



**TRANSPORT FOR LONDON
COMMERCIAL, SURFACE TRANSPORT**

CONTRACT

FOR

**Blackwall Southbound and Rotherhithe Tunnels
Refurbishment – Stage 2 (Feasibility Study)**

BETWEEN

TRANSPORT FOR LONDON

AND

ATKINS LIMITED

Project Reference Number: tfl_scp_001144_co005
Framework Reference Number: TfL 91313

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SECTION 1 – CALL-OFF CONTRACT DATA PART 1 and 2

ATTACHMENT 1 – FORM OF CALL-OFF CONTRACT

THIS AGREEMENT is made the day of 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) Atkins Limited whose registered office is at Woodcote Grove, Ashley Road, Epsom, Surrey, KT18 5BW (“the Consultant”).

WHEREAS:

- (A) This Agreement is made pursuant to a framework agreement between the Parties relating to the provision of professional services dated 4 May 2016 (“the Framework Agreement”).
- (B) The Employer wishes to have provided services as detailed in the Scope (“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;
 - The *Consultant's* Quality Submission and;
 - BIM Protocol
 - Schedule 11A

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 conditions of contract;
- 5.1.3 Third : The Scope
- 5.1.4 Fourth : Any other documents included in this contract.

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.

EXECUTED AND DELIVERED AS

A DEED by

THE CONSULTANT

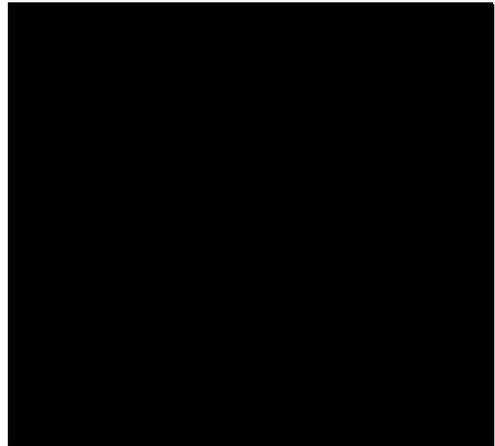
Acting by:

Signature of Director

Print Name of Director

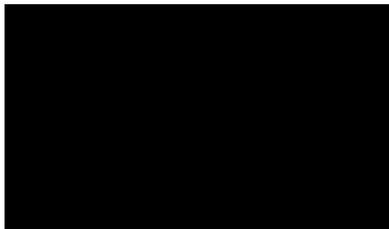
Signature of Director/Secretary

Print Name of Director/Secretary



The common seal of
Transport for London
was affixed to this Deed
In the presence of:

Authorised Signatory



6146

CALL-OFF CONTRACT DATA PART ONE

CALL OFF CONTRACT DATA

Part One - Data provided by the *Employer*

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 **E**, and Secondary Options **X2**, **X10**, **X18**, **X22**, each as may be amended or supplemented by all as attached to the Transport for London Professional Services Framework Agreement.
- The *Employer* is
Name: **Transport for London (which includes its successors in title and assigns)**
Address: **42-50 Victoria Street, London, SW1H 0TL**
- The *Employer's Agent* is
Name: [REDACTED]
Address: **Transport for London, Palestra, 8 floor, 197 Blackfriars Road, London, SE1 8NJ**
- 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 Stage 2 Feasibility Study to provide site survey requirements and specifications, including high level feasibility options, implementation estimate and anticipated programme for the Blackwall Southbound and Rotherhithe tunnels refurbishments.
- The Scope is in 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**
- 2 The Parties' main responsibilities
 - The *Employer* provides access to the following persons, places and things
 - access to *access date*
 - Bridge Station System** **29 May 2017**
(structures and tunnels asset information)
 - ASite** (relevant site information for this project, including contract management activities) **29 May 2017**
 - CDM Datastore System** (structures and tunnels asset information, including highways) **29 May 2017**
- 3 Time
 - The *starting date* is **30 May 2017**
 - The *Consultant* submits revised programmes at intervals no longer than **4 weeks**.
- 4 Quality
 - 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 **2% per annum above the base rate of the Bank of England**.
- 8 Indemnity, insurance and liability
 - The owner control excesses that the contractor is liable for is included in the document titled "Transport for London Proposed Owner Controlled Insurance Cover" in Annex A1 of this document.
 - The amounts of insurance and the periods for which the *Consultant* maintains insurance are

