

**TRANSPORT for LONDON –  
COMMERCIAL, SURFACE TRANSPORT**

**CONTRACT**

**FOR**

**Technical Consultancy for Hammersmith Bridge  
Strengthening and Refurbishment Works – Stages  
2 Feasibility Study & 3 Preliminary Design**

**BETWEEN**

**TRANSPORT FOR LONDON**

**AND**

**MOTT MACDONALD LIMITED**

Project Reference Number: tfl\_scp\_001144\_co006  
Framework Reference Number: TfL 91313

# CONTENTS

## Section One

Form of Agreement.....	4
Call Off Contract Data Part One .....	7

## Section Two

Call Off Contract Data Part Two .....	18
---------------------------------------	----

## Section Three

Scope .....	24
Appendix 1 – Specification .....	52
Appendix 2 – Site Information.....	76
Appendix 3 – Risk Register .....	88

## Section Four

Quality Submission.....	92
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# **SECTION ONE**

## FORM OF AGREEMENT

THIS AGREEMENT is made the 01 day of NOVEMBER 2017

**BETWEEN:**

(1) Transport for London whose registered office is at Windsor House, 42-50 Victoria St, London, SW1H 0TL ("the *Employer*" which expression shall include its successors in title and assigns); and

(2) Mott MacDonald Limited whose registered office is at Mott MacDonald House, 8-10 Sydenham Road, Croydon, CR0 2EE "the *Consultant*").

**WHEREAS:**

(A) This Agreement is made pursuant to a framework agreement between the Parties relating to the provision of professional services dated 09 May 2016 ("the Framework Agreement").

(B) The *Employer* wishes to have provided the provision of technical consultancy services to support Pathway Stage 2 Feasibility and Stage 3 Preliminary Design for the Strengthening of Hammersmith Bridge project. ("the services").

(C) The *Employer* has accepted a tender by the *Consultant* for the design of the services and correction of Defects therein in accordance with the conditions of contract.

**NOW IT IS AGREED THAT:**

1. Terms and expressions defined in (or definitions referred to in) the conditions of contract have the same meanings herein.
2. The *Consultant* Provides the Services in accordance with the conditions of contract.
3. The *Employer* pays the *Consultant* the amount due in accordance with the conditions of contract.
4. The documents forming the contract are:
  - 4.1 This Form of Agreement duly executed by the Parties as a deed;
  - 4.2 The *conditions of contract*;
  - 4.3 The attached Call-Off Contract Data Part 1
  - 4.4 The attached Call-Off Contract Data Part 2; and
  - 4.5 The following documents:
    - The Scope;
    - Schedules 1 to 20 inclusive of the Framework Agreement; and

- Any other contract documents

5. Where there is any discrepancy or conflict within or between the documents forming the contract the order of priority shall be as follows:

- 5.1.1 First : This Form of Agreement;
- 5.1.2 Second : The Call-Off Contract Part One;
- 5.1.3 Third : The Call-Off Contract Part Two;
- 5.1.4 Fourth : The Scope;
- 5.1.5 Fifth : The Consultant's Quality Submission;

6. Notwithstanding the manner of execution of this Agreement it is agreed that:

6.1 the limitation period within which any claim may be brought by the Employer for breach of this Agreement by the Consultant is 12 years from the date of breach; and

6.2 the Consultant agrees not to raise in defence of any such claim a shorter limitation period whether pursuant to the Limitation Act 1980 (as the same may be amended or re-enacted from time to time) or otherwise.

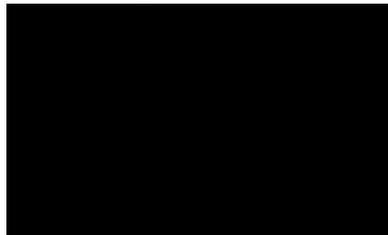
IN WITNESS whereof this Agreement has been signed for and on behalf of the *Employer* and the *Consultant* the day and year written above.

The common seal of

Transport for London

was affixed to this Deed

314



EXECUTED AND DELIVERED AS

A DEED by

THE CONSULTANT

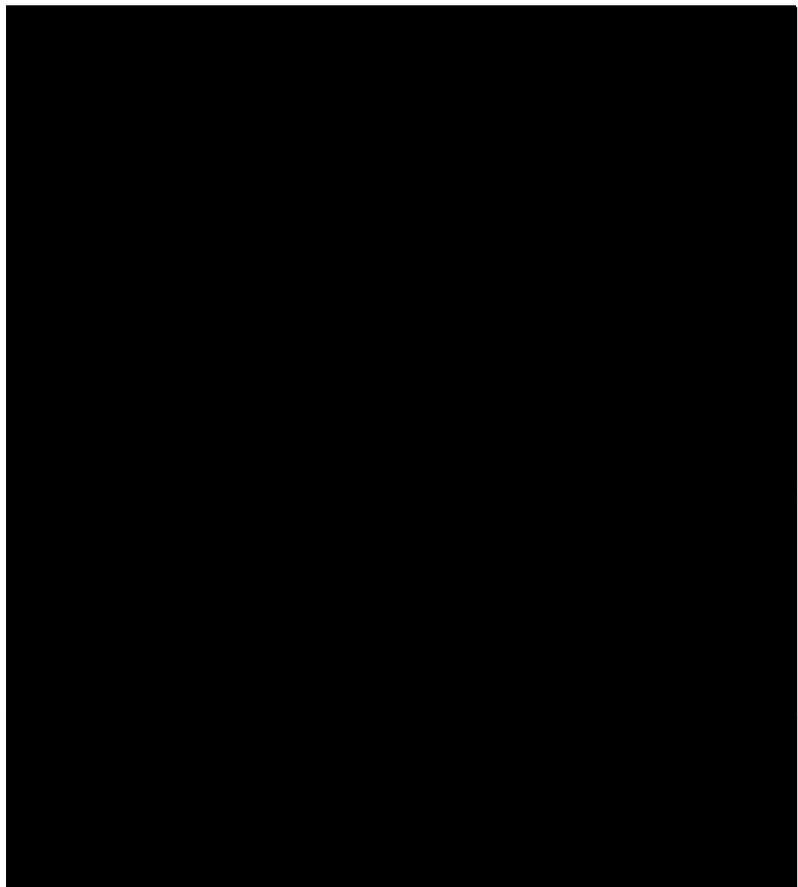
Acting by:

Signature of Director

Print Name of Director

Signature of ~~Director~~/Secretary

Print Name of ~~Director~~/Secretary



## Call Off Contract Data Part One

### Part One - Data provided by the *Employer*

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

#### Statements given in all contracts

##### 1 General

- The *conditions of contract* are the core clauses as may be amended or supplemented by the clauses for Main Option **A** and Option **E** and Secondary Options **X2, X10, X18**, each as may be amended or supplemented by the Z Clauses as attached to the Transport for London Professional Services Framework Agreement.
- The *Employer* is  
Name: **Transport for London (TfL).**  
Address: **Windsor House, 42-50 Victoria St, London, SW1H 0TL.**
- The *Employer's Agent* is  
Name: [REDACTED]  
Address: **London Borough of Hammersmith & Fulham  
5<sup>th</sup> Floor Town Hall Extension  
King Street  
London W6 9JU**
- The authority of the *Employer's Agent* is  
**To make all decisions related to this Call Off Contract as set out in Option X10.**
- The *services* are:  
**For the provision of technical consultancy services to support Pathway Stage 2 Feasibility and Stage 3 Preliminary Design for the Strengthening of Hammersmith Bridge project.**
- The *Scope* is in the document titled  
SCOPE
- The *language of this contract* is **English**
- The *law of the contract* is **the law of England and Wales**
- The *period for reply* is **two (2) weeks.**
- The *period for retention* is **12 years following Completion or earlier termination.**
- The *tribunal* is **the courts of England and Wales**
- The Risk Register can be found in Appendix 3

2 The Parties' main responsibilities

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

**access to**

Hammersmith Bridge as shown on plans General Arrangement drawings included in Annex 2 (site information).

**access date**

*starting date*, subject to 2 weeks advance notice received from the *Consultant* and subject to acceptance and appropriate approvals of method statements, traffic management plans, risk assessment by the Employer's Agent .

The access areas, which include carriageway and footway (subject to agreed traffic management setup), anchor chambers, chain tunnels and abutments (subject to agreed confined space set up), inside towers, whole superstructure (subject to approved access arrangements), under bridge (subject to Port of London Authority and Environment Agency Approval).

*starting date*, subject to 2 weeks advance notice received from the *Consultant* and subject to acceptance and appropriate approvals of method statements, traffic management plans, risk assessment by the Employer's Agent .

3 Time

- The *starting date* is **30 October 2017**.
- The *Consultant* submits revised programmes at intervals no longer than **Four (4) weeks**.

4 Quality

- The quality policy statement and quality plan are provided within **Two (2) weeks of the *starting date***.
- The *defects date* is **52 weeks** after Completion of the whole of the services.

5 Payment

- The *assessment interval* is **Four (4) weeks**
- The *currency of this contract* is **pounds Sterling (£)**
- The *interest rate* is **Two (2)% per annum above the base rate of the Bank of England**.

8 Indemnity, insurance and liability

- The amounts of insurance and the periods for which the *Consultant* maintains insurance are;



## Optional statements

### If Option A is used

The consultant prepares forecast of total expenses at intervals no longer than **Four (4) weeks**

### If Option E is used

- The *Consultant* prepares forecasts of the total Time Charge at intervals no longer than **four (4) weeks**.

The *completion date* for the whole of the *services* is **nine (9) months after the date of award of the contract or earlier as identified in the *Consultant's* services programme approved and agreed by the *Employer's Agent* with the option to extend for a total of a further three (3) months.**

### If no programme is identified in part two of the Contract Data

- The *Consultant* is to submit a first programme for acceptance within **Two (2) weeks** of the *starting date*.

### If the *Employer* has identified work which is to meet a stated *condition* by a *key date*

- The *key dates* and *conditions* to be met are

<i>Condition</i> to be met	<i>Key date</i>
1 End of Investigation Phase	<b>3 April 2018</b>
2 End of Options Study and Analysis	<b>11 May 2018</b>

### If Option Z is used

- The additional conditions of contract are those set out in Schedule 2A of the framework agreement, and supplemented by Annex 1 to this Contract Data.

## Annex 1 – Additional Conditions of Contract

### Addendum to Transport for London Professional Services Framework Agreement, Schedule 2A main Option A.

Insert a new clause:

#### **Z1 notice to proceed to Stage 3 Preliminary Design**

Z1.1 The *Consultant* allows a period of 12 weeks from the completion of Stage 2 Feasibility before a notice to proceed can be issued.

Z1.2 The Employer's Agent issues a notice to proceed to Stage 3 Preliminary Design when

- the *Consultant* has completed the *services* for Stage 2 Feasibility,
- the *Consultant* has met the conditions stated in the Scope,
- the *Employer* (in its absolute discretion) has confirmed the *services* are to proceed.

Z1.3 The notice to proceed and any information provided with the notice to proceed is not a compensation event.

Z1.4 If the Employer's Agent does not issue a notice to proceed to Stage 3 Preliminary Design for any reason, he issues an instruction that the work required in Stage 3 Feasibility is removed from the Scope. If the *Employer's Agent* intends to proceed with all, some or none of the recommendations from Stage 2 Feasibility, he issues an instruction changing the Scope. These instructions are not compensation events and the *Consultant* is not entitled to any claim for loss of profit, business or opportunity arising from any such omission, whether or not the *Employer* appoints another Consultant to complete the Stage 3 Preliminary Design *services*.

Z1.5 If the *Employer's Agent* does not issue a notice to proceed to Stage 3 Preliminary Design the *Employer* may appoint another Consultant to complete the Stage 3 Preliminary Design *services*.

Z1.6 If the *Employer's Agent* does not issue a notice to proceed to Stage 3 Preliminary Design, if clause 92.2 applies the relevant amount due on termination uses the first forecast of the Defined Cost for the *services* for Stage 2 Feasibility and not the first forecast of the Defined Cost for the whole of the *services*.

Z1.7 From and including the date of issue of a notice to proceed any *services* not completed in Stage 2 Feasibility are completed as Stage 3 Preliminary Design *services*.

Z1.8 From and including the date of issue of a notice to proceed, in the *Consultant's* applications for payment and in the *Employer's Agent's* assessments of the Price for Work Done to Date and payment certificates, the Price for Work Done to Date for Stage 2 Feasibility and the Price for Work Done to Date for Stage 3 Preliminary Design are separately identified."

Insert a new clause:

**Z2: Contractual flow down**

Z2.1 This professional services contract is between the Employer and the Consultant. As there is an element of the Scope which may be subcontracted, the Consultants subcontract is to take the form of the NEC3 Engineering Construction Contract Main Option A: Priced contract with Activity schedule.

Insert a New Clause:

**Z4: Work Related Road Risk**

Z.4.1 Definitions

Z.4.1.1 Bronze Accreditation means the minimum level of accreditation within the FORS Standard, the requirements of which are more particularly described on the FORS website;

Z.4.1.2 Car-derived Vans means a vehicle based on a car, but with an interior that has been altered for the purpose of carrying larger amounts of goods and/or equipment;

Z.4.1.3 Collision Report means a report detailing all the collisions during the previous 12 months involving injuries to persons or fatalities;

Z.4.1.4 Delivery and Servicing Vehicle means a Lorry, a Van or a Car-derived Van;

Z.4.1.5 Driver means any employee of the *Consultant* and his SubConsultants (including an agency driver), who operates Delivery and Service Vehicles on behalf of the *Consultant* while Providing the Services;

- Z.4.1.6 DVLA means the Driver and Vehicle Licensing Agency;
- Z.4.1.7 FORS means the Fleet Operator Recognition Scheme, which is an accredited membership scheme for businesses operating van and lorry fleets. It offers impartial, independent advice and guidance to motivate companies to improve their compliance with relevant laws and their environmental, social and economic performance;
- Z.4.1.8 FORS Standard means the standard setting out the accreditation requirements for the Fleet Operator Recognition Scheme, a copy of which can be found on the FORS website;
- Z.4.1.9 Gold Accreditation means the highest level of accreditation within the FORS Standard, the requirements of which are more particularly described on the FORS website;
- Z.4.1.10 Lorry means a vehicle with an MAM exceeding 3,500 kilograms;
- Z.4.1.11 Losses means all costs (including legal costs and costs of enforcement), expenses, liabilities (including any tax liability), injuries, direct, indirect or consequential loss (all three of which terms include pure economic loss, loss of profits, loss of business, depletion of goodwill and like loss), damages, claims, demands, proceedings and judgments;
- Z.4.1.12 MAM means the maximum authorised mass of a vehicle or trailer including the maximum load that can be carried safely while used on the road;
- Z.4.1.13 Side Guards means guards that are fitted between the front and rear axles of a Lorry and that comply with EC Directive 89/297/EEC and the Road Vehicles (Construction and Use) Regulations 1986;
- Z.4.1.14 Silver Accreditation means the intermediate level of accreditation within the FORS Standard, the requirements of which are more particularly described on the FORS website; and
- Z.4.1.15 Van means a vehicle with a MAM not exceeding 3,500 kilograms.

## **Z.4.2 Fleet Operator Recognition Scheme Membership**

- Z.4.2.1 Where the *Consultant* operates Delivery and Servicing Vehicles to Provide the Services, it shall within 90 days of the *starting date*;
- (unless already registered) register for FORS or a scheme, which in the reasonable opinion of the *Employer* is an acceptable substitute to FORS (the “**Alternative Scheme**”);
  - (unless already accredited) have attained the standard of Bronze Accreditation (or higher) or the equivalent within the Alternative Scheme and shall maintain the standard of Bronze Accreditation (or equivalent standard within the Alternative Scheme) by way of an annual independent assessment in accordance with the FORS Standard or take such steps as may be required to maintain the equivalent standard within the Alternative Scheme. Alternatively, where the *Consultant* has attained Silver or Gold Accreditation, the maintenance

requirements shall be undertaken in accordance with the periods set out in the FORS Standard.

### **Z.4.3 Safety Equipment on Vehicles**

Z.4.3.1 The *Consultant* shall ensure that every Lorry, which he uses to Provide the Services shall:

- has Side Guards fitted, unless it can be demonstrated, to the reasonable satisfaction of the *Employer*, that the Lorry will not perform the function for which it was built, if Side Guards are fitted;
- have front, side and rear blind spots completely eliminated or minimised as far as practical and possible, through the use of fully operational direct and indirect vision aids and driver audible alerts;
- have equipment fitted with an audible means of warning other road users of the Lorry's left manoeuvre; and
- have prominent signage on the Lorry to warn cyclists and other road users of the dangers of passing the Lorry on the inside and of getting too close to the Lorry.

### **Z.4.4 Driver Licence Checks**

Z.4.4.1 Where the *Consultant* operates Delivery and Servicing Vehicles to Provide the Services the *Consultant* shall ensure that:

- it has a system in place to ensure all its Drivers hold a valid driving licence for the category of vehicle that they are tasked to drive, along with recording any endorsements or restrictions on the Driver's licence; and
- each of its Drivers, who work on this contract, has a driving licence check with the DVLA or such equivalent before that Driver commences to work on this contract and that the driving licence check with the DVLA or equivalent authority is repeated in accordance with either the following risk scale (in the case of the DVLA issued licences only), or the *Consultant's* risk scale, provided that the *Consultant's* risk scale has been approved in writing by the *Employer* within the last 12 months:
  - 0 – 3 points on the driving licence – annual checks;
  - 4 – 8 points on the driving licence – six monthly checks;
  - 9 – 11 points on the driving licence – quarterly checks;
  - 12 or more points on the driving licence – monthly checks.

### **Z.4.5 Driver Training**

Z.4.5.1 Where the *Consultant* operates Delivery and Servicing Vehicles to Provide the Services the *Consultant* shall ensure that each of its

Drivers undergo approved progressive training (to include a mix of theoretical, e-learning, practical and on the job training) and continued professional development to include training covering the safety of vulnerable road users and on-cycle hazard awareness, throughout the duration of this contract.

#### **Z.4.6 Collision Investigations, Collision Reports and FORS Reports**

Z.4.6.1 Where the *Consultant* operates Delivery and Servicing Vehicles to Provide the Services, the *Consultant* shall:

- ensure that it has a system in place to capture, investigate and analyse road traffic collisions that results in fatalities, injury or damage to vehicles, persons or property and for generating Collision Reports; and
- within 15 days of the *starting date*, provide to the *Employer* a Collision Report. The *Consultant* shall provide to the *Employer* an updated Collision Report within 7 days of a written request from the *Employer*.

