Environment Agency
NEC3 professional services contract (PSC)
Scope

Project / contract Information

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Project 1B1S reference	
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Revision history

Revision date	Summary of changes	Version number
	First issue	

Details of the *services*

Details of the *services* are:

1. Description of the work:

Background

In the summer of 2012 and again in 2013 the Calder Valley was badly affected by flooding with over 1200 residential and commercial properties impacted as well as all major transport routes through the valley and other critical infrastructure. A multi-agency project team has been established to promote flood risk management works throughout the valley. This team consists of the Environment Agency and Calderdale MBC (as well as Yorkshire Water, Canal & River Trust, Network Rail and others).

Hebden Bridge was particularly badly impacted being flooded three times within the space of three months. The flood events encompassed both fluvial and pluvial flooding mechanisms. The town is very susceptible to flooding as it lies at the confluence of two rivers, with a third joining towards its western edge and sits in the bottom of a steep sided valley.

Despite this risk there are no formal flood defences in the town. The town is entirely reliant on third party defences and as a result the standard of protection varies with the onset of flooding occurring at the 5 year flood event.

This document sets out the work required to investigate the feasibility and develop outline designs for a comprehensive flood alleviation scheme for Hebden Bridge. The consultant will be required to identify solutions for both river and surface water flooding.

Flood Risk from rivers

In order to lower the risk of flooding in Hebden Bridge from the River Calder and Hebden Water it will be necessary to deploy some combination of the following interventions:

- Storage
- Containment
- River training/realignment

This document sets out the work required to be undertaken that will allow this combination to be optimised and understood.

Confluence Modelling

It has long been recognised that the configuration of the confluence of Hebden Water and the River Calder has a significant impact on the overall flood risk in the town.

Hebden Water and the River Calder meet with a significant proportion of their flow opposing one another. This leads to turbulence and the formation of a standing wave. The impact of this is to cause elevated water levels on both watercourses.

Immediately downstream of the confluence a four arch barrel aqueduct passes across the river at a skew angle. As well as the arches being a restriction in and of themselves the skew of the arches to the direction of flow further restricts the flow of water.

Re-configuration of the confluence through river training or realignment would minimise the impact and reduce river levels. However as noted in the Arup (2006) report:

"The three dimensional flow effects present at the confluence, which are caused by the interaction of the two watercourses and the presence of the skewed aqueduct structure immediately downstream, are difficult to replicate in a one-dimensional river model. As such, current water level predictions in this area are associated with a significant degree of uncertainty"

In order to investigate the potential for river training or realignment to reduce the risk of flooding as well as to have improved certainty over design levels for containment schemes and the baseline flood damages we have chosen to commission a physical model.

The following services are required:

- Manage the procurement, contract provision & administration, building, calibration, testing and use of a physical model of the Hebden Water / River Calder confluence including any topographical or site investigations necessary.

- Draw up and agree flood defence options to be tested. Use the model to optimise these options.

- Compile a full report on the modelling process and results to be used for subsequent detailed design calculations and drawings.

- Investigate the differences between the hydraulic model and the physical model results. Amend the hydraulic model so that its results more closely resemble the results of the physical model. Make comments to its future use and applicability beyond this point. Create a baseline and preferred option model run.

- Production of presentation materials for public consultation including interactive presentation of modelling outputs and visualisations. Facilitation of 4 visits to the model for the local community. 2No of these visits will include school children under supervision.

The modelled scenarios to be tested are as follows:

- Baseline river configuration
- Baseline configuration with reservoir storage amended inflows
- River training options
- River realignment options (open channel and culverted)
- Shoal removal options in Hebden Water and confluence
- Containment options on River Calder and Hebden Water
- Combinations of the above options

[N.B. For each scenario a full range of flood flows should be tested: 1 in 10, 20, 30, 40, 50, 75, 100 yr, 100yr + CC, 1000yr]

The extents of the model should be based on the technical requirements of the project. However the extents must be sufficient so that the full impact of the options can be understood.

Reservoir Storage

Hebden Water has a catchment of approx. 58km^2 with approx. 26km^2 draining through six water storage reservoirs within three groups. Previous studies (Arup 2006 and De Leuw Rothwell 1999) have identified that significant flood risk benefits could be realised by utilising

a proportion of the reservoir's storage capacity during times of flood. At present the condition of the reservoir catch waters has deteriorated such that water resource that could be stored is not and flood water that should enter the reservoir is discharging directly to the watercourse.