Event	cover	Period following Completion of the whole of the <i>services</i> or earlier termination
Liability of the <i>Consultant</i> for claims made against him arising out of his failure to use the degree of reasonable skill, care and diligence normally used by competent professionals experienced in providing services similar to the <i>services</i> in connection with works of a similar size, scope and complexity to the Works (professional indemnity insurance)	£3,000,000 for each and every claim and in the aggregate per annum	12 years

<p>All sums for which the insured shall become legally liable to pay as damages in respect of death of or injury or illness or disease to third parties and/or loss of or damage to third party property obstruction loss of amenities trespass nuisance or any like cause happening during the period of insurance and arising out of or in connection with the Framework Agreement and each Call-Off Contract</p>	<p>Employer</p>	<p>£10,000,000 any one occurrence and unlimited in the period of insurance. To be maintained for the duration of the project.</p>
<p>Liability for death of or bodily injury to employees of the <i>Consultant</i> arising out of and in the course of their employment in connection with this contract.</p>	<p>£5,000,000 in respect of each claim, without limit to the number of claims</p>	<p>The duration of the contract</p>

Optional statements

- The *completion date* for the whole of the *services* is **27 July 2018**

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

condition to be met

key date

- 1 . **Provide site survey and site investigation requirements and specifications. The *Consultant* will need to provide a schedule covering each scope items detailing the types of investigation or survey required, the level of detail for the investigation and the expected outcome of each investigation.**

09 June 2017

- 2 . **Provide feasibility options, implementation cost and programme. The *Consultant* is to carry out an initial assessment of each scope asset, identify priority items and provide the *Employer* with a cost and programme for implementation.**

13 October 2017

Option E

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

If Option X18 is used

- The end of liability date is **12** years after Completion of the whole of the services.
- The *Consultant's* total liability to the *Employer* for all matters arising under or in connection with this contract, other than the excluded matters, is **£2,000,000**.

If Option X22 is used

- The BIM Protocol is at Schedule 1 of this contract
- The Project is to deliver services in relation to the feasibility stage of Blackwall Southbound and Rotherhithe Tunnels

ANNEX A1

TRANSPORT FOR LONDON

Proposed Owner Controlled Insurance Cover

TYPE: PROJECT INSURANCE (CONSTRUCTION/ERECTION ALL RISKS/DELAY IN COMPLETION/PUBLIC LIABILITY)

ORIGINAL INSURED:

- 1 Department Of Transport
- 2 Transport for London and all its subsidiaries
London Underground Limited and/or its subsidiary companies as Employer.
- 3 As Management Contractors/Construction Manager
- 4 All Contractors and/or Sub-Contractors in any tier as Contractor
- 5 Suppliers/Manufacturers/Professional Consultants for their manual site activities only.

for their respective rights and interests.

THE PROJECT Any Project undertaken by or on behalf of Transport for London

PERIOD: Projects attaching from inception date T B A until 3 years thereafter plus 12 months defects liability maintenance thereafter including testing and commissioning each risk.
Maximum project duration 36 months or as otherwise agreed by Underwriters.
NB . The Owner Controlled Insurance Programme (framework agreement facility) is initially for the period 1st August 2005 to 30th June 2007 and any contracts attaching within that period will run through to completion .

INTEREST: To indemnify the Insured in respect of all risks of physical loss, destruction or damage in respect of any Project incepting during the Period arising from any

cause whatsoever except hereinafter excluded.

SECTION 1 - CONSTRUCTION ALL RISKS

All Risks of Loss or Damage of whatsoever nature to:-

- (a) the permanent and/or temporary works, materials and supplies (including free issue materials provided the value thereof is declared to insurers) and any other property for which the Insured is responsible, intended for use in connection with or for incorporation in the Project by the Insured.
- (b) constructional plant, tools and equipment including spare parts, demountable and temporary buildings and all contents and/or other property, materials, supplies and spares and any other items of a similar kind owned or hired in by the Insured or for which they are responsible, tools and personal effects of Employees of the Insured (Parties 1 & 2) Only as defined in Policy Schedule.
- (c) Employers existing structures including fixtures and fittings not forming part of the Works, and surrounding property

used or intended for use in connection with the Project all being the property of the Insured or for which the Insured is responsible or has instructions to insure anywhere within the Situation including transit by road, rail or inland waterways and Ro-Ro ferries.