#### **Z.4.7 Self Certification of Compliance**

Z.4.7.1 Where the *Consultant* operates Delivery and Servicing Vehicles to Provide the Services, within 90 days of the *starting date*, the *Consultant* shall make a written report to the *Employer* detailing its compliance with **paragraphs Z.4.3, Z.4.4 and Z.4.5** above (the “**WRRR Self-certification Report**”). The *Consultant* shall provide updates of the WRRR Self-certification Report to the *Employer* on each three month anniversary of its submission of the initial WRRR Self-certification Report.

#### **Z.4.8 Obligations of the Service Provider Regarding SubConsultants**

Z.4.8.1 The *Consultant* shall ensure that those of its SubConsultants who use Delivery and Servicing Vehicles to Provide the Services shall:

- comply with **paragraph Z.4.2**; and
- where its SubConsultants use the following vehicles to Provide the Services shall comply with the corresponding provisions of this contract:
  - For Lorries – **paragraphs Z.4.3, Z.4.4, Z.4.5 and Z.4.6**; and
  - For Vans – **paragraphs Z.4.4, Z.4.5, and Z.4.6**,as if those SubConsultants were a party to this contract.

## **Z.4.9 Failure to Comply with Work Related Road Risk Requirements**

### **Z.4.9.1**

Without limiting the effect of any other clause of this contract relating to termination, if the *Consultant* fails to comply with paragraphs **Z.4.2, Z.4.3, Z.4., Z.4.5, Z.4.6, Z.4.7 and Z.4.8:**

- the *Consultant* has committed a material breach of this contract; and
- the *Employer's Agent* may refuse the *Consultant*, its employees, agents and Delivery and Servicing Vehicles entry onto the Site or any property that is owned, occupied or managed by the *Employer* for any purpose (including but not limited to deliveries). Any Losses arising from such refusal of entry shall not constitute a compensation event.

# **SECTION TWO**

## Call Off Contract Data Part Two

### Data provided by the *Consultant*

Statements given in  
all contracts

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

- The *Consultant* is

Name : **Mott MacDonald Limited**  
Address: Mott MacDonald House  
8-10 Sydenham Road  
Croydon CR0 2EE.

- The *key persons* are

(1) Name: [REDACTED]

Job: **Project Director.**

.....

Responsibilities: overall direction for the delivery of the project

.....

Qualifications: Member of the Institution of Engineers (Chartered Engineer), India

Member of the International Association for Bridge and Structural Engineers.

(2) Name: [REDACTED]

Job: **Project Manager.**

Responsibilities: overall management of the project . . .

.....

Qualifications: ICE Chartered Engineer. . .

(3) Name: [REDACTED]

.....

Job: **Technical Lead**

..

Responsibilities: Design lead, delivery to standards .

Optional statements  
whole of the

If the *Consultant* is to decide the **completion date** for the

- The *completion date* for the whole of the *services* is 29 October 2018 .

If a programme is to be identified in the **Contract Data**

- Detailed Works Programme as part of the quality submission









# **SECTION THREE**

# SCOPE

## TABLE OF CONTENTS

### ACRONYMS

1.	Introduction.....	26
1.0	Background .....	26
1.1	Project Team .....	27
1.2	Stage 1 Overview .....	27
1.3	Background Information.....	28
2.	SCOPE.....	28
2.0	General.....	28
2.1	Desktop Study and Document Review.....	30
2.2	Testing, inspection, investigation, monitoring, surveys.....	30
2.3	Structural Assessment.....	38
2.4	Feasibility Study .....	41
2.5	Hold point .....	42
2.6	Preliminary Design.....	42
2.7	Extent of Scope .....	43
2.8	Site Access.....	43
2.9	Reporting.....	44
2.10	Technical Assurance .....	46
2.11	Technical Requirements .....	46
2.12	Access to structures for maintenance or inspection .....	47
2.13	Method Statement .....	47
2.14	Project Schedule .....	47
2.15	Cost Plan.....	48
2.16	Stakeholder Engagement .....	48
2.17	Statutory Undertakers.....	49
2.18	Records and Archives.....	49
2.19	Quality Requirements .....	49
2.20	Health and Safety .....	49
2.21	Project Governance – Pathway Products.....	50
2.22	Workshops .....	50
2.23	Progress Meetings and Reports.....	51
2.24	Project Works Programme.....	51
2.25	Delivery Team Staff and Experience.....	51
2.26	Reference Documents .....	51

## List of Annex Documents

**Appendix 1 – Specification**

**Appendix 2 – Site Information**

**Appendix 3 – Risk Register**

## ACRONYMS

3D	Three Dimensional
ARM	Active Risk Manager
BEP	BIM Execution Plan
BIM	Building Information Modelling
BoQ	Bills of Quantities
CDE	Common Data Environment
CDM	Construction (Design and Management)
EDMS	Electronic Data Management System
EFC	Estimated Final Cost
EIR	Employer's Information Requirements
IMM	Information Modelling and Management
ITT	Invitation to Tender
LBHF	London Borough of Hammersmith and Fulham
NDT	Non-destructive Testing
PLA	Port of London Authority
PPMP	Pathway Product Management Plan
QRA	Quantitative Risk Analysis
SDR	Scope / Design Review
TfL	Transport for London
BPRN	Borough Principal Road Network
VfM	Value for Money
WLC	Whole Life Cost

# 1. INTRODUCTION

## 1.0 Background

Hammersmith Bridge is a grade 2\* listed structure [owned by London Borough of Hammersmith & Fulham (LBHF)] crossing river Thames linking Hammersmith Bridge Road to Castlenau Road. The bridge is currently restricted to vehicles with a max GVW of 7.5T with an exemption to the emergency services and the public buses (buses up to 12T GVW one in each direction at any one time).

Hammersmith Bridge needs a major overhaul as the life of some of the elements of the bridge has expired and require repair/renewal. In addition, TfL has requested to investigate strengthening the bridge to allow double decker buses to use the bridge.

In 2016, a project board consisting of members from TfL, LBHF and London Bridge Engineering Group (LoBEG) agreed to proceed with a strengthening scheme following TfL's integrated project management delivery methodology, Pathway. More detail on Pathway can be found in 1.0.1 below.

Pathway Stage 1 (Outcome Definition) was completed in September 2016 by BAM Nuttall Ltd and their appointed consultant, Arup. The Stage 1 report suggests a series of tests and inspections to be completed as part of the Stage 2 works to provide the data necessary to produce an accurate model of the structure's current condition and behaviour. The Stage 1 report also summarises previous studies/reports completed on the structure, a chronology of previous works, project risks, stakeholder issues, construction methodology and an estimated cost and programme for various options.

### 1.0.1 Pathway Stages

TfL follows an integrated project management delivery methodology, Pathway. Pathway comprises six stages as set out below.

- Stage 1 – Outcome Definition
- Stage 2 – Feasibility
- Stage 3 – Preliminary Design
- Stage 4 – Detailed Design
- Stage 5 – Delivery
- Stage 6 – Project Close

This commission relates to Stage 2 – Feasibility (including surveys, investigations, and testing) and Stage 3 – Preliminary Design only. New commissions may be let for future stages of 4 and 5.

### 1.0.2 Overall Objectives for the Project

The condition of the structure has deteriorated, and several components are reaching the end of their service life in line with expectation and normal wear and tear. A 7.5T weight restriction and limits on bus access are already in place. Further restrictions or closures of the bridge are inevitable, if timely intervention is not made.

The objectives for this project are:

1. To strengthen the bridge and/or refurbish the structure (including, electrical rewiring, relighting, repainting, footways and deck replacement).
2. Maintain reliable and safe operation of the road network
3. Safe and incident free delivery of works
4. Improved safety during future maintenance and operations
5. Protect heritage value & improve aesthetics /ambience

6. Minimise whole life costs
7. Minimise disruption during the works, including
  - Traffic (including Buses and emergency vehicles)
  - Pedestrian
  - River
  - Cycling
8. Reduce the risks pertaining to functionality, safety, and environment

### **1.0.3 Stage 2 & 3 Objectives**

The key objectives for these stages are to:

- a) Undertake a desktop study of available documents and information to establish gaps in the information required to achieving the overall project objectives.
- b) Verify or discount the assumptions made following the identification of gaps in knowledge in Stage 1 by undertaking surveys, investigations, testing, assessments, and any further studies. To collect relevant data and information required to achieve the objectives of the project.
- c) Undertake a Load Assessment and feasibility study using the data captured during the desktop study and the investigation done in a) and b) above to determine whether the overall project objectives are achievable, the options for their delivery and the option that will deliver them for optimum and best value, avoiding any over-design and/or over-strengthening.
- d) Once a feasible/recommended option has been approved, complete stage 3 Preliminary design and prepare specification for Stages 4 & 5 Design and Build contract.

### **1.1 Project Team**

TfL as Employer shall appoint a Consultant (the successful tenderer of this contract) to carry out works during Stages 2 and 3. The Consultant may need to appoint their own specialist contractor with suitable experience on relevant projects (projects with dynamic structures and heritage value) to fulfil the requirements of the contract.

Upon tender award, TfL will appoint a representative from LBHF to project manage the contract on a day to day basis. This representative will be the main point of contact for the contract.

#### **1.1.1 Consultant Responsibilities**

The Consultant shall primarily be responsible for undertaking all the works described in this Volume 2 (but not limited to), use and supervise competent experienced firms as and when deemed necessary for delivery of the objectives of Stages 2&3, consult and liaise with all key stakeholders (e.g. Historic England and Port of London Authority), reporting, attending meetings, holding workshops and all other functions necessary to deliver the scope of works described in this Vol 2 of ITT.

Sub-letting of works shall need prior agreement from TfL and LBHF to ensure that the firm fulfils the requirements provided in 1.1 above.

### **1.2 Stage 1 Overview**

Stage 1 Outcome Definition was carried out between June and September 2016, and it delivered the following:

- (1) Objectives of the project
- (2) Review of previous reports/documents
- (3) Indicative scope for the project
- (4) Potential constraints, dependencies, and risks to delivery of the outcomes and benefits
- (5) Gaps in available information
- (6) Review of the original order of magnitude cost estimate
- (7) Programme for the Project

The outputs from Stage 1 report by Bam/Arup (refer to Annex 2 of ITT Volume 2 Site information) confirmed that there are gaps in information, which could potentially affect the current risk to budget, safety, functionality, and environment. Stage 1 report proposes suggestions for Investigations, testing, monitoring and surveys in Stage 2 to enable an accurate determination of the existing condition of the structures and identify the full nature and extent of the works that are required to achieve the project objectives.

On completion of the investigations, options for delivering the project outcomes shall be assessed to determine the optimum scope providing maximum value for money avoiding over design and over-strengthening.

TfL and LBHF will then review the options presented in stage 2 and select a preferred option to progress to stage 3 for development as a Preliminary design which will also be part of this contract.

The output from Stage 1 is presented in a report by BAM/Arup copy of which can be found in the file share drive referred in Annex 2 of ITT Volume 2 (Site Information).

### **1.3 Background Information**

An outline description of the structure and site information including a schedule of the available reports and recent inspection and maintenance records is provided in Annex 2 of ITT Volume 2 (Site Information).

## **2. SCOPE**

### **2.0 General**

The main objective for this stage 2 and 3 works is to undertake the necessary field testing and structural identification to assess the bridge condition and carry out a reliability evaluation at the serviceability, fatigue and ultimate limit states. Also undertake a field-calibrated theoretical assessment (if required), developed for structural identification, in order to understand the real behaviour and performance of the actual bridge and to quantify relative contributions of different stiffness and resistance mechanism to achieve optimum solutions to each of the weight limit criteria set out in item 2.4(1) of this Vol 2 ITT Scope.

As such the scope of works to be undertaken by the Consultant shall include (but not limited to) the following:

- a) Working collaboratively with the Employer, LBHF (Project Manager) and Stakeholders to deliver the stages 2 & 3 objectives encompassing the whole project objectives. (see sections 1.0.2 and 1.0.3 of ITT Volume 2 - Scope).
- b) Carry out desktop study of available documentations and historical information as well as reviewing stage 1 report by Bam/Arup "Hammersmith Bridge Strengthening and refurbishment – Early Contractor Involvement Report Rev 2". Verify identified gaps, prepare a plan to collect all the information required to fill any gaps and missing data for undertaking

the load assessment, feasibility study, preliminary and detail design. Please note even though detailed design is not part of this contract, collection of all the necessary information and data that would be needed for detailed design shall be undertaken by the Consultant as part of this contract to satisfy the selected option from the load cases listed in 2.4(1) of this Volume. (See section 2.1 and 2.4 of ITT Volume 2 -Scope).

c) Producing detailed works specifications for testing, monitoring, surveys and investigations identified by the Consultant as per item 2b above and include any additional works required to undertake the scope of stage 2 and 3 works to deliver an optimised, value-engineered solutions.

d) Undertake (and supervise) all testing, inspections, surveys (including topographical surveys) and monitoring as outlined in section 2.2 of ITT Volume 2 - Scope, including provision of all access and licensing requirements.

e) Producing inception report and factual & interpretive reports for inspections, surveys and investigations identifying constraints and dependencies as per section 2.9 of ITT Volume 2 – Scope.

f) Undertake load assessment for the five loading arrangements provided in section 2.3 of this document using the data and information collected in items 2b), 2c), 2d), and 2e) above and as detailed in item 2.3 of this ITT Volume 2 – Scope.

g) Undertake feasibility study to evaluate options for each of the loading arrangements and refurbishment/replacement of the deck, footway, electrical rewiring/relighting (including Decorative lighting), and paint system using the information collected in items 2a), 2b), 2c), 2d), 2e), and 2f) as set out in item 2.4 of this Vol 2.

h) Appraising potential solutions identified in item g) above, which enable the desired project objectives outlined in section 1.02 of ITT Volume 2 -Scope to be delivered, with focus on buildability (including temporary works), cost, Traffic management and programme considering all identified constraints.

i) Developing cost estimates and delivery programme for all potential solutions identified in item 2h) above.

j) Identifying and analysing risks and opportunities for all potential solutions identified in item 2h) above.

k) Agree to be on standby at end of stage 2 hold point until TfL and LBHF evaluate the feasibility options and instruct the Consultant to progress the selected option to stage 3 Preliminary design.

l) Undertake stage 3 Preliminary Design to establish detailed concept design for strengthening/refurbishment works to achieve the overall project objectives developing the option selected by the Employer during the hold point stage.

m) Prepare detailed specifications for the Stages 4 & 5 Detail Design and Build tender document using the Stage 3 detailed preliminary design (undertaken as part of item 2i) above. The detailed specification prepared by the Consultant shall be fit for purpose and achieve Clients Objectives.

## 2.1 Desktop Study and Document Review

The consultant shall undertake a desktop study, review historical information, available documents as well as review stage 1 report by Bam/Arup (See Annex 2 ITT Volume 2 Scope). Identify gaps if any, in the available information and existing documents that is required for carrying out an accurate load assessment, feasibility study, preliminary design, and detailed design (even though detail design is not part of this tender) to arrive at the most optimum and feasible option for achieving the overall project objectives described in item 1.0.2 considering the load cases given item 2.4(1) of this document and enable progression to stage 4 & 5 detail design and build whilst ensuring minimum whole life cost.

The Consultant shall produce an inception report outlining the findings of this exercise for approval of the Employer. **Note: Limited as-built drawings exist and there is no Health and Safety File for this structure.**

## 2.2 Testing, inspection, investigation, monitoring, surveys

The Stage 1 report by Bam/Arup (See Annex 2 ITT Volume 2 Scope) outlines the indicative targeted areas, numbers and extent of surveys, investigations, and testing. This shall be reviewed and updated (if required) by the Consultant as part of this tender process.

The Consultant shall ensure that sufficient inspections, surveys, testing and monitoring is allowed in their tender submission to give 100% confidence for accurately modelling the structure for assessment, feasibility study, preliminary design and inform the detailed design stage to ensure optimisation of solutions for the proposed options with recommendations for preliminary and detail design to avoid overdesign and over-strengthening.

The Consultant shall clearly outline the details of all testing, inspections, surveys, and monitoring allowed in their tender submission and highlight any deviation from the recommendations given in the Stage 1 report Bam/Arup (See Annex 2 ITT Volume 2 Scope) and/or schedules identified as part of this ITT Volume 2 documents. Reference must be made for measures considered for level of testing, inspections, surveys, and monitoring allowed to achieve optimum solution and avoid overdesign and over strengthening to achieve optimum solutions. Please note, the Category 3 checking Consultant employed by the Employer shall be verifying that the level of testing, inspection, surveys, and monitoring proposed by the Consultant is appropriate to ensure optimum solutions can be achieved. The targeted areas, numbers and extent of surveys, investigations, monitoring and testing shall be included in the detailed works specifications produced by the Consultant.

Following completion of the works described in item 2.1 above, the consultant shall produce detailed works specifications for all inspections, surveys, monitoring and testing works required for collecting and verifying any data and information identified in item 2.1 to enable delivery of the overall project objectives with highest degree of accuracy to result in the most optimum and feasible options. Specific investigations outlined in stage 1 report Bam/Arup (See Annex 2 ITT Volume 2 Scope) are described below under separate headings.

The consultant shall set out in their tender submission if the investigations identified in BAM/Arup report is required and set out any other additional investigations that would be needed to give 100% confidence that all required data is collected and verified for arriving at the most optimum options during feasibility study and preliminary and detail design.

Collection of the existing structure's topographic/geometric arrangements (if required) is a part of this commission. Any proposed surveys (or other methods) should be stated in the tenderer's submission and allowance shall be made in Vol 3 financial information for collection of required data.

## 2.2.1 Inspections

The bridge is due for a Principal Inspection which forms part of this contract. In addition to Principal Inspection, stage 1 report identifies the need for an Inspection for Assessment so that all the data required for load assessment is collected. The consultant shall undertake inspection of the bridge to produce a Principal Inspection report and collect all required data and information for undertaking Load Assessment as specified in item 2.3.

The consultant shall ensure that the inspections undertaken 12 are sufficiently robust to allow accurate load assessment, feasibility study and preliminary design to be undertaken with 100% confidence in achieving the most optimum options for stages 2, 3, 4 and 5 works. A report detailing the findings of the inspection shall be provided no later than 2 weeks after the completion of the inspection.

### a) Principal Inspection

A full Principal Inspection of Hammersmith Bridge shall be carried out by the consultant and inspection data entered in BridgeStation. Information on the structure shall be inspected and it must be noted that limited as-built drawings exists on this structure with no Health and Safety File. Copy of the past inspection records are included in the file share drive. Please see Annex 2 of ITT Volume 2.

