout
    - Cross Section
    - Standard Details
- HERR/DRA/PSRA

8.1.17 AD: The *Consultant* shall produce a technical memo that explains the design rationale and main potential engineering risks associated with each storage location.

Reservoir Reporting

8.1.18 AD: The *Consultant* shall produce a feasibility study report presenting the analysis completed, main conclusions, limitations and recommendations for inclusion in the OBC.

9 Stakeholder Engagement

9.1.1 The *Consultant* shall prepare / review, update and maintain a stakeholder engagement plan in accordance with the Environment Agency guidance “Working with Others” including agreement of key stakeholders with discussion with the *Client*. The *Consultant* shall ensure that the results from the stakeholder engagement informs the appraisal.

9.1.2 The Consultant shall provide monthly circulation of updated communications records at progress meetings.

9.1.3 The *Consultant* shall provide technical support, prepare information for and attend key stakeholder meetings, as well as preparing information and reviewing external communications prepared by Others (e.g. quarterly newsletters).

9.1.4 The *Client* will arrange and advertise public meeting/workshops. The *Consultant* shall provide technical support, prepare information for input into the consultation documents and prepare site plans and typical outline design drawings for public display. Attendance at these meetings shall include the *Consultant* project manager, environmental lead and other roles as necessary.

9.1.5 The *Consultant* shall provide technical support and attend meetings with key external organisations/individuals impacting upon option selection process.

9.1.6 The *Consultant* shall consider the following and document how they are addressed on this contract:

- Public diversity in engagement and perception of the project team.
- Accessibility.
- How inclusive environments are created for the project team.

10 Health and Safety

10.1.1 Health, Safety and Wellbeing (HSW) is the number one priority of the *Client*. The *Consultant* shall promote and adopt safe working methods and shall strive to deliver design solutions that provide optimum HSW to all.

10.1.2 The *Consultant* shall follow and comply with the requirements outlined in the Safety, health environment and wellbeing (SHEW) Code of Practice (LIT 16559).

10.1.3 The *Consultant* shall supply designer risk assessments, drawings and any other data required to fulfil their duties under CDM.

10.1.4 The works on site included in the geotechnical section will be subject to notification to the HSE. Appraisal work to outline design shall be treated as if it was notifiable.

11 Business Case Submission

11.1.1 The *Consultant* shall aggregate all of the work undertaken from this commission into a business case document – the OBC. The format of this document and guidance on the contents is detailed in “Write a Business Case LIT 55124” (Link) and the Business Case templates.

11.1.2 The *Consultant* shall be responsible for dealing with responses to queries during the approval process and any resubmission required.

11.1.3 The OBC Delivery is to be in accordance with the *Client’s* submission programme for either the National Project Assurance Service (NPAS) or the Large Projects Review Group (LPRG) for projects costing over £10m. The *Client* shall be kept up to date of progress and submission dates in order that the delivery of this to the review team can be programmed and a place booked at the appropriate review meeting.

11.1.4 This section of the study shall conclude with the final recommendation from the relevant assurance board.

12 Relevant guidance

The *Consultant* shall deliver the *service* using the following guidance:

Ref	Report Name	Where used
LIT 16559	Safety, health environment and wellbeing (SHEW) Code of Practice	Throughout
183_05	Data management for FCRM projects	Mapping and modelling
LIT 11327	Computational Modelling to assess flood and coastal risk	Modelling
LIT 14847	Risk Guidance for Capital Flood Risk Management Projects	Option development
OI 120_16	Whole-life Carbon Planning Tool	Option development
LIT 14284	Whole Life (Construction) Carbon Planning Tool User Guide	Option development
LIT 12982	Working with Others: A guide for staff	Consultation & Engagement
LIT 17631	Appraisal Guidance Manual	OBC
LIT 14174	Business case template – 5 case Model	OBC
LIT 4909	Short Form Business case template	OBC
LIT 4909	Flood and Coastal Erosion Risk Management appraisal guidance (FCERM-AG)	OBC
	Flood and Coastal Erosion Risk Management: A Manual for Economic Appraisal (the 'Multi Coloured Manual')	OBC
LIT 58244	Benefits management Framework	OBC
LIT 17608	Partnership Funding Calculator Guidance	OBC
LIT 15030	The Investment Journey	OBC
LIT 55124	Write a Business Case	OBC
LIT 55096	Integrated Assurance & Approval Strategy	Approvals
FRS18087/IG/R1	Development of interim national guidance on non-stationary fluvial flood frequency estimation – science report	OBC
SC120014	Accounting for residual uncertainty: updating the freeboard guide	OBC
Flood Estimation Handbook	UK FEH 2013	OBC / Modelling
Flood and Reservoir Safety	ICE Floods and Reservoir Safety 4th ed	OBC / Modelling

13 Requirements of the Programme

13.1.1 The *Consultant* shall provide a detailed programme in Microsoft Project format version ~~X~~ 2013 or later meeting all requirements of Cl.31 of the conditions of contract.