The following services are required:

- Review the previous work done to date (DLR, 1999) and update utilising the latest hydrological and hydraulic models from the Updated River Calder & Hebden Water flood model (JBA, 2015).
- Model the impact that eliminating flood flows discharging from the three reservoir groups has on flood levels within the town for a full range of return periods
- Undertake the above modelling but for each group individually and for all combinations of two groups
- Calculate the volume of storage required for all combinations of storage and return periods.
- Identify flood storage requirements for each return period when combined with other options e.g. wall raising, river training, etc
- Work with water resource specialist to determine the 'cost' of the lost water resource and the level of potential compensation for storage
- Review the existing condition of the reservoir catch waters above Gorple and Widdop Groups. Estimate the lost water resource due to the condition of these catch waters and estimate the work necessary to restore these assets. Estimate the additional flood inflows into Hebden Water due to the condition of these assets.
- Identify methods to actively manage water levels within the reservoirs so as to minimise the water resources losses during drought conditions but to maximise the flood storage potential during storm conditions.
- Assist with negotiations with YWS

Calculate the flow through Hebden Bridge, the storage volume required and the containment heights for each of the following combination of flood storage options and return period.

Return Periods: 1 in 10, 20, 30, 40, 50, 75, 100 yr, 100yr + CC, 1000yr

Storage options:

- Gorple, Widdop, Walshaw Dean
- Gorple and Widdop
- Gorple and Walshaw Dean
- Widdop and Walshaw Dean
- Gorple
- Widdop
- Walshaw Dean

Other storage sites

The flood model investigation study has also identified 3 potential flood storage sites within the valley itself, namely:

- Stoodley Glen cricket ground
- Mytholm Meadows
- Crow Nest Wood

Consideration should be made about utilising these sites to provide additional flood storage as part of the combination of flood alleviation measures.

Containment

The feasibility study conducted by Arup in 2006 identified a containment only scheme. The study identified river training and reservoir storage as having a potentially significant impact on flood risk but both were outside the scope of the study.

An all containment scheme has been too expensive to fund in the past and with the changes to funding is likely to be even more unaffordable today. Given the conservation area status of the bulk of Hebden Bridge and that tourism is a big part of the local economy an all containment scheme is most likely to be rejected anyway.

However it is inevitable that some containment will be required. Utilise the physical model / updated hydraulic model to test out options.

- Review previous studies, flood mechanisms and identify flood cells.
- Identify wall raising requirements for each flood cell for:
    - A range of return periods and;
    - With/without storage and river training options

Bridge Gate is the primary location where the town interacts with the river. There have been extensive public realm improvements in the past to make this an attractive place for both locals and visitors to spend time. Simple wall raising will be unacceptable in this location. As such it is proposed that an architectural competition is organised both for amateurs and professionals so develop the public realm so that both the flood defence and aesthetic and cultural values remain. The consultant will assist in arranging and running this competition.

- Arrange and run an architectural competition for Bridge Gate.

It will be necessary to bring together the most promising options to obtain the optimum combination of:

- Reservoir storage
- Containment
- River training/realignment

Once the storage, containment and river training/realignment options have been tested the following additional services are required:

- Review the feasibility, cost estimate, risk and uncertainty of modelled options
- Development of the preferred option(s) to outline design; confirm the performance of the proposed scheme to reduce flood risk
- Production of a risk register. This should detail risks, assumptions & further investigations necessary to progress scheme to detailed design
- Detailed cost estimate of the preferred option(s). Include assumptions made and provide a detailed breakdown of the risk allowance
- Detailed flood damage assessment from this flooding mechanism and flood benefits assessment from proposed option(s). These assessments are to be utilised in the wider Hebden Bridge FAS scheme appraisal
- CDM services
- Environmental services as detailed below

Consultant outputs will include:

- A physical model of the River Calder/Hebden Water confluence

- Details of options to be tested
- Modelling report
- Update of the existing hydraulic model
- Reservoir catch water condition report
- Options Appraisal Report
- Design Statement (inc. details of the analysis undertaken & data/models produced)
- Outline design drawings
- Performance specification & scope of works.
- Detailed cost estimate inc. risk
- Risk Register
- Flood damage and benefit assessment
- CDM risk assessment
- Ecological, Environmental & Water Framework Directive assessment
- Architectural competition for Bridge Gate works
- Public consultation presentation materials