Principal Inspections shall be carried out in accordance with (but not limited to) the following documents (the current versions):

- i. Management of Highway Structures: A Code of Practice (2005) (United Kingdom Bridges Board and Department for Transport).
- ii. Inspection Manual for Highway Structures (2007) (Highway England).
- iii. London Bridge Engineering Group (LoBEG) Good Practice Guide: Creating Consistent Element Inventories for Highway Structures.
- iv. County Surveyor Society (CSS) Guidance Note on Bridge Condition Indicators (BCI).
- v. Highway England - Design Manual for Roads and Bridges (DMRB).

The inspection shall include:

- Any adjacent earthworks or waterways, damage or any other changes which could affect the stability of the structure. River banks and river bed near the structure shall be examined for evidence of scour or for conditions, such as the deposition of debris, which could lead to scour.
- All inspectable parts of the structure shall be accessed within touching distance as specified by BD63. The Consultant shall note movements in all joints, defective areas, rusted locations, and paint system failures. This includes (but not limited to) inspection of all hangers, underside of deck, the catenary chains and the exterior and interior of the towers, anchor chambers, chain tunnels, abutments, bearings at top of Towers, abutments and piers, footways, deck, expansion joints, all connections, gantry rails, lighting, paint system, including all areas considered necessary by the consultant.
- The abutments, chain tunnels, and anchor chambers are considered as confined space. The Consultant shall detail accessing these areas in the method statement and make allowance for confined space access in Vol 3 ITT Financial information. The anchor chambers and the chain tunnels are prone to flooding by seepage through the walls of the tunnels and the chambers. The Consultant shall allow for pumping the water out

prior to inspection and include any financial implications of such provisions in the ITT Volume 3 Financial information.

b) Inspection for Assessment

An inspection for assessment is required to verify the dimensions, material properties and condition factors to be used in the load assessment. This shall be co-ordinated with the other survey, testing and investigation works.

As part of the Principal Inspection, the Consultant shall undertake special inspection for assessment, in compliance with the Highway Agency Design Manual for Roads and Bridges documents particularly BD63 and BD21, to gather all the information the Consultant considers to be required for accurate load assessment of the structure with absolute minimum assumptions. Detailed inspection and testing of any elements, whose condition or functionality needs to be ascertained for the purpose of undertaking accurate load assessment, shall be proposed by the Consultant and allowed for as part of this tender submission.

The Consultant shall inspect, measure, and highlight all Steel, cast iron, and Wrought Iron sections together with the locations/details of strengthened plates which have been added as part of the strengthening. The Consultant shall compare the dimensions of the steel, cast iron, and wrought iron sections and the strengthening plates against all available drawings recording differences together with noting which plates are part of strengthened measure. The Consultant shall inspect all rivets, connections, bearings, and secondary elements and record any evidence of corrosion and effects of stress reversals and or fatigue.

A recent desktop review has concluded that the condition and functionality of some of the bearings and hanger pins are not known. Detailed inspection and testing of any elements whose condition or functionality needs to be ascertained shall be proposed by the Consultant and should be allowed for as part of the tender submission. This commission shall include calculation of the theoretical rotational and linear displacement of each bridge bearing and deck.

If the results from the inspection imply that other material parameters than what is stated in the code is suitable for the current bridge, the values from the inspection should be used. The inspection shall identify any signs of fatigue (cracks) and inform the need for fatigue assessment.

A report detailing the findings of the inspection for assessment shall be provided no later than 2 weeks after the completion of the inspection.

The contents of the inspection for assessment report shall be agreed with the Employer prior to undertaking the inspection.

## **2.2.2 Testing and Surveys**

Stage 1 Bam/Arup report identified gaps in the available information to be verified by surveying the bridge. The surveys proposed as part of stage 1 reports are:

- Topographical and geometric survey to establish the true geometric shape of the bridge.
- Test for determining dead load force distribution on bridge elements.
- Protective Coating Survey.
- Tests to establish material properties of the Steel superstructure.

### **2.2.2.a) Topographical and Geometric Survey**

The consultant shall undertake a topographical and geometric survey of the bridge with no live loading to establish the true geometric shape of the whole structure, section sizes and the finishes for use in load assessment, feasibility study and preliminary/detail design.

The topographic and geometric survey shall include all areas of the bridge, including the deck (carriageway and footway), chains, chain tunnel, anchor chambers, abutments showing saddle bearings and all internal content, hangers, longitudinal girders, piers, towers showing external and internal tower components, tower saddle bearings, underside, and all related structural detailing to be represented within the Point Cloud Dataset.

The topographic survey to produce a "Point Cloud Dataset" with an absolute accuracy of  $\pm 5\text{mm}$  and Maximum relative accuracy of  $\pm 3\text{mm}$ . The consultant shall produce free web based portal with 360o High Dynamic Range photography in a web environment. The Consultant shall comply with the specification for topographic survey set out in section 3 of Annex 1 ITT Volume 2.

Any topographic survey data collected as part of this commission must be stored electronically by the consultant for 12 months following the completion of the contract. The consultant shall also make allowance for provision of any topographic survey data to the successful tenderer of the subsequent Stage 4 (Detailed Design) phase of this project. This data shall be provided in a data format that enables it to be easily adopted by subsequent consultants i.e. not in a format specific to one piece of software that cannot be imported by other software.

The consultant to propose method of achieving true geometric shape of the whole structure and the finishes and verify the accuracy being proposed to ensure the load assessment, feasibility study, Preliminary and detail design will produce optimum value for money options. The Consultant shall provide details of their proposals in their tender submission.

#### 2.2.2 b) Load Test

To achieve the project objectives, the Consultant shall assess, following the collection of data by means of topographic survey and inspection, if any load testing would be required to fill the gaps in the data for full filling the project objectives. If the Consultant considers Load testing to be necessary, then the consultant shall set out their proposals as part of their tender submission and allow for such a provision in Vol 3 ITT Financial information.

Should The Consultant consider testing to be required the following headings and description shall be the minimum provision for Consultant's Pricing submission in Vol 3 ITT Financial Information. Any additional testing requirements shall be described in the tender submission and priced separately in Vol 3 ITT Financial Information.

The Consultant shall allow for supply, installation, removal, licencing, and all access provisions for all testing equipment.

##### 2.2.2.b.1 Physical Load Test

The Consultant shall undertake live load testing (if required) to compare against the theoretical load assessment data for calibration of the theoretical model to reflect the true capacity and behaviour of the structure and be fit for purpose of this contract.

If the Consultant considers Physical Load Test to be necessary, the Consultant shall fit accurate instrumentation to the bridge structure to measure displacements of the abutment bearings, tower top and bottom bearings, stresses in superstructure members including (but not limited to) chains, hangers, cross girders, catenary connections, hanger connections, chains inside the chain tunnels and central diaphragm longitudinal members.

The Consultant shall identify key sensitive locations where the instrumentations needs to be fitted to ensure meaningful information is obtained to achieve the project objectives to avoid gathering excessive testing data.

#### 2.2.2.b.2 Dead load stress distribution test

The Consultant shall undertake surveys/tests to establish stress in key structural members under permanent loads for use in load assessment, feasibility study and preliminary/detail design. The consultant shall propose method(s) of achieving permanent load stress distribution to structural members and validate that the proposed options ensure the load assessment, feasibility study, preliminary and detailed design will produce optimum value for money options. The Consultant shall provide details of their proposals in their tender submission.

#### 2.2.2.c) Protective coat survey

The Consultant shall carry out a paint survey to determine the condition of the paint in accordance with the Highway Agency's DMBR standard. The survey shall be a visual inspection of 20% of the bridge focusing on each of the key elements of the structure, i.e. bridge deck, inside towers/abutments, anchor chambers, chain tunnels, catenary chains, and hangers focusing on areas where the paint system has broken down. The Consultant shall identify areas of low adhesion, paint breakdown and corrosion and identify any details which may have caused accelerated breakdown of the Corrosion protection system in defined regions.

The specification the paint system currently applied on the bridge is included in the file share drive (see Annex 2 ITT Volume 2)

The Consultant to undertake a repainting feasibility study for surface preparation and repainting of the bridge to identify options for a suitable paint system with life expectancy of a minimum of 25 years.

A paint condition survey shall be carried out by the Consultant to gather information on the properties and condition of the paint systems on the structures.

All paint tests required by this specification shall comply with the current specific standards listed in BS 3900-0. The tests shall use a non-destructive testing method where possible.

All samples shall be treated as containing heavy metals, and shall be handled and disposed by licenced Contractors. The dust and debris shall be contained such that it does not pollute the land, water or air. Clean water and cleaning agents, which do not leave harmful residues on the surface shall be used for cleaning. All areas of substrate that are left exposed by the testing shall be reinstated in accordance with MCHW series 5000 to prevent the onset of further deterioration prior to future paint works on the structure.

Testing laboratories utilised for any work in this specification shall be accredited in accordance with BS EN ISO/IEC 17025. The accreditation shall be by UKAS or equivalent European accreditation organisation that is party to a multi-lateral agreement (MLA) with UKAS or any other equivalent International Accreditation Forum MLA signatory.

The paint condition survey shall, but not be limited to determining the following:

- Paint system failure mode and possible causes
- Presence of lead and any other potentially hazardous constituents

The survey shall include an inspection of a minimum of 20% of the paint system including (but not limited to) the catenary chain, hangers, bearings, longitudinal beams, transverse beams, towers (internal and external), balustrade, anchor chambers (internal and external).

Testing for presence of lead and other potentially hazardous constituents shall consist of a minimum of 12 samples and tests at different locations. As the structure was blasted and re-painted in 1995, tests should be targeted at locations that are difficult to reach by blast cleaning and therefore have potential to contain these constituents. Locations are to be proposed by the Consultant and agreed with the employer.

#### 2.2.2.d) Material properties test

Properties of key structural elements – The Consultant shall confirm that the material properties of all key elements on the structure are accurately known and available for structural assessment, feasibility study, preliminary and detail design (if required). An outline description of the structure and site information including a schedule of the available drawings, reports and recent inspection and maintenance records is provided in Annex 2 of ITT Volume 2.

All gaps in material properties shall be confirmed using appropriate investigation and or tests. The Consultant shall propose the investigations and/or tests and agree them with the Employer. The material tests shall be carried out by the Consultant.

All material property tests shall be planned and co-ordinated with the Principal/Special inspections.

The Consultant shall submit their proposed method of verifying the material properties of all the key structural elements of the bridge in their tender submission.

#### 2.2.2.e) Fatigue Survey

The Consultant shall undertake a fatigue survey of 20% of the areas vulnerable to fatigue damage and undertake a feasibility study of options to mitigate the risk of fatigue damage as part of preliminary design and detail design. Fatigue consideration shall be in compliance with Design Manual for Roads and Bridge (DMRB) Documents.

The Consultant shall submit their proposed method of fatigue survey of all fatigue sensitive elements of the bridge in their tender submission.

#### 2.2.2.f) Electrical and Lighting Test

The Consultant shall carry out electrical and lighting testing as specified in Annex 1 of Vol 2 ITT.

### 2.2.2.g) Asbestos Management Plans

The Consultant shall carry out an Asbestos Management Survey and produce an Asbestos Management Plan for the structure. The plans shall provide a reference for identified or presumed locations with Asbestos Containing Materials (ACMs), as well as a strategy to effectively manage any risk associated with possible ACMs.

The plan shall include, but not limited to:

- The person(s) responsible for the management plan
- A brief description of the structure (e.g. no. of spans, lengths, no. of lanes, location, materials, etc.)
- An asbestos register, identifying known locations of asbestos containing materials within each structure
- A review of existing information to determine likely asbestos containing materials (e.g. inspection records, drawings, photographs)
- A listing of previous surveys undertaken on the bridge
- Recommendations for further surveys, and their potential scope
- Asbestos Risk register, which shall include, but not limited to:
  1. Summaries for individual bridge elements,
  2. Ratings for each element for the likelihood for possible asbestos containing material, based on information (or lack of) from previous records, an
  3. Asbestos Action Levels
- Process controls, which includes but not limited to:
  1. Requirements for Asbestos Action Plans
  2. Strategies for parties who are likely to have or require information on possible asbestos containing material
- Schedule for monitoring the materials' condition
- Detailed asbestos survey reports

The plan shall cover the full extents of the bridge plus 5m on either side of the abutment joints. The plan shall be written so that it is clear, concise, and readily updatable.

### 2.2.2.h) Ecological and Habitat Survey

The consultant will undertake an extended phase 1 ecological and habitat survey. This will aim to identify and map the main habitat types present on site and their ecological value. The survey will also identify animal species which are present, or potentially present on the site together with the potential impacts of the bridge strengthening project on a particular species and habitat, and appropriate mitigation and control measure. The survey will involve a walkover survey and desk-top assessments. The outcomes of the survey will be presented in a report.

### **2.2.3 Monitoring of Bridge Behaviour**

The monitoring shall be carried out by the Consultant to provide information about the performance of the structure. The results from monitoring shall aid in developing and analysing the load assessment, feasibility study, preliminary and detail design.

Monitoring of the bridges shall be undertaken over a period of 18 months from the completion of installation of all instrumentation and monitoring equipment and completion and approval of initial calibration.

The monitoring system shall meet, but not limited to, the following requirements:

- The monitoring gauges, sensors and data loggers shall be securely fixed directly to the elements being monitored. Loose paintwork and rendering shall be removed to ensure the sensors are firmly attached to the monitored elements
- The monitoring gauges, sensors and data loggers shall be protected from vandalism and the elements. This includes (but not limited to) river spray, water from high tide, rain, water run-off from above and sunlight
- The monitoring system shall be designed to record the rotation, translation and associated change in temperature and humidity remotely
- The monitoring gauges, sensors and data loggers shall be designed for a working life of at least 10 years
- The monitoring gauges, sensors and data loggers shall function in all weather conditions. A temperature range of 1 in 25 years shall be considered
- The data loggers shall be designed for two cases:
  1. Short term – to record the static and dynamic effects of vehicular movement (frequencies and testing periods shall be agreed with the Employer once the supplier has been appointed),
    - Minimum of 2 test under controlled conditions over the bridge, closed to other traffic), and
    - 4 recordings per month under uncontrolled conditions (normal traffic flow). 2 recordings shall be taken during peak periods and 2 recordings during night off peak periods. Peak and off peak times to be obtained from Employer (based on traffic flow data). The recordings shall last for Long term – to record the effects of temperature changes (frequencies shall 15 minutes with readings taken every second as a minimum, and
  2. be agreed with the Employer once the supplier has been appointed). A minimum of one reading per hour shall be recorded.
- Any external power required shall be arranged by the Consultant
- Data collected from all sensors shall be sampled simultaneously
- Monitoring of the data and analysis of the data shall be undertaken by the Consultant
- The monitoring instruments shall be inspected by the supplier at three monthly intervals as a minimum to check their performance and undertake any maintenance as required

The monitoring report shall include the complete data captured during the monitoring and load test in readable format with summarised output and be useful for delivery of the Project Objectives.

The Consultant shall specify intervention trigger levels with recommendations for measures to be taken when the Monitoring data triggers the critical points. The monitoring data shall be kept in summarised format to be used pre-works, during the works and post works.

A web-based system shall be set-up to allow Employer and the Consultant to view the remote monitoring and the collection of data. The system shall be capable of recording the data for the 18-months period, and the Employer shall be able to interrogate the historical data.

Where preparation of the surfaces is involved, the works shall comply with current safety and environment legislation and these areas reinstated in accordance with MCHW.

The type of instrument, number of sensors, locations, datum, axis, operating range and accuracy shall be proposed by the Consultant as part of this tender submission and agreed with the Employer. The Consultant shall comply with the specification set out in section 4 Annex 1 of ITT Volume 2.

### **2.3 Structural Assessment**

The Consultant shall comply with DMRB BD2/12 Approval in Principle (AIP) requirements prior to undertaking the Load Assessment. The Employer and the Project Manager will approve the AIP. London Borough of Hammersmith & Fulham is the Highway Authority over the bridge and is the Technical Approval Authority (TAA) for this project.

The Consultant shall carry out the Load assessment of the structure to ascertain the current load capacity of the structure in compliance with the relevant Highway England 's code of practices in Manual for Design of Roads and Bridges (MDRB).

The purpose of the Load assessment is to establish the current carrying capacity of the bridge, identify overstressed structural members when the bridge is subjected to each of the load cases listed below to aid in undertaking the feasibility study, preliminary design and inform detail design to be commissioned following a separate tender.

The load assessment shall incorporate any material and geometric nonlinearities with critical load combinations to find extent of improvements/strengthening works needed to achieve the project objectives. The Consultant shall include proposed changes and additional strengthening materials in the load assessment in a cyclical process to satisfy the requirements of the Project Objectives. The combined effect and sequence of construction measures proposed for each of the load cases given below shall be carefully examined during the load assessment stage to assist the optioning at the feasibility study.

Due to the narrowing of carriageway between abutments and the towers, traffic flows over the bridge are configured to 2 lanes (one in each direction) and despite the width of the carriageway, a deviation for the notional lane consideration shall be made to reflect the traffic flow lay out over the bridge.

The abutment roller bearings are considered as seized. The Consultant shall verify if this is the case and investigate the global and local effect of the bearings releasing themselves and becoming free.

Load assessment shall be carried out (in accordance with, but not limited to, the Highway England's DMRB manual and all related British code of practices, in particular BD21, BD50, BD56, BD61 and BS5400) to evaluate the current capacity of the bridge and assess works required to achieve each one of the load cases given below. Both Ultimate and serviceability limit state checks shall be considered.

The Consultant shall, subject to the approval of the Employer, consider any deviations or modifications factors in various guidance and standards recommended for assessment of old structures such as Hammersmith Bridge to avoid over-strengthening and/or unnecessary refurbishment when undertaking the feasibility study, preliminary design whilst considering detailed design even though detailed design does not form part of this contract.

The assessment shall identify fatigue sensitive areas of the bridge and shall include undertaking fatigue assessment of the sensitive members/connections to indicate measures required to mitigate fatigue risks.

The Consultant shall carry out both Global and Local assessment of the structure to study the overall structural behaviour and to focus on sensitive areas of the bridge in detail.

The Consultant shall undertake a reliability assessment with the help of the monitoring data, collecting survey data, identifying load distribution to minimise the uncertainties and apply fewer assumptions in the structural analysis. Consideration shall be given to the 3D dynamic behaviour of the structure as well as assessment of the fatigue resistance of the critical part of the bridge.

Load assessment shall include foundation capacity evaluation to indicate that the foundation and substructure can carry all the loading conditions set out below.