SECTION 2 - ADDITIONAL COST OF CONSTRUCTION

In the event of physical Loss or Damage to the Works, Insurers will indemnify the Insured against:

- a) the amount by which the cost of construction of those parts of the Works (being unbuilt or incomplete at the time of such Damage), not suffering such Damage shall exceed, solely by reason of the delay, the cost of such construction had no such Damage occurred.
- b) additional expenditure necessarily and reasonably incurred for the sole purpose of expediting completion of the Project but not

exceeding the additional amount that would have been payable under a) above had such expenditure not been incurred.

SECTION 3 - PUBLIC LIABILITY

To indemnify the Insured against all sums for which the Insured shall become legally liable to pay (whether contractually or otherwise) in respect of or consequent upon:

- (a) death of or bodily injury (including mental anguish and/or shock) death illness and death disease suffered by any person
- (b) loss of or damage to any property including existing/handed over project assets – expecting property more specifically insured under Section 1(c) above.
- (c) obstruction, interference, loss of amenities, nuisance, trespass, stoppage of traffic, infringement of light, easement of quasi easement, denial of access or any like cause

Occurring during the Period and in connection with the Project

SECTION 4 - NON-NEGLIGENCE COVER

To provide cover as required by Clause 21.2.1 of the Standard JCT Conditions of Contract 1980 Edition including 1986 November Amendment if applicable.

SECTION 5 – ADVANCE BUSINESS INTERRUPTION

[As specifically agreed with Underwriters]

If Damage by any cause not excluded occurs at the site of the Project to property comprising the Project or to other property used in connection with its construction and such Damage causes interruption of or interference with the programme for the construction and marketing of the Project.

Insurers will pay to the Employer the amount of the loss resulting from

the interruption or interference.

'The Loss' includes but is not limited to Loss of Advance Revenue/Interest/Rent as applicable and/or Consequential Loss including Additional Interest Charges incurred as a result of Loss or Damage to Property Insured within Section 1 which results in a delay in completion of the Project.

SUM INSURED/LIMIT Section 1 - Construction All Risks (All Parties)

OF INDEMNITY:

- a) GBP tba each contract
- b) GBP 1,000,000 any one occurrence (tba)
- c) As required but up to
First Loss Limit GBP5,000,000

Section 2 - Additional Cost of Construction (Insured 1 & 2 only)

GBP 500,000 any one occurrence but GBP1,000,000 in the aggregate for any one project in any one 12 month period (commencing from inception date).

Section 3 - Public Liability

As require but up to:

GBP 155,000,000 any one occurrence/unlimited

GBP 155,000,000 in the aggregate in any 12 month period from inception date in respect of pollution

Or other amount as may be agreed with Underwriters for particular projects.

Costs and expenses in addition.

Section 4 - 21.2.1.

GBP 10,000,000 any one occurrence

Section 5 - Advanced Business Interruption

GBP: TBA

Indemnity Period: months

EXCESSES

Section 1 –

a) GBP 150,000 each and every other loss or series of losses arising out of loss or damage caused by a defect in design plan specification materials or workmanship in the permanent works (DE5).

b) GBP 10,000 each and every other loss or series of losses

Section 2 – 20% any one loss – minimum GBP 25,000

Section 3 – GBP 10,000 for Third Party Property Damage claims only

Section 4 – 10,000 each and every claim

Section 5 – TBA

The deductibles for all sections to be agreed Leading Underwriter only

SITUATION:

Anywhere in Great Britain, Northern Ireland, the Channel Islands and the Isle of Man and all other countries comprising the European Union but solely in respect of Section 3 and 4, the situation shall be worldwide arising out the project

CONDITIONS:

All as per Policy wording agreed Leading Underwriter only, including but not limited to:-