Surface Water / Hill slope runoff

Hebden Bridge is equally at risk of flooding from surface water and hill slope runoff as it is from the overtopping of rivers and streams. Therefore in order to realise the benefits of reduced flood risk, it is necessary to provide protection against these flood mechanisms as well. We have split Hebden Bridge up into 4 surface water catchments although many of the flood receptors are common to multiple catchments:

- Birchcliffe (inc. Chiserley, Dodd Naze and Machpelah)
- Keighley Rd (inc. Pecket Well and Old Town)
- Central Hebden Bridge (inc. The Buttress, Moss Rd, Lee Wood Rd, Hangingroyd Rd)
- Erringden Hillside (inc. Stubbing Brink, Hebble End and Palace House Rd)

[A scheme has already been developed for Erringden Hillside and will shortly be implemented. No further work on Erringden Hillside is therefore necessary as part of this study].

The catchments boundaries identified are shown on plans appended to this document. These boundaries are indicative only. It will be necessary for the consultant to review these boundaries and modify them so that they better represent the hydrological catchments.

For each surface water catchment the following services are required:

- Hydrological assessment of the catchments
- Identification of flooding mechanisms, flood flow routes and hill slope runoff routes
- Understanding of the existing drainage network, its performance and the standard of protection it provides
- Identification of the performance required to meet a range of improved standards of protection
- Identification of flood alleviation options (this should include options for Natural Flood Management)
- Review the feasibility, cost estimate, risk and uncertainty of identified options
- Development of the preferred option to outline design; confirm the performance of the proposed scheme to reduce flood risk
- Production of a risk register. This should detail risks, assumptions & details of further investigations necessary to progress scheme to detailed design

- Detailed cost estimate of the preferred option. Include assumptions made and provide a detailed breakdown of the risk allowance
- Detailed flood damage assessment from this flooding mechanism and flood benefits assessment from proposed option. These assessments are to be utilised in the wider Hebden Bridge FAS scheme appraisal
- CDM services
- Environmental services as detailed below
- Production of presentation materials for public consultation including interactive presentation of modelling outputs

Consultant outputs will include:

- Options Appraisal Report
- Design Statement (inc. details of the analysis undertaken & data/models produced)
- Outline design drawings
- Performance specification & scope of works.
- Detailed cost estimate inc. risk
- Risk Register
- Flood damage and benefit assessment
- CDM risk assessment
- Ecological, Environmental & Water Framework Directive assessment
- Public consultation presentation materials

Hebden Bridge FAS scheme appraisal

A full economic appraisal will be required for the FAS. The baseline do nothing and do minimum damages should be calculated for both river flooding and surface water flooding. An assessment based on historical precedent should be made of the joint probability of river and surface water flooding to ensure we do not over estimate damages. The appraisal should include damages avoided for those scheme option(s) being put forward.

Budget cost plans should be developed in sufficient detail and with consideration of risk that we can have confidence that we understand the amount and timing of funding required.

The PF calculator should be completed for each scheme option under consideration.

The makeup of the benefits for each element of work should be reviewed to determine if the total project can be phased

Environmental Services

Utilising and complying with the Minimum Technical Requirements (MTR), the consultant should investigate the potential environmental constraints and opportunities within the project, including those identified in the earlier feasibility study, to enable these to be considered at an early stage. In particular, opportunities for environmental improvements should be considered to enable the delivery of multiple benefits within the project; the benefit assessment should aim to quantify the monetary value of these environmental benefits.

In line with the products of the MTR, a Preliminary Environmental Information Report (PEIR), including a screening opinion of EIA requirements, should be prepared. This should also include a full WFD assessment, and particularly the potential for the project to deliver WFD improvements should be investigated.

A Phase 1 Habitat Survey has not been carried out, and so there is no detailed baseline information on the flora and fauna present throughout the study area. However, it is known

that there are important habitats and designated sites in the locality, so any constraints placed upon the programme and plan activities through the presence of protected species should be identified. Further, opportunities may exist for the ecological betterment of the sites, through habitat improvement or creation, and these should be considered at this stage. Consideration should also be given to natural flood management processes.