Load assessment is required to establish member stresses under permanent weight of the bridge and live load conditions with the following weight limits:

1. Weight limited to 7.5T (GVW), and emergency vehicles only
2. Weight limited to 7.5T(GVW), emergency vehicles and restricted London Transport 13T Midi-buses
3. Weight limited to 13T(GVW) including London Transport 13T Midi-buses, and emergency vehicles
4. Weight Limited to 7.5T(GVW), emergency vehicles and restricted London Transport double decker buses
5. Weight Limited to 18T(GVW), emergency vehicles and unrestricted London transport double decker buses

Allowance shall be made for unrestricted use of the bridge by the emergency service when considering all the live load options.

The Load Assessment shall be a theoretical analysis considering both static and dynamic loading with particular attention to fatigue sensitivity. The consultant shall use the output from the desktop study, inspection, surveys, testing and monitoring undertaken as part of this contract to calibrate the theoretical analysis to undertake an accurate load assessment of this structure and avoid assumptions that may result in unnecessary over-strengthening and/or refurbishment works.

The Load assessment shall include modifications proposed by the consultant for deck and footway replacements and changes to the structure that may be necessary for any strengthening and/or refurbishment works, to fulfil the project objectives, all of which shall be in compliance with heritage requirements. (i.e. the load assessment shall be an iterative process to capture any proposed changes and ensure the most optimum assessment is undertaken for achieving the project objectives.)

### **2.3.1 Category 3 check - General**

The load assessment will require a category 3 check in accordance with BD 2/12. The Employer will commission a Category 3 Consultant to carry out an independent check of the objectives of the Project in this contract. In order to speed up the process of appointing the Category 3 consultant, all tenderers shall provide quotation for provision of Category 3 checking consultancy. The quote submitted against Category 3 Check item in ITT Volume 3

Financial information shall be used by the Employer to consider the appointment of the 2<sup>nd</sup> and 3<sup>rd</sup> best valued firm as the Category 3 Checking Consultant. The assessment for the Category 3 checking Consultant shall be from the shortlisted Consultants following the Quality evaluation.

#### 2.3.1.a) Duties of the Consultant

The Consultant appointed to undertake stage 2 & 3 works shall exchange all the data and information with the Category 3 Consultant in compliance with BD2/12 requirements to enable the Category 3 Consultant undertake all relevant checks independently.

The Consultant shall submit to the Category 3 Checking Consultant all the data, reports and information collected as part of stage 2 & 3 works described in this ITT Volume 2 to undertake an independent review and checking of the following:

1. Desktop study (section 2.1 of ITT Volume 2)
  - a. Submission of draft outcome report
2. Testing, Inspection, investigation, monitoring, surveys (section 2.2 of ITT Volume 2)
  - a. Submission of draft specification for activities set out in section 2.2 of ITT Volume 2
  - b. Submission of draft outcome report of the activities set out in section 2.2 of ITT Volume 2.
3. Structural Assessment (section 2.3 of ITT Volume 2)
  - a. Submission of the following (but not limited to):
    - i. Draft Calculations
    - ii. Numerical Modelling (if any)
    - iii. Draft reports
4. Stage 3 Preliminary Design
  - a. Submission of draft preliminary design

The Consultant shall allow in ITT Volume 3 Financial Information for working closely with Category 3 checking Consultant to satisfy the above and the BD2/12 requirements.

The Consultant shall allow for provision of such a service in the Volume 3 financial information.

#### 2.3.1b) Duties of Category 3 Checking Consultant

The Category 3 checking Consultant shall examine the specification for testing, investigation, monitoring and survey specifications produced by the Consultant as per item 2c above. The Category 3 Checking Consultant shall ensure the adequacy of the level of testing, investigation, monitoring and surveys specified will provide relevant data for achieving the optimum and best value solutions in delivery of the project objectives.

Category 3 Checking Consultant as an independent Consultant shall also check the load assessment in accordance with BD2/12.

The Category 3 Checking Consultant shall check the preliminary design for achieving optimum solutions and avoiding over-design and over-strengthening. It must be noted that a hold point between stage 2 feasibility study and stage 3 preliminary design has been include in this tender when the Employer decides on which of the feasible options reported as part of

the feasibility study to progress to stage 3 Preliminary Design. Should stage 3 not progress then the Category 3 Checking Consultants duties in relation to stage 3 will not be required.

The Category 3 Checking Consultant shall undertake an independent review and check of all the data, reports and information collected by the Consultant as part of stage 2 & 3 works described in this ITT Volume 2 to ensure compliance with BD 2/12 and achieving the optimum and best value solutions.

The list below sets out the activities required of the Category 3 Checking Consultant:

- 1 Desktop study (section 2.1 of ITT Volume 2)
  - a. Review and checking of draft outcome report
- 2 Testing, Inspection, investigation, monitoring, surveys (section 2.2 of ITT Volume 2)
  - b. Review and checking of draft specification for activities set out in section 2.2 of ITT Volume 2
  - c. Review and checking of draft outcome report of the activities set out in section 2.2 of ITT Volume 2.
- 3 Structural Assessment (section 2.3 of ITT Volume 2)
  - d. Review and checking of the following (but not limited to):
    - i. Draft Calculations
    - ii. Numerical Modelling (if any)
    - iii. Draft reports
- 4 Stage 3 Preliminary Design
  - e. Review and checking of draft preliminary design

The category 3 checking Consultant shall allow in ITT Volume 3 Financial Information for working closely with The Consultant undertaking stages 2 & 3 works to satisfy the above and the BD2/12 requirements.

The Category 3 Checking Consultant shall allow for provision of the services described above in Volume 3 Financial Information.

## **2.4 Feasibility Study**

Following completion of the desktop study, inspection, testing, monitoring and load assessment works, the consultant shall undertake a feasibility study to identify the full nature and extent of the works that are required to achieve the project objectives.

The Consultant shall evaluate options against each of the criteria given below and provide:

- Potential constraints, dependencies, and risks to delivery of the overall project objectives
- An estimate of the Preliminary design, detail design and construction cost
- A Programme for Preliminary design, detail design and construction

The Consultant shall make recommendations for the preferred option, balancing long-term value for money and short-term affordability with no overdesign to compensate assumptions. The Consultant shall avoid unreasonable assumptions that may result in over-strengthening of the bridge jeopardising value for money.

The list below highlights the items that the Consultant shall investigate as part of the feasibility study. The outcome of the feasibility study shall be fed back into the load assessment in a cyclical approach to ensure optimum solutions are achieved.

- (1) The feasibility study shall investigate optimum options for refurbishment, modifications, and/or strengthening of the bridge to carry the following load cases listed below:
  - a) Weight limited to 7.5T(GVW) and emergency vehicles only
  - b) Weight limited to 7.5T(GVW), emergency vehicles and restricted 13T (GVW) Midi-buses
  - c) Weight limited 13T(GVW) including unrestricted London Transport 13T (GVW) Midi-buses and emergency vehicles
  - d) Weight Limited to 7.5T(GVW), emergency vehicles and restricted double decker buses
  - e) Weight Limited to 18T(GVW), emergency vehicles and unrestricted double decker buses
- (2) Consult shall liaise with Historic England and the Port of London Authority to ensure their requirements are captured and considered for design, buildability and heritage purposes that relate to the bridge strengthening and refurbishment works described in this ITT Volume2 Scope of works. Consideration shall be given to listed consent matters and timescales for obtaining approval of such consent by the borough's planning department and Historic England.
- (3) Options shall be investigated for Deck and Footway replacement including (but not limited to) articulations, Structural stability, Fixings to superstructure, and maintenance.
- (4) Consultant shall investigate surface preparation and repainting options
- (5) Relighting and rewiring options including cabling routes from one end of the bridge to the other giving considerations to durability and ease of maintenance, Within the Consultant report where applicable, a number of comprehensive alternative road and decorative lighting solutions are to be included. This is to include alternative and innovative cable routes, ascertained and formed as part of the overall Bridge reconstruction and recommendations
- (6) The feasibility study shall include consideration to temporary works, buildability, traffic management and its impact, Navigational channel management and its impact, Risk assessment to public, pedestrians, navigational users, vehicular users and impact of closures and/or restrictions on traffic flows both navigational and highways.

Testing, survey, inspection, Monitoring and Load Assessment Data shall be passed to the Employer and be in useable format to be used at stage 4 and 5 by the detail design and build Consultant/Contractor to be appointed as part of a separate tendering exercise.

## **2.5 Hold point**

Following the completion of Stage 2 (Feasibility Design) the Employer will select a preferred option to progress to Stage 3 (Preliminary Design). It is expected that the selection process will take considerable time and that during this period, minimal input will be required from the Consultant. Once the Employer decides which option to develop the Consultant shall be instructed to carry out a preliminary design for the structure. Once instructed to carry out a preliminary design, it is expected that the Consultant will re-mobilise and commence the preliminary design works within a maximum period of 12 weeks.

## **2.6 Preliminary Design**

Following Employers review and selection of a preferred option, The Consultant shall develop the selected option to completion of Stage 3 - Preliminary Design.

The Approval in Principle shall be included as part of the Consultant's activity in undertaking the Preliminary design.

The Consultant shall ensure that the preliminary design is undertaken in accordance with the Consultant's assurance protocol and shall demonstrate this in their tender submission. The Consultant shall prepare Preliminary sizing, fixings, stability, articulation for the selected strengthening/refurbishment option in compliance with Historic England and Port of London Authority. Consideration shall be given to all constraints identified as part of Stage 2 investigation and feasibility study works taking into account the listed structure status of the bridge, construction methodology, cost, maintainability, Health and safety.

The Preliminary Design shall include consideration to temporary works, buildability, traffic management and its impact, Navigational channel management and its impact, Risk assessment to public, pedestrians, navigational users, vehicular users and impact of closures and/or restrictions on traffic flows both navigational and highways.

The Consultant shall ensure that Port of London Authority and Historic England's requirements are fully complied with when undertaking preliminary design.

The Consultant shall be responsible for obtaining initial consent for planning applications and Listed Structure Consent if required. The Consultant shall allow in their tender submission for obtain full approval of Port of London Authority and Historic England.

The Consultant shall review the existing traffic management systems on both approaches to the bridge and over the bridge itself and provide options with a recommended solution to safeguard the bridge in a configuration suitable for the option that the Preliminary design is being developed for.

The Consultant Produce specifications for Stages 4 & 5 - Detailed Design and Build

## **2.7 Extent of Scope**

This contract includes the following structure:

- Hammersmith Bridge (location TQ 522977/178102) Structure No.: 12/T6

Further information is given in Annex 2 ITT Volume 2 – site information

## **2.8 Site Access**

### **2.8.1 General**

The structure is accessible from roads. The underside of the decks and substructure can be accessed from the river or via a temporary access structure / mobile platform.

The Consultant shall obtain all consents, and arrange for all access (including any traffic and navigational management) required during Stage 2 and 3 works.

### **Site Work**

Prior to any site work, the Employer shall be informed. All required access and consents from the relevant authorities shall be obtained by the Consultant.

The Consultant (or their appointed contractor) shall liaise with

- (1) TfL Planning Intervention team to book road space on SRN for the proposed works (if required)
- (2) Port of London Authority (PLA) to get consent on river access and working over Thames
- (3) London Boroughs to book road space on borough roads for the proposed works
- (4) Relevant authorities to get the listed building consents

All parties shall comply with TfL's Health and Safety requirements including the preparation of Risk Assessments and/or Method Statements.

During any pedestrian only inspections, care shall be taken not to block the footways for other users of the structure.

Confined space provisions will be required to access the anchorages and abutments. Access for overhead inspectors may require traffic management and crange.

### **2.8.2 Access**

All access provisions for all inspections, surveys, testing and monitoring shall be provided by the Consultant (or their appointed contractor) and shall include obtaining all related approvals for the purpose of Traffic management, navigational channel management heritage requirements, and environmental protection.

## **2.9 Reporting**

### **2.9.1 Inception Report**

An inception report shall be produced by the Consultant following the desktop study and their review of the available information and documentation. The report should outline any gaps identified and propose any additional works to obtain the required information for undertaking the works for this commission

The inception report shall outline the methodology proposed for collecting all the necessary data to fulfill the information gaps identified following desktop study and documentation review..

The draft inception report shall be submitted within three weeks of contract award and the final report shall be submitted within one week of receipt of comments from the Employer.

### **2.9.2 Factual Reports**

Factual reports shall be produced by the party responsible for carrying out the testing, inspections, investigations, monitoring and surveys.

On completion of the surveys, testing, inspections, monitoring, and investigations, the Consultant shall produce factual reports. The reports shall include, but not limited to the following:

- Details of the personnel involved and their qualifications
- Actual locations of work
- Test and measurement results and observations
- Relevant photographs
- Drawings showing the location of the photographs contained within the report
- Dimensioned drawings of all elements surveyed showing the locations and details of defects

- Commentary on the accuracy and limitations of the methods employed
- Graphical representation of results

The Consultant shall review the factual reports, to ensure that the required information is provided in accordance with the specification.

The draft factual report shall be submitted within two weeks of completion of work, and the final report shall be submitted within one week of receipt of comments from the Employer.

### **2.9.3 Interpretive Reports**

Based on the contents of the factual reports of surveys, testing, monitoring, and investigations, the Consultant shall produce interpretive reports. The report shall consider the potential consequences of each defect on the structure's safety, durability, and functionality.

Any assumptions made in interpreting the factual reports shall be stated in the report, and recorded in the gaps and assumptions log.

The draft interpretive report shall be submitted within two weeks of completion of the factual report, and the final report shall be submitted within one week of receipt of comments from the Employer.

### **2.9.4 Monitoring Report**

The Consultant shall provide reports on the installed monitoring as outlined in item 4 of Annex 1 ITT Volume 2– Specifications.

### **2.9.5 Principal Inspection Report**

The Consultant shall carry out a Principal Inspection of the bridge to establish the condition of the bridge and carry out dimensional check of the elements as per item 2.2.1 of ITT Volume 2 and submit their findings in a report.

### **2.9.6 Structural Load Assessment Report**

The Consultant shall carry out a structural assessment of Hammersmith Bridge to establish the current capacity of the bridge and examine the various load cases given in section 2.3 and submit their findings in a report and a presentation.

### **2.9.7 Feasibility Study Report**

The Consultant shall prepare a Feasibility Report for the structure setting out their findings of their investigations, listing feasible options, with costings and programme, risk register recommendations for the feasible option to progress to Preliminary design and give a presentation of their findings.

### **2.9.8 Preliminary Design**

The Consultant shall undertake a preliminary report as per item 2.6 of ITT Volume 2 and produce a report of their finding submitting all the calculations, digital and numerical data together with all the relevant preliminary design details and give a presentation of the findings.

### 2.9.9 Reporting Format

The Employer requires the findings from the investigations, testing and surveys to be provided within the factual and interpretive reports. The Consultant is required as part of his tender submission to provide an example of the format in which this data will be presented. As well as presenting data, the proposed format will need to include provision to links for photographs and documents as appropriate.

### 2.9.10 Common Data Environment

The Consultant shall provide a web-based Common Data Environment (CDE) for use by the project team including TfL and LBHF team members. The Employer shall provide a list of staff who will require access. Accounts and suitable training on use of the CDE shall be provided by the Consultant. The CDE shall be used for transfer and submission of reports and storage of all project data. Access to the CDE shall be provided within three weeks of the contract being awarded and shall continue until 12 months past completion of the contract. The tenderer shall state in their tender submission the name of the proposed CDE software to be used.

### 2.10 Technical Assurance

The Consultant shall engage with the Employer on all technical aspects of these works. The Technical Approval Authority shall be the LBHF Project Team

### 2.11 Technical Requirements

The requirements set out in the following documents shall be complied with

- Design Manual for Roads and Bridges (DMRB)
- Manual of Contract Documents for Highway Works (MCHW)
- Eurocodes
- Heritage requirements
- Construction (Design and Management) Regulations 2015
- TfL Guidance Notes listed below

<b>GN Ref</b>	<b>Title</b>
SMT/GN/00/15	Tunnels and Structures Guidance Notes List
SMT/GN/02/14	Requirements for the development and acceptance of proposals for structures & tunnels capital schemes
SMT/GN/03/15	Technical approval of highway Structures and tunnels schemes
SMT/GN/05/11	Inspection guidance for bridge expansion joints Part 1 – Reference guide
SMT/GN/06/11	Inspection guidance for bridge expansion joints Part 2 – Inspector's Practical Guide
SMT/GN/07/14	TfL Inspection Reports and Entry into BridgeStation
SMT/GN/08/14	Requirements for the development and acceptance of proposals for works affecting the transport for London road network – Guidance for developers
SMT/GN/09/14	TfL Inspection Pro Forma Defects Guidance
SMT/GN/10/14	TfL Safety Defect Guidance
SMT/GN/11/15	Requirements For Tunnels And Structures Health And Safety Files, Records And Maintenance Manuals

Industry good practice guidance for design, maintenance and management of structures shall be followed and complied with wherever possible. If there are good reasons for deviating from good practice then justification should be submitted to the Employer for agreement before proceeding.

## **2.12 Access to structures for maintenance or inspection**

The Consultant shall review the existing access provisions for maintenance and inspection, together with health and safety hazards.

The Consultant shall also recommend options for improving safe access for routine inspection and maintenance activities.

The Consultant shall produce a report to document the existing and proposed access arrangements.

## **2.13 Method Statement**

For all works scheduled in Volume 2 - Scope, a method statement shall be prepared by the Consultant and submitted to the Employer at least 2 weeks prior to commencing any works on site. The document shall include, but not limited to the following:

- Names, qualifications and experience of all individuals on site (incl. Subcontracted staff)
- Planned inspections, surveys and testing
- Programme of works
- Planned methodologies, including whether any damage shall be caused to the structure, fixings or coatings
- Intended means of access to all areas, and whether road, pedestrian or river access shall be affected
- Proposals for traffic management and river access
- Risk assessments
- Expected number of visits to site
- Site clearance, and how any waste materials shall be removed from site
- Emergency procedures
- Welfare facilities

Works on-site shall only commence once the method statement(s) has been accepted by the Employer.

## **2.14 Project Schedule**

An overall project schedule has been prepared by the Employer taking in to account the Employer's constraints which will need to be updated at the completion of Stage 3. The Consultant shall assist the Employer by providing a schedule for the detailed design and construction phases. The Consultant shall seek the advice of a suitably qualified and experienced contractor to provide a schedule and methodology for construction. The consultant shall capture all necessary notices required by the key stakeholders when preparing the Project schedule.