SECTION 1

- a) Other Interests
- b) Free Issue Materials
- c) Professional Fees Clause - Limit GBP5,000,000
- d) Plans and Documents – Limit GBP 500,000
- e) Debris Removal Clause - Limit GBP5,000,000
- f) Continuing Hire Charges Clause – Limit GBP250,000

- g) Plant Owners Indemnity
- h) Immobilised Plant
- i) Negligent Breakdown
- j) Escalation Clause 15%
- k) Expediting Costs Clause - Limit GBP5,000,000
- l) Where and to the extent required by the Insured's contract conditions, this Insurance extends to indemnify the Insured's sub-contractors as Joint Insured
- m) Preventative Costs Clause
- n) Employees Tools and Personal Effects subject to limit of GBP 500 any one employee and excess of GBP 50 each and every loss
- o) Full terrorism exclusion, however buy back insurance in accordance with Pool Reinsurance Company's rules is purchased
- p) Joint Code of Practice (Large Project)
- q) Section 1 excludes temporary building and contents thereof, plant and equipment and employees tools and personal effects, other than those which are the responsibility of Insured Parties 1 and 2.
- r) Public Authorities Clause
- s) Munitions Clause
- t) Marine 50/50.

SECTION 3

- a) Indemnity to Other Persons
- b) Contractual Liability
- c) Other Costs (Fatal Accident Inquiries and rail accident enquiries under Health & Safety at Work Act legislation etc.)
- d) Health and Safety at Work Act Defence Costs
- e) Motor Contingent Liability
- f) Rented Premises Clause
- g) Plant Owners Indemnity
- h) Cross Liabilities Clause
- i) Worldwide Jurisdiction excluding USA/Canada arising out of Project activities
- j) Data Protection Act 1998 liability and defence costs
- k) Compensation for Court Attendance

- l) Unauthorised Movement of Vehicles
- m) Sudden and Accidental Pollution Clause Limit of indemnity in the aggregate.
- o) Excluding asbestos
- p) Excluding terrorism (Option to buy-back subject to market availability)
- q) Excluding Professional Indemnity
- r) Corporate Killing / Corporate Manslaughter defence costs.
- s) Advertising Liability - £1,000,000
- t) SRA Contractors & Sub-contractors Joint Insurance clause.
- u) SRA Cancellation clause – 30 days notice.
- v) One times automatic reinstatement of aggregate limit for Pollution for an independent event. Nil additional premium.

SECTION 5

- a) Denial of Access/Exit
- b) Loss of Utilities
- c) Food poisoning
- d) Including Terrorism
- f) Including Advanced Business Interruption arising from Contractors Plant and Equipment.
- g) Other interests

ANNEX A2 – PREAMBLES TO PRICING SCHEDULE

The Pricing Schedule is located in Annex B1.

Preambles

- a. The *Consultant* is required to deliver the services set out in Volume 2, Scope.
- b. All *Consultants'* expenses and the provision of Personal Protective Equipment (PPE) shall be deemed as included in the staff rates in the Pricing Schedule (Annex B1).
- c. All rates shall exclude VAT.
- d. The Pricing Schedule is based on a time based contract and as such the Pricing Schedule is to be completed by providing rates for all individuals charging time.
- e. The *Consultant* shall add extra rows as necessary to Table 1 of the Pricing Schedule to include all named individuals.
- f. The *Consultant* shall include hourly rates of any equipment required in the delivery of the Scope in Table 2 of the Pricing Schedule. Additional rows shall be included as necessary.
- g. The *Consultant* shall include the accommodation (co-located office) cost for any four (4) week period in Statement 1 of the Pricing Schedule. This cost shall be pro-rated for any part thereof.
- h. The *Consultant* shall include the IT equipment cost in Statement 2 of the Pricing Schedule. This cost shall be paid to the *Consultant* as a one-off, lump sum cost within 4 weeks of the second *key date*, and the *Consultant* has demonstrated evidence of purchasing the IT equipment.
- i. Normal day rates shall be 8am to 8pm from Mondays to Fridays inclusive in accordance with the PSF 91313 Professional Services Framework – Multidisciplinary Services. Normal day rates shall be valid for an 8 hour day, and shall be prorated for any part thereof.
- j. Night rates shall be 8pm to 8am Monday to Sunday inclusive. The rates shall be valid for an 8 hour day and shall be prorated for any part thereof.
- k. Weekend rates shall be 8am to 8pm Saturday or Sunday inclusive and any Bank Holiday. The rate shall be valid for an 8 hour and shall be prorated for any part thereof.
- l. Percentage mark-ups for out of hours working shall be entered as additional to the normal day rate. For example, an entry of 50% shall be interpreted as the normal day rate plus an additional 50%. An entry of 0% shall be interpreted as no mark-up on the normal day rate.
- m. Staff Designation/Grades shall match those found in the PSF 91313 Professional Services Framework – Multidisciplinary Services (see Annex A3), and their competencies shall match the descriptions shown. Rates for individual staff shall not exceed the maximum rates under that framework.
- n. Candidates named in the Pricing Schedule shall correspond to the CV(s) included in Quality Submission (A) and correspond to the consultant grade descriptions described in Annex A3.
- o. Day rates are fixed in the Contract for the duration of the commission.