Reference to the MTR should also be made with regard to landscape considerations; the main landscape drawings required are listed, together with reference to the Landscape Consultants Appointment, which defines which works are to be undertaken at key stages of a project. A suitably qualified and experienced landscape architect needs to be fully integrated into the appraisal team from the outset to influence the environmental outcomes as the scheme develops.

Production of a PAR document

Once the outputs above have been produced and reviewed by the Environment Agency and others we will require the consultant to produce a PAR document for the proposed Hebden Bridge FAS.

2. Drawings, site information or reports already available

a) Hebden Bridge FAS Appraisal, Arup, 2006

b) Hebden Water Catchment Drainage Study, De Leuw Rothwell, 1999

c) River Calder Flood Risk Mapping Study, JBA, 2015

d) Flood Model Investigations, Mott Macdonald, 2015

- Stoodley Glen Cricket Ground (storage)
- Mytholm Meadows (storage)
- Crownest Wood (storage)
- Adult Learning Centre (bridge removal)
- Fountain St (bridge removal)
- Mayroyd (bridge removal)
- Mayroyd (weir removal)

e) Updated River Calder (inc Hebden Water and Rochdale Canal) flood model

- 1d/2d ISIS/Tuflow model files
- Model outlines (defended and undefended)
- 2d depth, velocity and hazard grids
- Defence capacity spreadsheets
- Channel survey (2009)
- Canal survey (2013)
- Model report

f) Section 19 reports and flood outlines

g) LiDAR and other data located at www.**geostore**.com/**environment-agency**/

h) Erringden Hillside outline design and overland flow model

i) Nutclough screen outline design

j) WFD evidence packs

k) Upper Calder Improvements Strategy

l) River Calder CFMP

m) Extent of works and surface water catchment boundaries

n) Maps of Reservoir Catch waters

Attachments:

- Section 19 report – 22nd June 2012
- Section 19 report – 6-9th July & 25th August 2012
- Arup 2006
- De Leuw Rothwell 1999
- Extent of works plan
- Surface water catchment boundaries
- Locations of interventions studied in flood model investigations.

Data not attached will be provided once a supplier is appointed

3. Specifications of standards to be used

a) All work should conform to the specifications set out within the WEM framework

b) National Standard Contract and Specification for Surveying Services v.3.1

c) All data should be submitted in formats and using software that is compatible with EA software and systems such as AIMS, Map Edit, MDSF2 and NFCDD compatible

4. Constraints on how the *Consultant* provides the *services*

a) During this commission the Environment Agency and Calderdale MBC will be delivering a programme of flood risk reduction schemes in the Calder Valley (including in Hebden Bridge). These schemes include surface water scheme for Erringden Hillside and a new screen and drainage arrangements for Nutclough. Details of both these projects will be made available. JBA Bentley was awarded the work following a competitive tender through the WEM Lot 4 framework. It is a requirement of this contract that the Lot 3 supplier co-operates and collaborates where appropriate with the Lot 4 supplier and the project team. It is within the scope of the Lot 4 supplier's commission to provide ECI and build ability advice as well as to be a route to providing site and ground investigation works. This constraint does not lock the Lot 3 consultant into working exclusively with the Lot 4 supplier and you may seek site investigation or construction advice from elsewhere.

b) During this commission Calderdale MBC and the Environment Agency will be working with an Economic Development consultant (Genecon) to identify the wider economic and social benefits of flood alleviation. This work is necessary so that we can identify and secure funding for the delivery element of the scheme. It is a requirement of this contract that the Lot 3 supplier co-operates and shares information generated as part of this work.

c) The Environment Agency and Calderdale MBC are working in partnership to deliver a programme of flood investment. This project is one element of the wider programme. Calderdale MBC staff will be an integral part of the project team and many of the assets to be created by this project will be assets that Calderdale MBC will take on (specifically around the surface water infrastructure).

5. Requirements of the programme

a) The tender is to be returned by mid day on 10/02/2015

b) The supplier is to be available to finalise contract details on w/c 23/02/2015

c) The project is to commence by 02/03/2015

d) Initial technical investigations to be completed by August 2015

e) The outline design work to be completed by October 2015

f) PAR is to be completed by December 2015

6. Services and other things provided by the *Employer*

a) See section 2 above.