## **2.15 Cost Plan**

A cost plan shall be prepared by the Employer at the completion of Stage 2 and updated at the completion of Stage 3. The cost plan shall relate to the detailed design and construction stage and shall include (but not limited to):

- a) all Detailed Design costs,
- b) all stakeholder costs (including but not limited to Historic England, Port of London Authority, costs attributed to Transport for London i.e. Buses, Network assurance, costs attributed to planning permission, local authority consents and permits
- c) all construction costs (including but not limited to preliminaries, traffic management, etc.)
- d) Project management costs
- e) all risks attributed to design and construction

The cost Plan shall be displayed as a forecast spend profile based on the agreed project schedule. The Consultant shall assist the Employer by providing design and supervision costs, including risk. The Consultant shall seek the advice of a suitable qualified and experienced contractor to provide costs for construction (including risk, consents and access).

## **2.16 Stakeholder Engagement**

The Consultant shall manage the stakeholder engagement assisted by the Employer.

There are a number of interfaces for the testing, surveys and inspections required for Stage 2, including road and river access. Stakeholder engagement shall be undertaken by the consultant to support these activities. The Consultant shall identify all potential stakeholders. The Consultant shall update the Stakeholder list identifying key strategic stakeholders and produce a stakeholder management plan. The existing stakeholder information is available in Volume 3.

It is anticipated that early stakeholder engagement shall take place during this stage 2 to raise awareness of this project and to identify any significant constraints, requirements or risks. Initial consultation with Stakeholders shall be used to ascertain potential requirements, constraints and dependencies in relation to the Stage 5 works for this project. These shall be captured in the form of Requirements, Constraints and Dependencies Log prepared / updated by the Consultant

The Stakeholders of utmost importance are (among others) Historic England, Port of London Authority which need to be engaged at the outset of this project and accommodate their requirements through out this contract's delivery. Regular meetings shall be held with Historic England and Port of London Authority to ensure their requirements are fully adhered to. The tenderers shall set out in their tender submission how such provisions will be accommodated.

Potential risks shall be identified by the Consultant and be included in the project risk register along with suitable mitigation measures. The project risk register shall be maintained by the Employer.

The Consultant shall notify the Employer prior to consulting with stakeholders and agree the proposed method and content of the notification. All formal consultations to be through TfL and LBHF communications teams.

The Preliminary Design shall include consideration to buildability, traffic management and its impact, Navigational channel management and its impact, Risk assessment to public, pedestrians, navigational users, vehicular users and impact of closures and/or restrictions on traffic flows both navigational and highways.

The Consultant shall ensure that Port of London Authority and Historic England's requirements are fully complied with when undertaking preliminary design.

The Consultant shall be responsible for obtaining initial consent for planning applications and Listed Structure Consent if required. The Consultant shall allow in their tender submission for obtaining full approval of Port of London Authority and Historic England.

## **2.17 Statutory Undertakers**

The Consultant shall carry out C2 statutory undertakers enquiries. The information obtained shall be collated and included in a separate drawing as part of the Stage 2 Works.

The Consultant shall update this information as required after the Stage 2 surveys and investigation. The consultant shall comply with all statutory undertaker's requirements and allow in the feasibility study and preliminary design all works necessary to protect the statutory undertakers apparatus including diversionary provisions and costs if necessary.

## **2.18 Records and Archives**

The Consultant and their appointed Contractor shall be given access to all available records and archived documents. This shall include but not be limited to: BridgeStation; CDM DataStore and local archive network drives.

The Consultant shall ensure that all required record information is transferred and stored on EDMS within the CDE, and BridgeStation records are updated.

## **2.19 Quality Requirements**

The Consultant shall operate a Quality Management System conforming to BS EN ISO 9001. The Consultant shall carry out their duties in accordance with the accepted quality procedures forming part of his Quality Proposal.

When requested by the Employer, the Consultant shall make available the quality manuals and all other relevant information for inspection. The Consultant shall provide copies of any certification, technical reviews, audit reports etc. and related documentation.

The Consultant shall provide details of authorised signatories for the various elements of the review, checking and approval of design, reports and the like.

The Consultant shall allow the Employer's authorised representatives to undertake any inspection, audit or check at any time within working hours, and within the period of notice of five working days, of any aspect of the Consultant's carrying out of the services, including, but not limited to, inspection of the Consultant's technical and organisational security measures for the protection of Personal Data.

## **2.20 Health and Safety**

The project shall comply with the Construction (Design and Management) Regulations 2015 and all other applicable health and safety legislation.

### **2.20.1 Construction (Design and Management) Regulations 2015**

The successful tenderer shall be the Dutyholder as required by Construction (Design and Management) Regulations 2015 for the duration of this contract only. The Consultant shall confirm as part of their tender submission details on how the CDM Regulations Dutyholder's role shall be delivered. The tenderers shall make allowance for the provision of CDM regulations in Volume 3 Financial information.

### **2.20.2 Hazards and Risks**

In addition to the hazards and risks normally associated with the types of work detailed in this document, the Consultant and their subcontractors shall consider the following significant residual risks whilst planning and undertaking the works.

- Vehicular, pedestrian and river traffic
- Tidal changes and river flows
- Working at height, including roped access
- Bird droppings
- Confined spaces
- Drowning
- Lead and heavy metal content in existing paintwork
- Interface with services
- Asbestos Management Plans are not currently available
- Emergency Incidents

The above list is not exhaustive and care shall be taken to maintain the safety of the public, including road users and non-motorised users, workforce, environment, security and infrastructure.

### **2.21 Project Governance – Pathway Products**

The Consultant shall assist the Employer during the preparation and / or updating of the following Stage 2 Pathway products

- Business Case
- Lessons Learned
- Operational Preliminary
- Maintenance Preliminary
- SDR – Scope / Design Review (Buildability)
- Estimate / Cost Plan
- Stakeholder Engagement Plan
- Communications Plan
- Schedule
- Risk Register
- Progress Report

### **2.22 Workshops**

The Consultant (and their appointed Contractor) shall attend project workshops during Stages 2 and 3.

An interactive planning workshop shall be arranged by the Employer within 3 weeks of contract award. Prior to this workshop, the Consultant shall complete their review of the specification for surveys, investigations, monitoring and testing, and update these if required. Updates to the specification shall be issued for review to the Employer prior to the workshop. The interactive planning workshop shall aim to achieve the following:

- Finalise the scope and specification for the surveys, investigations, monitoring and testing, including access, traffic management arrangements, consents, and approvals
- Agree the programme for Stage 2 & 3 delivery
- Discuss risks and opportunities
- Describe method and resources required
- Health and Safety

Workshops shall also be held (1) at the end of the investigation phase to discuss the outcomes of the investigation works, and (2) towards the end of the options appraisal and analysis phase to discuss the feasibility report.

Additional workshops may be required where all parties must contribute to a deliverable such as risk and lessons learned. It is anticipated that an additional four workshops will be required.

### **2.23 Progress Meetings and Reports**

The Consultant shall prepare and submit a monthly progress report. The format of these shall be agreed upon contract award however it is expected that the report shall be a maximum of 3 A4 pages.

The Consultant (and their appointed contractor) shall attend regular progress meetings. These shall generally be held once every two weeks. The Consultant shall be responsible for the recording and maintaining minutes of all progress meetings.

### **2.24 Project Works Programme**

The Consultant shall submit an updated programme showing project progress fortnightly to the Employer.

### **2.25 Delivery Team Staff and Experience**

The key Consultant staff employed on the project shall be agreed with the Employer prior to commencement of works. All staff shall demonstrate that they have a relevant qualification in civil or structural engineering with recent experience of similar projects and have the necessary knowledge and skills required, to ensure successful delivery.

Any additional or replacement members of the team shall be subject to the same approval process.

### **2.26 Reference Documents**

The Scope (ITT Volume 2) shall be read in conjunction with the following documents:

1. Annex 1 – Specifications
2. Annex 2 – Site information

## **APPENDIX 1 – SPECIFICATION**

### **Table of contents**

1.	Introduction.....	53
2.	Specification for Principal Inspection .....	53
3.	Specification for Topographical and Geometric Survey.....	58
4.	Monitoring of Bridge Behaviour.....	70
5.	Street Lighting Inspection Testing and Proposal for renewal/repairs.....	73

## **1. INTRODUCTION**

The outputs from Outcome Definition (Stage 1) report by Bam/Arup (see Annex 2 of ITT Volume 2) confirmed that there are gaps in information, which could potentially affect the current risks to safety, functionality and environment. Investigations, testing, surveys and structural assessment are proposed in Stage 2 to enable an accurate determination of the existing condition of the structures, and to identify the full nature and extent of the works that are required to improve the state of good repair and address any potential risks to safety, functionality and environment. Stage 3 works will provide a preliminary design that addresses the project objectives

The specifications given in the following sections shall be read in conjunction with the following documents:

3. Volume 0 - Instructions
4. Volume 1 - Call Off Documentation
5. Volume 2 – Scope
  - a. Annex 1 – Specification
  - b. Annex 2 – Site Information
6. Volume 3 - Pricing

The surveys, testings, inspections, investigations, structural assessment and design scope for the structure has been identified in Section 2 of ITT Volume 2 – Scope.

## **2. Specification for Principal Inspection**

### **2.1 Public Safety**

If an inspection identifies defects that are considered to have safety implications, either for the structure to function safely or which affects the safety of those using, inspecting or maintaining the structure and requires urgent attention, the Consultant shall immediately report it to the relevant Borough Manager and confirm it in writing to the Employer and the Employer's Representative within 2 days.

### **2.2 Access**

The Consultant shall be responsible for liaising with relevant parties to arrange the necessary access and traffic management to carry out the inspection work.

The Consultant shall be responsible for procurement of all access plant and equipment necessary to carry out the inspection.

Where access plant (including confined space access, as appropriate) and traffic management are used to carry out the inspections, these shall be described in the Method Statement under Hazard/Risk Assessment heading. Photographs and/or drawings showing a general view of such access plant and traffic management shall be included in the Hazard Assessment heading.

The Consultant shall notify the Employer's Representative of any access constraints or Health and Safety issues that the Consultant is reasonably expected to be aware of and which may affect the delivery of the inspection programme in good time such that the impact can be mitigated.

### **2.3 Photographs**

The Contractor shall take colour photographs to record all defects or damage identified. For each defect, a wide angle photograph to show the overall location of the structure, and a close-up photograph of the defect itself, shall be included. Where possible general photographs to show the elevations and spans to give an overview of the structure shall be included.

Electronic photographs shall be reviewed on the site, to ensure the photograph accurately identifies the defect. Photographs that are blurred or contain glare shall be retaken with appropriate lighting in place. Also, photographs that are incorrectly lit shall be retaken with appropriate lighting unless there is a reason this cannot be carried out, which shall be documented in the report and agreed with the Employer. Photographs that are submitted and are not of an acceptable standard to the Employer shall be re-taken by the Contractor at his expense.

Each element and/or defect shall be photographed, and the electronic file uploaded onto BridgeStation. These photos shall be applied to the picture column on the element details grid on the CSS Inspection Details form. The location of each element and each defect shall be described in the structure-specific CSS Inspection Details form.

The minimum image dimensions for uploaded photos shall be 2240x1680 pixels (equivalent to a 4-megapixel camera). The file size of a JPEG output compression shall not be less than 500KB. The maximum file size of uploaded photos file size shall be less than 10MB.

The photographs shall be date encoded. They shall be uploaded in BridgeStation in electronic jpeg or tif format. The photographs shall be labelled clearly to identify the defect, to ensure that the meaning of each photograph is clearly identified.

### **2.4 Health and Safety**

Inspections and associated works shall be carried out in compliance with all Statutory Requirements, Approved Codes of Practice and Guidance Notes relevant to Health and Safety at Work with regard to welfare of the operatives as well as the general safety of members of the public and properties.

The Contractor shall complete the Hazard/Risk Assessment and Environment Awareness forms within BridgeStation.

Regulation 4 of the Control of Asbestos Regulations 2006 (CAR 06) places a duty on those persons who have responsibility for maintenance or repair to ensure that a suitable and sufficient assessment is carried out as to whether Asbestos Containing Materials (ACMs) are likely to be present in their premises. If no information has been provided on ACM's by the Employer, it should be presumed that materials do contain asbestos unless there is strong evidence that they do not. If, at any time, the presence of asbestos or any hazardous material is identified or suspected, the Contractor shall cease work immediately and advise the Employer and the Employer's Representative.

## **2.5 Recording Inspection Results**

The elements identified in the CSS Inspection Details form shall be inspected as a minimum requirement. This list of elements shall not be considered as an exhaustive list. Therefore, the inspector shall update the 'Element List' in the CSS Inspection Details form to include other elements that should be inspected. Also record and report in the form the condition of the updated list elements. The condition of the elements shall be recorded directly onto BridgeStation. Instructions on creating a CSS Inspection Details form is in (<https://www.bridgestation.co.uk/Support/KB/a138/consistent-element-inventories-cei-inspection-proforma.aspx>).

In the CSS forms under the 'Engineer's Comments' section, the inspector's comments shall be reviewed by an engineer other than the inspector.

Condition data of foundations and waterproofing where not visible shall always be recorded based on evidence of movements, seepage etc. Elements that are not visible during the inspection shall be reported and reasons for this provided. Examples would include a culvert's primary deck not being inspected because a general inspection is being undertaken, or vegetation covering the structure which requires clearing.

In the 'Element Conditions' section for the elements where data in relation to the fields for Material, Proximity to Spray, and Exposure are missing for any element, it shall be completed by the Contractor.

Where elements appear in the CSS pro-forma but are not present on the structure, this shall be reported to the Employer's Representative and noted in the 'Inspector's Comments' section. Where elements are repeated in the forms, this shall be noted in the Inspector's Comments.

The contractor shall nominate the names of two of his staff to whom the Employer's Representative will provide usernames and passwords to login to BridgeStation. This login facility will be terminated on completion of the contract.

The current element condition data reported in the CSS Inspection Details form shall be compared with the previous inspection data, where such data are available and shall comment on the variability of the data in the report.

## **2.6 Remedial Works**

Advice on remedial works is required, including cost estimates, shall be made on the CSS Inspection Details form in BridgeStation.

If material testing and/or investigation are considered to be necessary the 'Engineer's comments' section of the CSS Inspection Details form in BridgeStation shall include recommendations for any further actions. These recommendations shall state the reason for and type of material testing and/or investigation, the location of the structure where they are needed, estimated costs and when they should be carried out. Proposals for such material testing and investigation and/or monitoring where deemed necessary shall be submitted to the Employer's Representative for him to consult the Employer. For the recommended monitoring regime reasons shall be given over other options. As the proposal will be additional work, such additional work shall not be carried out without the Employer's prior instruction.

If monitoring of a defect is considered necessary, recommendations shall be included in the CSS Inspection Details form for the type and frequency of monitoring.

If a significant defect is identified, but the cause, extent and the nature of the remedial works are uncertain, then the inspector shall make recommendations for a future Special Inspection to be undertaken, describing briefly the objectives and including a budget estimate for carrying out the inspection.

For structures with restricted headroom, comments in the CSS Inspection Details form on the following shall be included:

- a. Evidence of any possible change in surfacing having occurred which has not been previously recorded/ measured.
- b. Evidence of any impact on the bridge. The Contractor shall formally notify the highway authority of any such damage and make reference to it in the inspection report.
- c. Comments on the completeness and effectiveness of the signing/hazard marking.

## **2.7 Structure Dimensions**

The dimensions of the structure shall be checked against the construction drawings listed in Annex 2 of ITT Volume 2 as part of the Principal Inspections. If the dimensions are inaccurate by more than 5%, then this shall be recorded in the "Inspector's Comments" section in the CSS Inspection Details form in BridgeStation.

## **2.8 Structure Summary**

The structure summary in BridgeStation shall be reviewed, and any recommended revisions shall be reported in the "Inspector's Comments" section in the CSS Inspection Details form in BridgeStation.

The Contractor shall notify the Employer the specific details of any inaccuracy, discrepancies or omissions it encounters in BridgeStation data that the Contractor becomes aware of while using or updating BridgeStation.

Prior to carrying out the site inspections, the Contractor shall review the CSS Inspection Details form in BridgeStation, for multi-span structures to check that the relevant elements for each span are shown on the CSS Inspection Details form, in order to record the inspection data for each span separately. The Contractor shall confirm via email to the Employer's Representative that he has carried out this check. If the form does not contain the relevant elements, the Contractor shall notify the Employer at least two weeks prior to the site inspections, to agree how the inspection data for each span is to be recorded in BridgeStation. Separate CSS forms shall be completed to record the data for each span unless agreed with the Employer's Representative. The Contractor shall ensure the final BCI scores in BridgeStation represent the critical defect of the structure or sum of the defects if more critical. The Contractor shall communicate to the Employer where he believes BCI calculations do not highlight elements with significant defects.

## **2.9 Defect Drawings**

For the Principal inspections, defects shall be shown on general arrangement drawings as a report document in BridgeStation. If such drawings do not exist the Contractor shall produce the drawings. Defect drawings of similar standard shall be submitted. The drawings shall clearly detail the defects describing the nature of the defect such as:

- a. Corrosion area, loss of section, missing rivets, cracked weld
- b. Spalling - area, depth, delamination.
- c. Exposed reinforcement/pre-stressing – length of exposure, corrosion
- d. Crack – width, length, orientation
- e. Seepage - area (local or global)
- f. Joints - length of failure, leakage, surface cracking, fretting due to hydrostatic pressure.
- g. Any other pertinent details to aid determining the extent of the repair work

## **2.10 Submission of Inspection Results**

When the Contractor has submitted the completed CSS Inspection Details form in BridgeStation, the Contractor shall use the inspection sign off function in BridgeStation to notify the Employer's Representative. In BridgeStation, instruction on the inspection sign off process is in (<https://www.bridgestation.co.uk/support/kb/a142/inspection-sign-off-process.aspx>).

The Employer's Representative will advise by e-mail whether or not the inspection records uploaded in BridgeStation are acceptable.

## **2.11 Programme**

Prior to carrying out the inspection work, the Contractor shall submit to the Employer's Representative for his approval a programme of works, covering the following activities:

- a. Inspections
- b. Entering inspection result in BridgeStation
- c. Revisions
- d. Final sign-off

The inspection details shall be entered in the CSS forms in BridgeStation no later than two weeks after carrying out the inspection. The Contractor shall allow in his programme a period of two weeks for the Employer's Representative to review and comment on the inspection details, and a further two weeks for the Employer's Representative to review and approve any resubmission. For the inspections carried out by the Contractors once the review for compliance with the Specification is completed, the 'reports' will be submitted via BridgeStation to the structure owner for his approval. If the structure owner has queries on the review he will liaise with the Employer's Representative to discuss the queries. Following the discussions if rejection is justified the contractor will be notified via BridgeStation and asked to make the necessary revision and re-submit for the Employer's Representative to review.