ANNEX A3 – CONSULTANT GRADE DESCRIPTION

Partner/Director

<p>General</p>	<p>For a partnership, a Partner in the practice; for a limited company, any employee who carries the title “Director” (or “Associate Director” or other similar title) and who is normally chargeable to projects. Member of a company generally in overall charge of the management, policy and conduct of the firm’s business including maintaining effective communication channels and is able to commit the company to undertake all major contracts.</p> <p>Responsible for all grades of personnel.</p>
<p>Typical Education /Qualifications and Experience</p>	<ul style="list-style-type: none"> • Hold appropriate professional qualifications applicable to the sub-category commissioned to perform and/or corporate membership of a major institution. • Must have relevant work experience spanning several major programmes. • The ability to demonstrate key involvement in delivering projects of high value and complexity. • Overall responsibility for project(s) and for supervision, control and development of subordinate personnel. • Significant management responsibility and direction within the consultancy including client liaison, specialist skills or experience.
<p>Responsibilities</p>	<ul style="list-style-type: none"> • Develop client relationships. • Review enquiries for consultancy services, prepare fee proposals and negotiate commissions. • Manage and control all the personnel efficiently, and in compliance with all relevant statutory instruments procedures, rules, regulations, standing orders and instructions and the adopted procurement method. • Develop and maintain effective communication channels, between the consultancy and TfL and external contractors and other bodies as necessary. • Ensure that sufficient personnel are assigned for the commission and that they are suitably qualified and motivated to perform the duties allocated to them. • Oversee all commission activities and ensure full adherence. • Comply with all the projects safety and quality assurance procedures and requirements, including audits, and ensure that all consultancy personnel do likewise. • Facilitate and ensure that training needs, both personal and that of the consultancy personnel, are identified and addressed.

Principal Consultant

<p>General</p>	<p>Reporting to Partner / Director. Member of a company who is able to deputise for the Director. The person will have the ability to manage and control teams and ensure that there are sufficient teams of personnel assigned to commissions.</p> <p>Responsible for all grades of consultants and support staff.</p>
<p>Typical Education /Qualifications and Experience</p>	<ul style="list-style-type: none"> • Hold appropriate professional qualifications applicable to the sub-category commissioned to perform and/or corporate membership of a major institution. • Must have relevant work experience spanning several programmes. • The ability to demonstrate key involvement in delivering projects of high value and complexity. • Must have substantial transport experience and technical skills appropriate to the sub-category. • Responsibility for project(s) and for supervision, control and development of junior personnel. • Significant management responsibility and direction within the Consultancy including client liaison, specialist skills or experience.
<p>Responsibilities</p>	<ul style="list-style-type: none"> • Deputise for the Partner/Director on all aspects of the project. • Manage and control a team(s) of consultants effectively and in compliance with all relevant procedures, rules, regulations, standing orders and instructions and the adopted procurement method. • Communicate effectively with other members of the project team and with other TfL departments and external consultants and bodies where necessary. • Ensure that sufficient personnel are assigned for the commission and that they are suitably qualified and motivated to perform the duties allocated to them. • Supervise, control and develop personnel assigned • Ensure that the team's activities meet the objectives of the commission. • Comply with all the project's safety and quality assurance procedures and requirements and ensure that all team members do likewise. • Ensure that all appropriate training, both personal and that the team personnel, is undertaken.