13.1.2 The *Consultant* shall provide a baseline programme for the project start up meeting and shall update the programme monthly for progress meetings with actual and forecast progress against the baseline. The programme shall also include alignment and submission of the BIM Execution Plan (BEP) and Master Information Delivery Plan (MIDP).

13.1.3 **The programme should be set out in a phased manner to account for the two potential routes to delivery detailed within earlier sections of this scope.**

13.1.4 AD: The *Consultant* shall produce and maintain a BEP in collaboration with the *Client* throughout the life of the project.

13.1.5 AD: The MIDP shall be located in the *Clients* common data environment (CDE) (A-Site), and this shall be maintained by the *Client,* and the *Consultant* where required, as stated within the BEP.

13.1.6 The programme shall cover all the activities and deliverables in the project and include all major project milestones from commencement to the end of the reporting, consultation and approvals stage.

13.1.7 The programme shall include review and consultation periods for drafts, scoping letters, statutory consultation etc.

13.1.8 The programme shall identify time risk allowance on the activities and float.

13.1.9 The following are absolute requirements for Completion to be certified:

- Population of the *Client's* latest version of the Project Cost and Carbon Tool, or its successor
- Transfer to the *Client* of BIM data
- Clause 11.2(2) work to be done by the Completion Date

14 Services and other things provided by the *Client*

14.1.1 Access to the *Client's* systems and resources including:

- Asite.
- FastDraft.
- Collaborative Delivery Community SharePoint access.

14.1.2 Letter of Appointment of Principal Designer.

14.1.3 Site access authorisation letter(s).

14.1.4 Previous studies listed in Section 1.2.1. The *Client* will provide the previous studies within two weeks of contract award.

15 Data

15.1.1 AD: The *Consultant* shall adhere to the information management requirements stated in version 10 of the Minimum Technical Requirements.

15.1.2 AD: All *Client* issued information referenced within the Information Delivery Plan (IDP) requires verifying by the *Consultant* unless it is referenced elsewhere within the Scope.

16 *Client's* Advisors

16.1.1 The *Client* for the Contract is represented by the Programme & Contract Management (PCM) team, primarily the Project Manager, acting as the *Service Manager*, and in their absence the Project Executive. Instructions may only be given by these staff.

16.1.2 The *Client* has a number of advisory departments. Instructions will only be deemed enacted from them when they are confirmed by an Instruction from the *Client*. These departments include Asset Performance, Partnership & Strategic Overview, NEAS, etc.

16.1.3 The *Client's* organisation has a regulatory function. Communications from the Environment Agency in its capacity as a regulator are not to be confused with communications as the *Client*.

17 *Client* Documents the *Consultant* Contributes to

17.1.1 The *Client* maintains several project documents, the *Consultant* is required to contribute to these *Client* owned documents:

- Project Risk Register.
- Project Efficiency CERT Form.
- Scheme Lessons Learnt Log.
- Cost and Carbon Tool (CCT)

Key Deliverables Per Phase

Deliverable	Phase 1	Phase 2
Initial reservoir engineering feasibility study	✓	
Outline design drawings (Reservoir Engineering)	✓	
Technical memorandum explaining design rationale (Reservoir Engineering)	✓	
Initial River engineering feasibility study	✓	
Outline design drawings (River Engineering)	✓	
Technical memorandum explaining design rationale (River Engineering)	✓	
Ground Investigation Scope	✓	
Conceptual Engineering Assessment Report (Ground Investigation)	✓	
Detailed desk based assessment to support the Outline Business Case (Ground Investigation)	✓	
Interpretative Reports (One for both sites) (Ground Investigation)		✓
Ground Investigation Report (GIR)		✓
FEH Calculation Report	✓	
Interim Hydrology Report	✓	
Final Hydrology Report	✓	
Baseline and with scheme tabulated 1D stage and flow data (Hydraulic Modelling)	✓	
Baseline and with Scheme hydraulic model reporting and model files (Hydraulic Modelling)	✓	
Economic Reporting	✓	
Data gap analysis technical note and data register (Environment)	✓	
Site visit file note (Environment)	✓	
Preliminary Environmental Assessment (PEA)	✓	
WFD Baseline Assessment	✓	
Environmental Site Appraisal Plan (ESAP)	✓	
Cultural heritage desk-based assessment	✓	
Population and health: opportunities assessment	✓	
Arboricultural Survey and Assessment (to BCC requirements)	✓	
Sustainability Opportunities Register (and Sustainability Appraisal or appropriate equivalent)	✓	
Carbon Optimisation Report	✓	
CEEQUAL Scoping note	✓	
Natural Capital Baseline Report	✓	
Stakeholder Engagement Plan and Action Tracker	✓	✓
H&S design tracker	✓	✓
Business Case Report		✓
Any further amendment to the deliverables shown above following the completion of the Phase 1 works have not been accounted for within the Activity Schedule.		