### **3. SPECIFICATION FOR TOPOGRAPHICAL AND GEOMETRIC SURVEY**

#### **3.1 Pre-survey deliverables**

##### **3.1.1 Certification requirements**

The method statement is to be accompanied by a certification of calibration of instrument to be used.

##### **3.1.2 Site Specific Risk Assessment**

A site specific risk assessment must be completed prior to any visit on-site. The document should cover details of the visit and contact arrangements, PPE requirements, risk considerations and high risk activities, signed and submitted as a PDF document.

##### **3.1.3 Method Statement**

Prior to survey works, a method statement must be submitted outlining the scope of work, working procedures, normal working hours, equipment safety and limitations along with contact details of the survey team leader.

Particular reference shall be made to the methodology for traversing accurately into the inside of the towers, abutments, anchor chambers and the London Borough of Hammersmith and Fulham Store under the bridge, and for traversing beneath the deck.

#### **3.2 Methodology**

##### **3.2.1 Survey Control**

All site survey data shall be tied into existing survey points on-site if London Borough of Hammersmith and Fulham (LBHF) are aware of their presence, otherwise they shall tie into Ordnance Survey benchmarks.

The method statement must describe the equipment and procedures to be employed to achieve the appropriate precision.

##### **3.2.2 Use of Ground Station Markers**

Permanent or temporary ground markers are to be non-invasive where possible. The type and location of any permanent marker should be approved by the LBHF before it is installed. Details of permanent stations must be provided within a witness diagram, along with written descriptions of the marks and location photographs. The marker types and locations shall be in line with heritage requirements to comply with the listed status of the bridge.

##### **3.2.3 Traversing Accuracy**

All traverse, triangles, braced quadrilaterals etc. should be well proportioned. Where traversing between stations is undertaken, closed loops or braced quadrilaterals are to be employed.

The maximum error between permanently marked survey stations is to be no greater than  $\pm 2\text{mm}$ .

An estimate of the precision achievable is to be included in the method statement.

All co-ordinate and level values generated must be expressed in metres to three decimal places and presented in the order of easting (x), northing (y) and height (z).

### **3.2.4 Feature Accuracy**

The vertical and horizontal tolerance should not exceed 4mm r.m.s.e (root mean square error) for all total station readings. Readings shall adhere to the following accuracy:

1. 67% of readings must be correct to or better than the r.m.s.e.
2. 90% of all readings must be correct to or better than 1.65 times than the r.m.s.e
3. All readings must be correct to or better than 3 times than the r.m.s.e

All readings that do not comply with the above conditions, including consequential errors shall be corrected by the Consultant at his own expense.

Features that cannot be surveyed to the specified accuracy will be reported to the Employer immediately.

## **3.3 Toposurvey Data Acquisition**

### **3.3.1 Point Density and Accuracy**

RGB coloured scans will be captured along with monochromatic reflective intensity datasets. An overall point density of 100mm should be adhered to as an absolute minimum for the areas agreed with the Employer. Refined scan selections should be carried out to reach a point density of 10mm – 20mm or smaller if required for features such as bolts, rivets, steel webs and flanges, stiffeners and cable runs, beneath the bridge deck, within the towers and the anchor chambers. Thus it is envisaged that all of the deck soffit and areas within the towers and anchor blocks will require refined scanning.

For all scanned measurements the maximum error is to be no greater than  $\pm 5\text{mm}$ .

### **3.3.2 Data Voids**

Data voids must be kept to a minimum. It is accepted that small portions of the bridge and surroundings will not be visible from certain angles, however, every effort must be made to capture each detail with overlapping coverage using multiple scan positions surrounding each area. Post-scan checks should be made after each scan to ensure that obstructions have not occluded the scanners view. Where occlusions have occurred, re-scans should be taken, or lasso selections re-scanned to form complete scans.

**3.3.3 Targeting**

High definition targets must be used to link multiple scan positions together. If cloud to cloud registrations are necessary, these individual scans must be identified in the survey report, with reasoning.

**3.3.4 Weather Conditions**

Weather conditions should be recorded for each day on-site surveying. Scanning and image capture should not be undertaken in adverse weather conditions. If milder conditions such as light rain is unavoidable on-site, any subsequent noise or unwanted artefacts picked up should be removed in post-processing.

**3.4 Post-processed point cloud data**

**3.4.1 Registration**

Registration diagnostics should be provided as proof of a valid registration. The registration diagnostics should contain details of constraint errors, constraint types and constraint weightings.

Details should be provided of any traverse/control network used on site with all easting, northing, elevation values of control points and residuals.

**3.4.2 Quality Assurance**

Manual QA checks should made once the individual scan positions have been combined into a unified point cloud. Preferably each scan should be coloured uniquely, then viewed in plan and elevation at varying positions for any obvious overlapping errors. Screen grabs or exported images of these checks should be included in the survey report QA section.

**3.4.3 Data cleaning**

All pedestrian, vehicular, weather related or other unwanted point cloud artefacts should be removed from the registered point clouds before export. This should leave a clean point cloud that can be triangulated into surface models without additional cleaning.

**Survey Feature table**

LEVEL POINTS					
Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Spot Level	7	Continuous	0.18mm	Block	SP
STREET FURNITURE					
Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Road Sign	8	Continuous	0.13mm	Block	AA

Name Plate	8	Continuous	0.13mm	Block	AB
Bollards	8	Continuous	0.13mm	Block	AD
Traffic Signal	8	Continuous	0.13mm	Block	AE
Bus Stop	8	Continuous	0.13mm	Block	AF
Reflector Post	8	Continuous	0.13mm	Block	AG
Letter Box	8	Continuous	0.13mm	Block	AH
Signal Pole	8	Continuous	0.13mm	Block	AI

## STREET FURNITURE

Flag Pole	8	Continuous	0.13mm	Block	AM
Control Cabin	8	Continuous	0.13mm	Block	AN
Aeration Equipment Electrical	8	Continuous	0.13mm	Block	AO
Cabinets	8	Continuous	0.13mm	Block	AP
Traffic Barriers	8	Continuous	0.13mm	Block	AQ
SF-Other	8	Continuous	0.13mm	Block	-

## ROADS

Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Kerb Edge of	9	Continuous	0.18mm	Line string	-
Surfacing	9	Continuous	0.18mm	Line string	-
Track	9	Continuous	0.18mm	Line string	-
Footpath	9	Continuous	0.18mm	Line string	-
Drop Kerb	9	Continuous	0.18mm	Line string	-
C/way Crown	9	Continuous	0.18mm	Line string	-
Pedestrian X'ing	9	Continuous	0.18mm	Line string	-
Steps	9	Continuous	0.18mm	Line string	-
Parapets	9	Continuous	0.18mm	Line string	-
Banana wall capping	9	Continuous	0.18mm	Line string	-

**BUILDINGS**

Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Building External Face	6	Continuous	0.25mm	Line string	-
Open Sided	6	Continuous	0.25mm	Line string	-

**BUILDINGS**

Railway Relay	6	Continuous	0.35mm	Line string	-
Railway Sub Stations/ Track Sections Cabins	6	Continuous	0.25mm	Line string	-
Concrete Internal Face	6	Continuous	0.35mm	Line string	-
Foundations	6	Hidden 2	0.5mm	Line string	-
Bridge Deck	6	Continuous	0.35mm	Line string	-
Bridge Parapets	6	Continuous	0.25mm	Line string	-
Bridge Abutments	6	Continuous	0.35mm	Line string	-
Bridge Piers	6	Continuous	0.35mm	Line string	-
Expansion Joints	6	Continuous	0.35mm	Line string	-
Drainage Gullies on Bridge Deck /Pipework	6	Continuous	0.35mm	Line string	-
Access Ladders	6	Continuous	0.18mm	Line string	-
Fenders	6	Hidden 2	0.13mm	Line string	-
B-Others	6	Continuous	0.25mm	Line string	-

**WATER**

Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Top of Banks	4	Continuous	0.18mm	Line string	-
Bed of watercourse	4	Continuous	0.18mm	Line string	-
Water Edge	4	Continuous	0.18mm	Line string	-
Water Level	4	Continuous	0.18mm	Line string	-

## WATER

Culvert Headwall	4	Continuous	0.18mm	Line string	-
Pipe End	4	Continuous	0.18mm	Line string	-
W-Others	4	Continuous	0.18mm	Line string	-

## BOUNDARIES

Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Chestnut Paling	3	Border2	0.35mm	Line string	-
Close Boarded	3	Border2	0.35mm	Line string	-
Corrugated Iron	3	Border2	0.35mm	Line string	-
Interwoven	3	Border2	0.35mm	Line string	-
Iron Railings	3	Border2	0.35mm	Line string	-
Paling	3	Border2	0.35mm	Line string	-
Post and Chain	3	Border2	0.35mm	Line string	-
Post and Rail	3	Border2	0.35mm	Line string	-
Post and Wire	3	Border2	0.35mm	Line string	-
Post, Barbed	3	Border2	0.35mm	Line string	-
Recreation Area	3	Border2	0.35mm	Line string	-
Gate	3	Border2	0.35mm	Line string	-
Stile	3	Border2	0.35mm	Line string	-

Wall	3	Border2	0.35mm	Line string	-
Retaining Wall	3	Border2	0.35mm	Line string	-
Chain Link Fence	3	Border2	0.35mm	Line string	-
Safety Fencing	3	Border2	0.35mm	Line string	-
Hoarding	3	Border2	0.35mm	Line string	-

## EARTHWORKS

Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Top of Slope	40	Dashed2	0.35mm	Line string	-
Bottom of Slope	40	Dashed2	0.18mm	Line string	-
Hatches	40	Dashed2	0.18mm	Hatch	-
E-Others	40	Dashed2	0.25mm	Line string	

## LANDSCAPE

Layer Name	Colour	Line type	Line weight	Object Type	Block Name
2.0m Spread	80	Phantom2	0.13mm	Block	LG
4.0m Spread	80	Phantom2	0.13mm	Block	LF
6.0m Spread	80	Phantom2	0.13mm	Block	LE
8.0m Spread	80	Phantom2	0.13mm	Block	LD
Tree Coniferous	80	Phantom2	0.13mm	Block	LC
Stump	80	Phantom2	0.13mm	Block	LS
Bushes	80	Phantom2	0.13mm	Block	LB
Hedge & Fence					
1m	80	Phantom2	0.13mm	Block	HEDGE 1
Hedge 1m Wide	80	Phantom2	0.13mm	Block	HEDGE 2
Hedge & Fence 2m	80	Phantom2	0.13mm	Block	HEDGE 3
Hedge 2m Wide	80	Phantom2	0.13mm	Block	HEDGE 4
Hedge & Fence 3m	80	Phantom2	0.13mm	Block	HEDGE5
Hedge 3m Wide	80	Phantom2	0.13mm	Block	HEDGE 6

## UTILITIES UNDERGROUND

Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Inspection cover	1	Hidden2	0.18mm	Block	UA
Manhole	1	Hidden2	0.18mm	Block	UB
Gully	1	Hidden2	0.18mm	Block	UC
Kerb Outlet	1	Hidden2	0.18mm	Block	UD

## UTILITIES UNDERGROUND

Water Meter	1	Hidden2	0.18mm	Block	UE
Gas Valve	1	Hidden2	0.18mm	Block	UF
Stop Valve	1	Hidden2	0.18mm	Block	UG
Gas Marker	1	Hidden2	0.18mm	Block	UH
Hydrant	1	Hidden2	0.18mm	Block	UI
Air Vent	1	Hidden2	0.18mm	Block	UJ
Drain or Sewer	1	Hidden2	0.18mm	Line string	-
Ducting	1	Hidden2	0.18mm	Line string	-
Pipework	1	Hidden2	0.18mm	Line string	-
Hydrant Marker	1	Hidden2	0.18mm	Block	UN
UUG-Others	1	Hidden2	0.18mm	Block	

## UTILITIES ABOVE GROUND

Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Power Line	200	Centre 2	0.18mm	Line string	-
Pylon-Small	200	Centre 2	0.18mm	Block	UAG-P
Lamppost	200	Centre 2	0.18mm	Block	UAG-L
Telegraph Pole	200	Centre 2	0.18mm	Block	UAG-T
BT/EB Box/Cabinet	200	Centre 2	0.18mm	Line string	-
Pylon Legs	200	Centre 2	0.18mm	Line string	-
EP Stay Wires	200	Centre 2	0.18mm	Line string	-
Telegraph Lines	200	Centre 2	0.18mm	Line string	-

Telephone Boxes	200	Centre 2	0.18mm	Block	UAG-TB
UAG-Others	200	Centre 2	0.18mm	0	

### MISCELLANEOUS

Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Tanks	35	Divide2	0.25mm	Line string	-

### MISCELLANEOUS

Conduits	35	Divide2	0.25mm	Line string	-
Valve Chambers	35	Divide2	0.25mm	Line string	-
Troughs	35	Divide2	0.25mm	Line string	-
Bird Netting	35	Divide2	0.25mm	Line string	-
Road Lighting on	8	Continuous	0.13mm	Block	-
Parapet Edge Up lighting	8	Continuous	0.13mm	Block	-
Underbridge Towpath Lighting	8	Continuous	0.13mm	Block	-
Suspended Lamps within Towers	8	Continuous	0.13mm	Block	-
Maintenance Lighting within Anchor	8	Continuous	0.13mm	Block	-
Suspended Lighting within Towers	8	Continuous	0.13mm	Block	-
Navigation Lighting	8	Continuous	0.13mm	Block	-

### BRIDGE STRUCTURE

Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Steelwork / Wrought Iron – Longitudinal Stiffening Girder	5	Continuous	0.35mm	Line string	-
Steelwork / Wrought Iron – Transverse Girder	5	Continuous	0.35mm	Line string	

Steelwork / Wrought Iron - Secondary	5	Continuous	0.25mm	Line string	-
Suspension Bridge Catenary Chain Link	5	Continuous	0.35mm	Line string	-
Suspension Bridge Anchorage Chains	5	Continuous	0.35mm	Line string	-

## BRIDGE STRUCTURE

Timber Decking to Main Carriageway (Timber Baulks)	5	Continuous	0.35mm	Line string	-
Footway Timber Deck Panels	5	Continuous	0.35mm	Line string	-
Hangers	5	Continuous	0.35mm	Line string	-
Bolts	5	Continuous	0.13mm	Line string	-
Rivets	5	Continuous	0.13mm	Line string	-
Pins	5	Continuous	0.13mm	Line string	-
Baseplates	5	Continuous	0.13mm	Line string	-
Elastomeric Bearings on Top of Tower	5	Continuous	0.35mm	Line string	-
Bearings on Top of Tower	5	Continuous	0.35mm	Line string	-
Main Girder Bearings to Bridge Deck at Piers Locations	5	Continuous	0.35mm	Line string	-
Main Girder Bearings to Bridge Deck at Abutment	5	Continuous	0.35mm	Line string	-
Tower Steelwork / Wrought Iron Anchorage	5	Continuous	0.35mm	Line string	-
Tunnels	5	Continuous	0.35mm	Line string	-
Chain Link Tunnels	5	Continuous	0.35mm	Line string	-
Concrete Plinths	5	Continuous	0.35mm	Line string	-
Face of Concrete	5	Continuous	0.35mm	Line string	-

Face of Concrete roof	5	Continuous	0.25mm	Line string	-
Face of Concrete floor	5	Continuous	0.25mm	Line string	-
Comms duct bank	5	Continuous	0.25mm	Line string	-
Other Concrete Ornamental	5	Continuous	0.35mm	Line string	-
Casing to Towers	5	Continuous	0.25mm	Line string	-

### BRIDGE STRUCTURE

Ornamental					
Casing to	5	Continuous	0.35mm	Line string	-
Portland Stone surround to Piers and Abutments	5	Continuous	0.35mm	Line string	-

### CONTOURS/SURVEY

Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Major Contours	210	Divide2	0.18mm	Line string	-
Minor Contours PGM's/Bench	210	Divide2	0.18mm	Line string	-
Mark	210	Divide2	0.18mm	Line string	-
Annotation	210	Divide2	0.18mm	Line string	-

### TEXT

Layer Name	Colour	Line type	Line weight	Object Type	Block Name
Text-Level Text	7	Continuous	0.25mm	Text	-
Text-Flat Areas	7	Continuous	0.25mm	Text	-
Text-Road Track	7	Continuous	0.25mm	Text	-
Text-Building	7	Continuous	0.25mm	Text	-
Text-Water Levels	7	Continuous	0.25mm	Text	-
Text-Ditch/Bed	7	Continuous	0.25mm	Text	-
Text-Boundary	7	Continuous	0.25mm	Text	-

Text-Earthworks	7	Continuous	0.25mm	Text	-
Text-Underground Utl.	7	Continuous	0.25mm	Text	-
Text-Aboveground Utl.Utilities	7	Continuous	0.25mm	Text	-

## TEXT

Text-Contours	7	Continuous	0.25mm	Text	-
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### 3.5 Deliverables

#### 3.5.1 Colour Point Clouds

Each location should be exported to Leica .PTS, Autodesk .RCS and AutoCad compatible 3D elements in a format readable in **.DWG, .RVT and .DXF** formats for maximum compatibility with RGB colour data embedded with reflective intensity values. The raw scan data should be provided for archive purposes.

Each feature should have its own layer as described in section 2.3.4 in the exported data and all locations should be categorised into their corresponding layers. For locations that do not have a designated layer in section 2.3.4, further appropriate layer names should be generated and locations allocated to them.

#### 3.5.2 Ortho-rectified Imagery

Ortho-rectified images shall be produced from the high resolution scan data. The images should be exported at a high pixel resolution (minimum 5000 pixel width) into TIFF formats, accompanied by TWF files for establishing the correct scale and orientation in third party packages.

#### 3.5.3 Site Photos

Any photographs taken on-site should be included onto the delivery medium. Photographs should be taken of each scan set-up location. Photographs taken as part of the witness diagram process, should be included in the method statement along with scan position ID's and descriptions.

#### 3.5.4 Survey Report

The survey report will be supplied in Word format and all spreadsheets are to be supplied in Excel format. All reports (including accompanying Figures and Drawings) and spreadsheets shall also be supplied in Adobe Portable Document Format (PDF). The survey report should include registration records, witness diagrams, a description of any issues found on-site, QA checks, and other notes including weather conditions, cloud to cloud targets etc.

### **3.5.5 File naming**

The survey point cloud files shall be labelled with the following prefix LDR\_CWBB, followed by the file name and date. The following naming convention should be adopted for all files:

1. Use only alphanumeric characters (a-z, 0-9), the hyphen (-) and the underscore (\_)
2. Spaces and full stops (.) must not be used within filenames
3. A full stop must only be used to separate the filename from the extension

### **3.5.6 File sizes**

Individual point cloud files should not exceed 4.7GB in size, allowing each file to be archived onto DVD-ROM media. Any point cloud files that exceed 4.7GB should be split into smaller segments.

The files should also be available to download from a file share website.

### **3.5.7 Delivery media**

The survey point cloud data, along with all other electronic deliverables shall be provided on an encrypted portable hard drive. The encryption password will be validated upon submission. A text 'readme' document should be supplied with the data, outlining the filing structure used to store the data.

## **4. Monitoring of Bridge Behaviour**

The Consultant shall supply and install a fully integrated Structural Monitoring System.

- Full range of monitoring. Ability to record at varying frequencies from 1000 samples per channel per second or slow speed once a minute/hour/day.
- All data shall be written in \*.CSV file which can be opened with MS excel, with all values in units mm, °C or °degrees.
- All data files shall be automatically named with following convention, "yearmonthdayhourminutesecond.csv", for easy recognition and management
- High rate dynamic synchronization of all channels – no multiplexing
- Automatic data transfer to nominated location and Dropbox™ or similar approved
- 1TB hard drive with all data cloned automatically to a 1TB external USB HD to allow rapid data removal and back up.
- IP rated cabinet to protect the system from the environment and weather
- External brackets for easy and secure fixture to the structure
- Dual SIM 3G/4G connection to allow wireless communication and access to the system and data
- Connectivity with Online Monitoring website displaying all data collected from site
- Connection to appropriate power supply.

The monitoring electronics shall be located inside an IP rated enclosure to be fixed securely to an agreed fixed location on the bridge approved by the Employer. This shall offer shelter and security to the monitoring system along with access to power supply that shall run locally.

## 4.1 Cables

The installation shall use newly supplied and installed cables, where required along a route agreed by the Employer. These shall be secured by UV resistant cable ties to the transverse girders and other structural steel – the installation shall be to a high standard to ensure no cable can come loose threatening either monitoring or the public. The cables shall be kept away from the service ducts, gantries and also allow straightforward installation reducing the risk of damage during installation and be kept wherever possible away from the power cables that run on the bridge.

Cable shall be secured with UV stable PVC cable ties to structural steel or plastic cable supports held onto the metal with structural adhesive.

## 4.2 Sensors

The following shall be the minimum specification for Sensors if provided for monitoring purposes:

- Longitudinal Voltage Displacement Transducers (LVDT) to measure the longitudinal articulation of the deck and saddle bearings (at deck level and at the top of the tower)
- Inclinometers to monitor the pins bearing and selected hangers for rotation
- Thermocouples to monitor ambient air and steel material surface temperature
- Uniaxial strain gauges (with thermal compensation) on suspension chains, hangers and the steel tower lattice
- Anemometer for measuring wind speed on top of the towers. All the sensors proposed are frequently and successfully used by Mistras so we have a high confidence in their reliability during prolonged out door use.

## 4.3 LVDT's

The Linear Voltage Displacement Transducers (LVDT) supplied, shall be in stainless steel and have high resolution for dynamic monitoring and range sufficient for bearing movement and deck movement. These shall make an accurate position measurement of the movement of the armature (the sliding part) relative to the body of the displacement transducer.

LVDT's with +/-50mm range shall be used to measure longitudinal movement of each bearing under the saddles at the tower top and at deck level. These will have passive return arms with the end tip fixed on an unconnected element allowing differential movement to be measured.

LVDT's with +/-150mm range shall be used to measure longitudinal expansion of the deck. These LVDT's will be fixed with brackets to the abutments and piers with passive return arms with the end tip fixed on the deck steel allowing differential movement to be measured. All these sensors shall use a unistrut welded perpendicularly to an end plate.

## 4.4 Inclinometers

+30 degree inclinometers shall be supplied with all necessary cabling and power supply. The sensors shall have an IP55 rating or better.

Inclinometers are proposed to be added to the pin bearings at the corner of each deck. These are housed in a IP67 junction box bonded directly to the end of pin bearing using a structural adhesive

The consultant shall propose any additional inclinometers to be added to specified vertical hangers, as deemed necessary. These will be housed in similar box casings for additional weather and security protection and clamped to the hanger with U bolts.

The signal cable shall be housed inside armored conduit in the public area to prevent accidental or deliberate damage.

#### **4.5 Temperature Sensors**

Ambient air temperature sensors shall be sealed IP666 units with all necessary cabling and power supply.

Bonded resistance gauges shall be used for measuring steel surface temperature.

#### **4.6 Strain Gauges**

Supply and use high quality uniaxial strain gauges to be temperature compensating to reduce the effect of temperature change. The gauges are to be bonded onto the prepared metal surface. The gauges shall be provided with impact, environmental, thermal and damage protection.

#### **4.7 Anemometers**

Supply anemometers to measure wind speed. Solid state, stainless steel ultrasonic anemometers to be used with sealed IP666 units to be suitable for marine environments and approved for offshore use..

#### **4.8 Remote System Connection**

An industrial wireless 3G/4G router and data only SIM contract shall be provided with monthly cost. The system shall have a powerful aerial to maximise transmission and network coverage. if the coverage is found in reality to be too weak or unreliable, manual collection of data at interval required shall be undertaken or cable broadband to be installed.

#### **4.9 Deliverables**

- The Consultant shall provide the following:
  1. A draft report within 2 weeks after the conclusion of the data collection on-site or earlier for review and comments
  2. A final report within 2 weeks after the comments are received from the Employer
- The Consultant shall provide operating and maintenance manuals for the installed monitoring equipment and all necessary software and training to the individuals or organisations commissioned by the Employer to monitor and analyse the readings
- The data shall be supplied in raw data and graphical format to the Employer. The data shall be in a format which can be readily importable to Microsoft Excel
- As installed details of monitoring system, including photographs and details of all sensors shall be supplied on installation and commissioning, to ensure it is easy to distinguish which sensor is providing particular data.

The Consultant shall analyse the data and provide a monthly report to the Employer within one week after the monthly data is provided.

The monitoring data for the movement of the bridges shall be analysed and compared to the calculated expected movements, and the findings shall be recorded in the interpretive report. The Consultant shall calculate the expected movements of the bridges.

## **5. Street Lighting Inspection Testing and Proposal for renewal/repairs**

The aim of the assessment is to provide information on the condition of the street lighting equipment and associated infrastructure to determine its deterioration and whether further investigations or remedial works need to be carried out in the future. The works shall comprise detailed visual inspection, non-destructive testing (NDT), electrical testing and inspection, lighting performance measurement and calculation.

Should this report ascertain remedial works are required, the consultant will, where applicable, provide a number of detailed alternative and innovative solutions to the elements of reported deterioration.

### **5.1 Structural Inspection**

The Consultant shall carry out structural inspection of the street lighting luminaires, columns, bracketry, fixing arrangement and associated equipment shall be undertaken in accordance with:

6. BS EN 40-3-2:2013 - Lighting columns, Part 3-2: Design and verification - Verification by testing, and
7. The Institute of Lighting Professionals Technical Report 22 (ILP TR22): Managing a vital Asset: Lighting Supports.

The inspections shall be carried out by competent persons. Competency shall be demonstrated through submission of method statements and CVs detailing relevant experience and qualifications.

The inspection shall also include a visual inspection of all electrical and mechanical equipment including but not limited to luminaires, network cabling and electrical distribution points, feeder pillars, switch-rooms, etc.

The Consultant shall prepare a detailed inspection report. The contents of the report shall be agreed with the Employer.

### **5.2 Non-Destructive Testing**

NDT shall be undertaken by the Consultant. Competency shall be demonstrated through the individual or the company holding certification from British Institute of Non-Destructive Testing or equivalent body.

NDT shall be carried out in accordance with:

8. BS EN 40-3-2:2013 - Lighting columns, Part 3-2: Design and verification - Verification by testing, and
9. The Institute of Lighting Professionals Technical Report 22 (ILP TR22): Managing a vital Asset: Lighting Supports.

### **5.3 Electrical Inspection and Testing**

Electrical inspection and testing shall be carried out by the Consultant.

Electrical inspection and testing of all street lighting equipment including but not limited to luminaires, columns, underbridge lighting, decorative and feature lighting, brackets and their fixings, network cabling and electrical distribution points, feeder pillars, switch-rooms, etc. shall be performed in accordance with:

10. Wiring Regulations 17th Edition BS 7671:2008 incorporating amendment 3:2015, and
11. ILP TR22 (details entered in Inspection Form)

Electrical inspection and testing shall be carried out by qualified electricians.

#### **5.4 Lighting Performance**

Lighting performance assessment shall be carried out by the Consultant.

The measurement of light output from the installation on each bridge shall be performed in accordance with BS EN 13201-4 *Road lighting. Methods of measuring lighting performance*. This shall be compared to the current expected class of lighting derived from:

12. BS5489-1:2013, Code of practice for the design of road lighting Part 1: Lighting of roads and public amenity areas, and
13. BS EN 130201-2:2003 Road lighting - Part 2: Performance requirements.

Lighting performance shall be assessed by:

14. Night time assessment in accordance with The Institute of Lighting Professionals Technical Report TR28: Measurement of road lighting performance on site
15. Desktop lighting assessment where possible will be undertaken using Lighting Reality software package or similar.

A comprehensive report with recommendations shall be provided detailing the existing and required lighting levels in accordance with the above standards.

The Consultant shall provide a comprehensive factual report for each of Hammersmith Bridges luminaires to include, underbridge and decorative feature lighting, brackets, columns and electrical supply locations.

The report shall include the following as a minimum:

16. Details of personnel involved with the survey, including qualifications and experience
17. Details of locations of tests
18. A commentary on the accuracy and limitations of the test methods employed
19. Photographs of the elements inspected, providing both an overview and close-up of investigated areas
20. Results of all NDT together with the Operational Risk Assessment Rating of each asset in accordance with ILP TR22
21. Structural Inspection Forms completed with inspection data from each asset in accordance with ILP TR22
22. Electrical Installation Condition Report in accordance with BS 7671 BS 7671:2008 incorporating amendment 3:2015
23. A report for the bridge detailing the methodology behind the current expected lighting classification derived from BS5489-1:2013, Code of practice for the design of road

lighting Part 1: Lighting of roads and public amenity areas and BS EN 130201-2:2003  
Road lighting - Part 2: Performance requirements

24. Details of existing lighting performance measurement and comparison of attained levels with those required for compliance with current required levels
25. Drawings showing street lighting equipment, cable routes, locations of electrical supplies, pull-in chambers, feeder pillars etc.
26. Street lighting inventory report, including photographs, for all Lighting Units and associated electrical infrastructure, including but not limited to, details of; columns, brackets, luminaires to include underbridge and decorative feature lighting, lamps, wattages, controls, electrical supply, luminaire optical information.

## **APPENDIX 2 – SITE INFORMATION**

### **Table of contents**

<b>Chapter</b>	<b>Pages</b>
1.Introduction .....	77
1.Hammersmith Bridge.....	77
2.Location of Structure .....	77
3.Existing Information.....	78
3.1 Access to existing information on the structure.....	78
3.2 Listing of Structure.....	78
3.3 Historical records and reports.....	78
3.4 Access.....	78
3.5 Drawings and Other Information .....	79
3.6.Stakeholders .....	83
3.7 Hazards and Risks .....	85
3.8 Statutory Apparatus.....	85
Appendix A Location Plan .....	86
Appendix B List of Annual Events Held in Vicinity of Hammersmith Bridge.....	86

### **Tables**

Table 2-1	Grid Reference	77
Table 3-1	List of available documents	78
Table 3-2	List of drawings	79
Table 3-3	List of stakeholders	83

## 1 INTRODUCTION

### 1 Hammersmith Bridge

Hammersmith Bridge

Structure No.: 12/T6

Hammersmith Bridge is a Grade II\* listed structure [owned by London Borough of Hammersmith & Fulham (LBHF)] crossing river Thames linking Hammersmith Bridge Road to Castlenau Road. The bridge is currently restricted to vehicles with a max GVW of 7.5T with an exemption to the emergency services and the public buses (buses up to 12T GVW one at any time in each direction).

Hammersmith Bridge needs a major overhaul as the life of some of the elements of the bridge has expired and require repair/renewal. In addition, TfL has requested to investigate strengthening the bridge to allow double decker buses to use the bridge.

In 2016, a project board consisting of members from TfL, LBHF and London Bridge Engineering Group (LoBEG) agreed to proceed with a strengthening scheme following TfL's integrated project management delivery methodology, Pathway.

Pathway Stage 1 (Outcome Definition) was completed in September 2016 by BAM Nuttall Ltd and their appointed consultant, Arup. The stage 1 report suggests a series of tests and inspections to be completed as part of the stage 2 works to provide the data necessary to produce an accurate model of the structure's current condition and behaviour. The report also summarises previous studies/reports completed on the structure, a chronology of previous works, project risks, stakeholder issues, construction methodology and an estimated cost and programme for various options.

## 2 LOCATION OF STRUCTURE

Hammersmith Bridge is located in West London and crosses the river Thames between Hammersmith in the London Borough of Hammersmith & Fulham and Castelnau, Barnes in the London Borough of Richmond upon Thames.

Hammersmith Bridge carried A306 Hammersmith Bridge Road to Join Castelnau on the Barnes side.

The OS grid references for the bridge is as below:

**Table 2.1 Grid Reference**

Structure Name	OS Grid Reference	London Borough
Hammersmith Bridge	TQ 522956 178069	London Borough of Hammersmith and Fulham

The location plans of the structures are included in Annex A.

### 3 EXISTING INFORMATION

#### 3.1 Access to existing information on the structure

Access to all available information shall be given to the consultant/contractor. All records shall be researched to obtain as much relevant information as possible.

A knowledge capture exercise shall be undertaken to record individual's knowledge and anecdotal evidence.

#### 3.2 Listing of Structure

Hammersmith Bridge is a Grade II\* listed and particular attention is required to comply with the heritage listing requirements.

#### 3.3 Historical records and reports

The inspection and assessment reports listed below are available with this contract uploaded to File Share Drive and additional reports shall be obtained from Employer.

**Table 3.1 List of latest Inspection and Assessment reports**

<b>Latest Inspection Report</b>
ECI Stage 1 Hammersmith Bridge strengthening and refurbishment ver 2.0 – BAM Nuttall/Arup 2016
Principal Inspection 2010 – Halcrow Report No. TBBHFB/R/02 Rev 01
Load Assessment 2013 – Hyder report No.: 5002-UA007052-SBR-01
Addendum Load Assessment 2015 – Hyder report no. 5010-UA007028-UT31R-02
H'smith Bridge Load Test 1997 – Hyder report no. LN00201/DOC1/1
H'smith Bdge investigation of deck surfacing 1995 – RPT report No. L1IH/95/2/report
H'smith Bdge investigation and design of deck replacement panels 1998 – .Hyder
H'smith Bridge timber assessment 2003 – Trada report no TC//F03150
H'smith Bridge Load Assessment Cat 3 check 1996 – Hyder report No RPT/0001/D1/1
Specification for existing paint system - 1994

#### 3.4 Access

The site is accessible from road level and the underside can be accessed from the River Thames and the river tow path.

The Port of London Authority (PLA) is the custodian of the River and all river access must be booked via the PLA in alignment with their procedures. The appointed consultant shall facilitate and liaise with the PLA, adjacent Highway Authorities and other stakeholders for access.

Bridge is weight restricted to 7.5T with an exemption for Midi-buses one in each direction at any one time. Traffic is controlled using width restrictions and bus barriers at both approaches to the bridge.

The Highway Authority for the bridge and 100 yards beyond the south side of the bridge is London Borough of Hammersmith & Fulham. The Highway Authority south of the bridge is London Borough of Richmond. The width restriction and the barriers on the south side of the bridge are located within London Borough Richmond's Highway.

Appointed Consultant/Contractor shall liaise with Historic England to comply with their requirements relating to the heritage status of the bridge.

A number of events takes place in the vicinity of the bridge annually and the Consultant/Contractor shall note and take measures to accommodate the events and avoid conflict with the events as much as possible. A table of planned events that London Borough of Hammersmith & Fulham is aware of are listed in Appendix B of this Annex 2 ITT Volume 2.

### 3.5 Drawings and Other Information

The following tables schedule the drawings available on File Share Drive .

**Table 3.2 List of drawings – General Arrangements for this tender**

Drawing No	Title	Date
82440/184/1	General arrangement	Apr-15
82440/185/1	General arrangement of existing bridge	May-15
82440/187/1	General arrangement drawing No. 3 - Navigable channel	May-15
82440/186/1	Location & setup of Deck Panels - Sheet 1 of 2	May-15
82440/186/2	Location & setup of Deck Panels - Sheet 2 of 2	May-15

**Table 3.3 List of Drawings – Contract 1 strengthening 1996 - 97**

Drawing No	Title	Date
LN00221/C/002	Typical cross section through bridge deck	Oct-97
LN00221/C/003	Existing details of typical downstream walkway cantilevers	Oct-97

LN00221/C/004	Existing details of typical upstream walkway cantilevers	Oct-97
LN00221/C/005	Girder connections rivet replacement detail – sheet 1 of 2	Oct-97
LN00221/C/006	Girder connections rivet replacement detail – sheet 2 of 2	Oct-97
LN00221/C/008	Cantilever plating details	Oct-97
LN00221/C/009	Footway cantilevers typical remedial details – sheet 1 of 4	Oct-97
LN00221/C/010	Footway cantilevers typical remedial details – sheet 2 of 4	Oct-97
LN00221/C/011	Footway cantilevers typical remedial details – sheet 3 of 4	Oct-97
LN00221/C/012	Footway cantilevers typical remedial details – sheet 4 of 4	Oct-97
LN00221/C/013	Girder connections rivet replacement cross girder Nos 1, 18, 19, 68, 69 and 86	Oct-97

**Table 3.4 List of Drawings – Contract 2 strengthening 1997-98**

<b>Drawing No</b>	<b>Title</b>	<b>Date</b>
LN00221/T/100	General arrangement – existing bridge - sheet 1 of 4	Dec-97
LN00221/T/102	General arrangement – existing bridge - sheet 3 of 4	Dec-97
LN00221/T/103	General arrangement – existing bridge - sheet 4 of 4	Dec-97
LN00221/T/104	General arrangement – existing bridge – grid reference system	Dec-97
LN00221/T/200	Hammersmith tower bearings – general notes	Dec-97
LN00221/T/201	Hammersmith tower bearings – existing bearings – general arrangement	Dec-97
LN00221/T/202	Hammersmith tower bearings – replacement bearings – general arrangement	Dec-97
LN00221/T/203	Hammersmith tower bearings – replacement bearings – details of new fabrication bracket	Dec-97
LN00221/T/300	Stiffening truss – general notes	Dec-97
LN00221/T/301	Stiffening truss – existing truss – sheet 1 of 2	Dec-97
LN00221/T/302	Stiffening truss – existing truss – sheet 2 of 2	Dec-97
LN00221/T/303	Stiffening truss – main span – existing details	Dec-97
LN00221/T/304	Stiffening truss – side span - Hammersmith side – existing details	Dec-97
LN00221/T/305	Stiffening truss – side span - Barnes side – existing details	Dec-97
LN00221/T/306	Stiffening truss – main span – strengthening details	Dec-97
LN00221/T/307	Stiffening truss – side span - Hammersmith side –	Dec-97

	strengthening details	
LN00221/T/308	Stiffening truss – side span - Barnes side – strengthening details	Dec-97
LN00221/T/309	Stiffening truss – new details – sheet 1 of 3	Dec-97
LN00221/T/310	Stiffening truss – new details – sheet 2 of 3	Dec-97
LN00221/T/311	Stiffening truss – new details – sheet 3 of 3	Dec-97
LN00221/T/400	Hanger articulation – general notes	Dec-97
LN00221/T/401	Hanger articulation – location plan and existing details	Dec-97
LN00221/T/402	Hanger articulation – details of existing hangers	Dec-97
LN00221/T/403	Hanger articulation – locations of replacement hangers	Dec-97
LN00221/T/404	Hanger articulation – replacement hanger type 1 & 2 sheet 1 of 3	Dec-97
LN00221/T/405	Hanger articulation – replacement hanger type 3 & 4 sheet 2 of 3	Dec-97
LN00221/T/406	Hanger articulation – replacement hanger type 5 & 6 sheet 3 of 3	Dec-97
LN00221/T/407	Hanger articulation – new details – sheet 1 of 2	Dec-97
LN00221/T/408	Hanger articulation – new details – sheet 2 of 2	Dec-97

**Table 3.5 List of Drawings – Contract 3 strengthening 1998-2000**

<b>Drawing No</b>	<b>Title</b>	<b>Date</b>
LN00221/T/500	Pier and Abutment repairs – genral Notes	Feb 99
LN00221/T/01	General arrangement – existing bridge - sheet 3 of 4	Feb 99
LN00221/T/502	General arrangement – existing bridge - sheet 4 of 4	Feb 99
LN00221/T/601	General arrangement existing bridge Gulleys, Expansion Joint	Feb 99
LN00221/T/602	General Arrangement existing bridge - typical footway details	Feb 99
LN00221/T/603	General arrangement – typical footway details	Feb 99
LN00221/T/700	Ne Road Markings, Road studs, Typical section	Feb 99
LN00221/T/701	General arrangement – Sub-deck Panel Layout	Feb 99
LN00221/T/702	General arrangement – Sub-deck Panels	Feb 99
LN00221/T/703	Existing and New Sub-deck unit connection Details	Feb 99

LN00221/T/801	Deck Replacement - New Plywood Panels	Feb 99
LN00221/T/802	Deck Replacement – Typical Details of Plywood Panels	Feb 99
LN00221/T/901	Deck Replacement – New Rubber Backed Steel Panel Options	Feb 99
LN00221/T/902	Details of Rubber backed steel Panel option	Feb 99
LN00221/T/903	Deck Replacement – Typical details of steel panels	Feb 99
LN00221/T/950	Rivet Replacement Details	Feb 99
LN00221/T/951	Cantilever Plating Details	Feb 99
LN00221/T/952	Footway Cantilever – typical remedial – sheet 1	Feb 99
LN00221/T/953	Footway Cantilever – typical remedial – sheet 2	Feb 99
LN00221/T/954	Footway Cantilever – typical remedial – sheet 3	Feb 99
LN00221/T/955	Footway Cantilever – typical remedial – sheet 4	Feb 99
LN00221/T/401	Hanger articulation – location plan and existing details	Feb 99

**Table 3.6 Lists of Drawings – Street Lighting 1998-2000**

<b>Drawing No</b>	<b>Title</b>	<b>Date</b>
D/1048/1	Main Distribution Equipment Layout	Dec-98
D/1048/2	New Distribution Board DB3	Dec-98
D/1048/3	New Distribution Board DB4	Dec-98
D/1048/4	New Distribution Board DB5	Dec-98
D/1048/5	New Distribution Board DB6	Dec-98
D/1048/6	New Distribution Board DB7	Dec-98
D/1048/7	New Distribution Board DB8	Dec-98
D/1048/8	Bridge Lighting Layout - Sheet 1 of 2	Dec-98
D/1048/9	Bridge Lighting Layout - Sheet 2 of 2	Dec-98
D/1048/10	Miscellaneous Details	Dec-98
D/1048/11	Location Plan	Dec-98

**Table 3.7 List of Drawings – Bridge Painting BS Colours 1994**

Drawing No	Title	Date
82440/30/2	Colour scheme for repainting of towers and abutments	May-94

### 3.6 Stakeholders

**Table 3-3 List of relevant stakeholders**

Stakeholder (Organisation)	Stakeholder (Department)	Contact Details
COLT		
Geo / Fisher German		
Sporting Use		Via PLA
The Boat Race		Via PLA
Transport for London		
Verizon		
Vodafone		
Watermen and Lightermen		Via PLA
Zayo		
BSkyB		
BT		
National Grid Gas		
Private Passenger Services		Via PLA
Rowing Clubs		Via PLA
Thames Water	Supply	
Thames Water	Sewage	
Transport for London	Taxis	Nicole Harris
Transport for London	Cycling	
Transport for	River Services	

London		
Virgin		
Transport for London	Strategic Traffic	[REDACTED]
Transport for London	Pedestrians	
Transport for London	Better Routes and Places	
Transport for London	Highways	[REDACTED]
Environment Agency		[REDACTED]
LFB		169 Union Street, SE1 0LL, 020 8555 1200
London Ambulance Service		220 Waterloo Road, SE1 8SD, [REDACTED] [REDACTED]
PLA	Deputy Harbour Master Upper	[REDACTED] Suite 417, EC3N 1LS, 01474 562516, [REDACTED]
Thames Tideway		The Point, W2 1AF
Transport for London	Bus Network	[REDACTED]
Transport for London	Bus Operations	[REDACTED] See Bus Ops Functional Map
Transport for London	Freight	
Police	River Division	[REDACTED]
Transport for London	Network Impact	[REDACTED]
Hammersmith and Fulham	EHO	
Hammersmith and Fulham	Planning	
Hammersmith and Fulham	Traffic Management	[REDACTED] Town Hall, W6 9JU, [REDACTED]
Wandsworth	Traffic Management	[REDACTED] The Town Hall, SW18 2PU, [REDACTED], [REDACTED]
Richmond	Traffic Management	Transport Planning, Civic Centre, RW1 3BZ, [REDACTED] [REDACTED]
Richmond	Street Trading	

Richmond	EHO	[REDACTED]
Richmond	Traffic Management	Transport Planning, Civic Centre, RW1 3BZ, [REDACTED] [REDACTED]
Richmond	Street Trading	
Richmond	EHO	[REDACTED]
Richmond	Traffic Management	Transport Planning, Civic Centre, RW1 3BZ, [REDACTED] [REDACTED]
St Pauls School		
Residents		

### 3.7 Hazards and Risks

In addition to the hazards and risks normally associated with the types of work detailed in this specification, the Consultants/Contractor and their subcontractors shall consider the following significant residual risks whilst planning and undertaking the works:

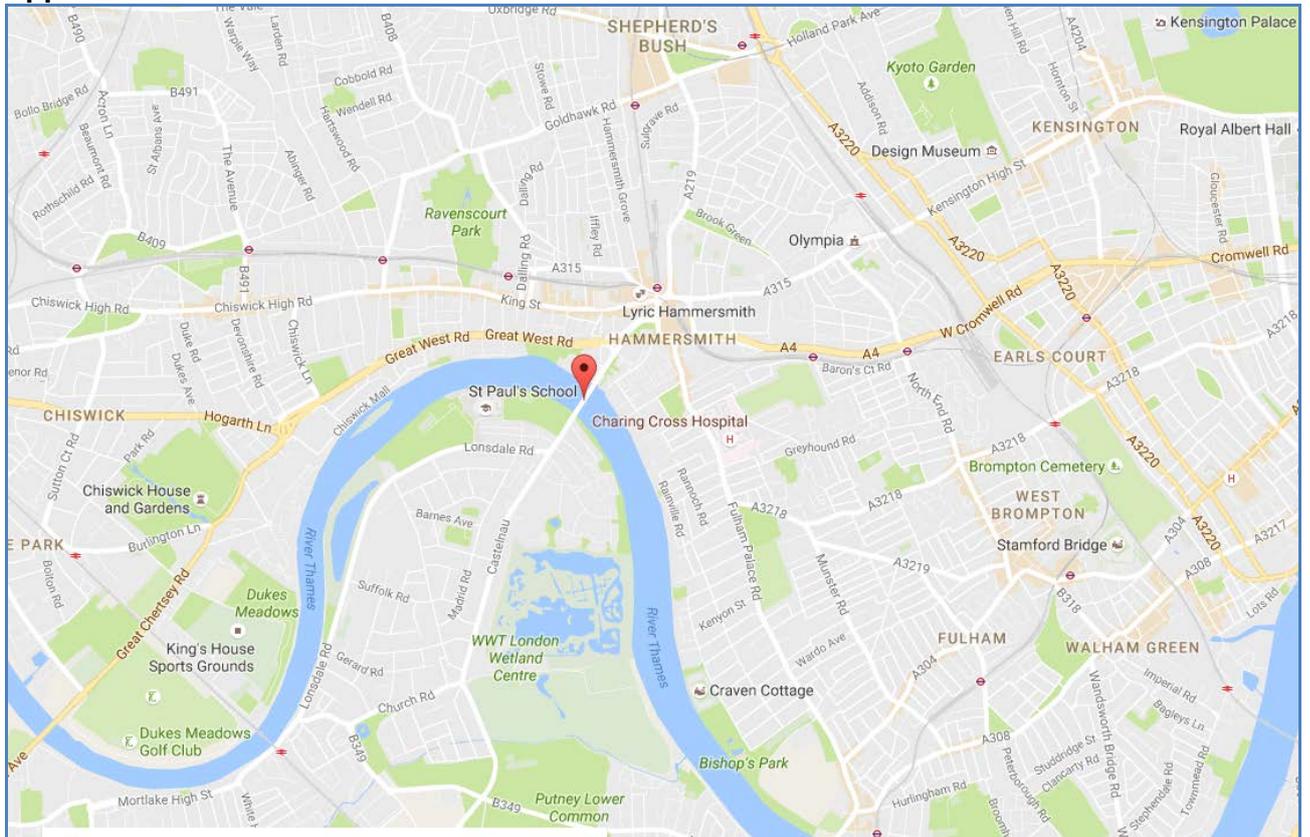
- Vehicular, pedestrian, river and cycling traffic
- Tidal changes and river flows
- Working at height, including roped access
- Bird droppings
- Confined spaces
- Drowning
- Lead and heavy metal content in existing paint
- Interface with services
- Presence of asbestos
- Manual handling

The above list is not exhaustive and care should be taken to maintain the safety of the public, workforce, environment, security and infrastructure.

### 3.8 Statutory Apparatus

The Consultant shall comply with the various statutory bodies' requirements.

## Appendix A – Location Plan



## APPENDIX B – LIST OF ANNUAL EVENTS HEDL IN THE VICINITY OF HAMMERSMITH BRIDGE

<b><u>Hammersmith &amp; Fulham</u></b>			
<b><u>Name</u></b>	<b><u>Month</u></b>	<b><u>Location</u></b>	<b><u>Affected Area</u></b>
Marsden March	March	Footway Only	Sttanford Bridge to Putney Bridge
The Boat Race	April	Along the River Thames	Along the River Thames
Putney and Fulham 1/2 Marathon	April	Barn Elms Playing Fields	Rolling Closures Putney to Hammersmith Bridge
Thames Bike Ride	May	Along the River Thames	Carnwath Road to Putney Bridge
Aegon Tennis Championships	June	Queens Club , Barons Court	CPZ D
Polo in the Park	June	Hurlingham Park	Hurlingham Road, Broomhouse Lane
Ride London	July	A4 and roads south of Borough	All roads south of A40

Fulham Football Club	August-May	Craven Cottage - Stevenage Road	Stevenage Road, Bishops Park Road, Cloncurry Street, Doneraile Street, Ellerby Street, Finlay Street, Greswell Street, Harbord Street, Inglethorpe Street, Kenyon Street
London Bikeathon	August	London Wide	Hammersmith Bridge, Fulham Palace Road, New King's Road
10K Run	Oct/Nov	Start and finish Bishops Park	Fulham Palace Road, Lillie Road, Dawes Road, Fulham Broadway, King's Road, New King's Road,
Remembrance Sunday Parade	November	Shepherd's Bush Green, Parsons Green	Sulgrave Road, Shepherd's Bush Green, Uxbridge Road, Minford Gardens, Church Gate, New Kings Road, Parsons Green

**HISTORICAL EVENTS NOT YET CONFIRMED**

Chelsea FC Victory Parade	May/June	Fulham Road, Hortensia Road, King Road	From Chelsea FC along Fulham Road, down Hortensia Road, King's Road back into Hamersmith
London Bridges Challenge	November	Starts at Chelsea Old Town Hall, Finishes Dickens Inn, crosses all bridges from Albert Bridge to Tower Bridge.	King's road, Oakley Street, Albert Bridge, Chelsea Bridge

## APPENDIX 3 – RISK REGISTER

Risk ID	Risk Name	Cause	Effect	Risk Description	Exposure Start Date	Exposure End Date	Current Risk Score	Current Probability (1 - Low to 5 - High)	Current Impact (1 - Low to 5 - High)	Target Risk Score	Target Probability (1 - Low to 5 - High)	Target Impact (1 - Low to 5 - High)
1	Major London Events	Planned Events on London Road/River network during planned works.	Projects delays, additional costs & high customer impact	Events which would usually cause a low / medium impact on the network are exacerbated by works on bridges, either causing customer delays or require rescheduling of project works.	01-Mar-17	20-Feb-18	9	3	3	6	2	3
2	3rd Party works impact on stage 2 & 3 delivery	3rd party works, either planned or emergency, may occur during planned project delivery.	Projects delays and additional costs.	Major 3rd party works, either planned or emergency, may result in delays to the Project and additional costs	01-Mar-17	20-Feb-18	9	3	3	6	2	3
4	Port of London Authority restrictions on River Working	Restrictions from PLA for river working may affect planned projects.	Delays to the projects. Additional costs. projects de-scoping.	Risk that the Port of London Authority will impose restrictions on the types of works done and delivery methods which impact on the Project.	01-Mar-17	20-Feb-18	12	4	3	9	3	3
5	Conflict with other Projects	Other adjacent projects affect planned works.	Delays to projects and additional costs.	Risk that other TfL/LBHF projects will take priority resulting in delays to planned works.	01-Mar-17	20-Feb-18	9	3	3	6	2	3
7	Bad Weather (severe)	1 in 10 weather event which has not been planned for.	Delays to projects and additional costs.	Significant, unexpected weather periods and weather events during the project delays or complicates works	01-Mar-17	20-Feb-18	8	2	4	6	2	3
9	Section 61 Requirements impact on planned delivery	Onerous Section 61 noise consent conditions affecting programme	Delays to projects and additional costs.	Risk that Section 61 noise requirements will be difficult for the projects to meet in required timescales.	01-Mar-17	20-Feb-18	6	3	2	4	2	2
10	Asbestos	Unexpected discovery of Asbestos during works.	Delays. Additional costs. Health and Safety risk for contractors and public.	Age of bridge means asbestos is likely to be in place and while this can be planned for there is a risk that unexpected asbestos will be discovered.	01-Mar-17	20-Feb-18	3	1	3	3	1	3
11	Lead	Unexpected discovery of Lead during works.	Delays. Additional costs. Health and Safety risk for contractors and public.	Despite full clean and repaint in 1993/94, residue of lead paint may still be present in difficult to access areas of the steel members. Also lead flashing has been used to tops of the towers to seal the hatch and roof.	01-Mar-17	20-Feb-18	8	2	4	6	2	3

12	Heritage Structures	Listed Structure requires Heritage England approvals / time and cost impact on programme.	Additional scope items and costs to projects.	Heritage constraints imposed by the Historic English - more critical than general stakeholders. Bridge is heritage listed Changes resulting in restricted working conditions and other scope requirements for projects.	01-Mar-17	20-Feb-18	12	3	4	6	2	3
15	Insufficient Scope of Works	Scope of works to minimise future repairs, prior to the main works is estimated.	Future works could be required prior to the main works, at additional cost.	If scope of Interim Repairs is minimal, future repair works could be needed prior to the main works which will carry additional cost and reputational damage to TfL/LBHF	01-Mar-17	20-Feb-18	12	4	3	9	3	3
16	Scope Creep	Scope is not fully known due to minimal opportunity for intrusive investigations.	Scope creep once works are commenced on site. Works will need to be prioritised to be completed in the half-term window.	Additional works maybe be added onto contracted works due to unidentified defects.	01-Mar-17	20-Feb-18	16	4	4	12	4	3
18	Limited Contractor , subcontractor and plant capacity	Significant works planned across London with limited availability of contractor and plant capacity.	Delays and additional costs to projects.	Other planned works. Interface and impact could be a risk to the programme. Insufficient capacity with contractors. Restrictions on plant availability due to their projects	01-Mar-17	20-Feb-18	4	1	4	3	1	3
19	Required resource availability	Availability of personnel with the appropriate skills and experience are in short supply.	Delays and additional costs to projects.	Skills shortage leads to lack of available personnel for project, either requiring additional costs for contractors or delays to projects to level resources.	01-Mar-17	20-Feb-18	4	1	4	3	1	3
20	Utilities	Utilities running across the bridge	Dealing with stats on the bridges could lead to diversions and conflicting work	Large number of utilities running across the bridge	01-Mar-17	20-Feb-18	3	1	3	3	1	3
21	Structural Failure (during works)	Sudden failure of structural member delays works and requires major works.	Major delay and additional cost to the project.	Survey of bridges identify it is unsafe and requires further loading restrictions or closure to be implemented.	01-Mar-17	20-Feb-18	10	2	5	5	1	5