Senior Consultant

<p>General</p>	<p>Reporting to Partner / Director or Principal Consultant. Person holding corporate membership of a professional body recognised by TfL and has the ability to demonstrate key involvement in delivering projects of high value and complexity.</p> <p>Responsible for all grades of consultants and support staff on behalf of the Director/Partner.</p>
<p>Typical Education /Qualifications and Experience</p>	<ul style="list-style-type: none"> • Hold appropriate professional qualifications applicable to the sub-category commissioned to perform and/or corporate membership of a major institution. • Must have relevant work experience spanning several programmes / projects • The ability to demonstrate key involvement in delivering projects of high value and complexity. • Must have substantial transport experience and technical skills appropriate to the sub-category. • Responsibility for project(s) and for supervision, control and development of junior personnel. • Significant management responsibility and direction within the organisation including client liaison, specialist skills or experience.
<p>Responsibilities</p>	<ul style="list-style-type: none"> • Deputise for the Partner/Director or Principal Consultant on all aspects of the Project. • Manage and control a team(s) of consultants effectively and in compliance with all relevant procedures, rules, regulations, standing orders and instructions and the adopted procurement method. • Communicate effectively with other members of the Project Team and with other TfL departments and external consultants and bodies where necessary. • Ensure that sufficient personnel are assigned for the commission and that they are suitably qualified and motivated to perform the duties allocated to them. • Supervise, control and develop personnel assigned • Ensure that the team's activities meet the objectives of the commission. • Comply with all the project's safety and quality assurance procedures and requirements and ensure that all team members do likewise. • Ensure that all appropriate training, both personal and that the team personnel, is undertaken.

Consultant

<p>General</p>	<p>Reporting to Principal Consultant / Senior Consultant. A person with the ability to assist in the management and control of a project team to ensure delivery of the required projects.</p> <p>Responsible for Junior Consultant / administration staff</p>
<p>Typical Education /Qualifications and Experience</p>	<ul style="list-style-type: none"> • Hold appropriate professional qualifications applicable to the sub-category commissioned to perform and/or corporate membership of a major institution. • Must have relevant work experience spanning several projects • Must have some transport experience and technical skills appropriate to the sub-category. • Responsibility for project(s) and for supervision, control and development of junior personnel.
<p>Responsibilities</p>	<ul style="list-style-type: none"> • Deputise for the Principal Consultant/ Senior Consultant on all aspects of the project. • Assist in the management and control of a project team of consultants to ensure efficiency and compliance with all relevant procedures, rules, regulations, standing orders and instructions and the adopted procurement method. • Communicate effectively with other members of the Project Team and with other TfL departments and external consultants and bodies as necessary. • Supervise, control and develop personnel assigned. • Ensure that own and assigned personnel activities meet the objectives of the commission. • Comply with all safety and quality assurance requirements and ensure that all team personnel to likewise • Ensure that all appropriate training, both personal and that of assigned personnel, is undertaken.

Junior consultant

General	Reporting to Senior Consultant/Consultant. A person with the relevant experience capable of working on some aspects of the delivery of the required project. Responsible for support staff.
Typical Education /Qualifications and Experience	<ul style="list-style-type: none">• Must have relevant work experience in at least one completed project.
Responsibilities	<ul style="list-style-type: none">• Assist the Consultant where appropriate.• Supervise the support staff assigned (if appropriate).• Work in compliance and ensure that all assigned personnel comply with all relevant procedures, rules, regulations, standing orders and instructions and the adopted procurement method.• Ensure that own and assigned personnel's activities meet the objectives of the commission.• Comply with all safety and quality assurance requirements and ensure that all assigned personnel do likewise.• Ensure that all appropriate personal training is undertaken.

4.0 CALL-OFF CONTRACT DATA PART TWO

Data provided by the *Consultant*

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

Statements given in all contracts

- The *Consultant* is
.....
Name Atkins Limited.
.....
Address
Woodcote Grove,
Ashley Road,
Epsom,
Surrey
KT18 5BW
- The *key persons* are
(1) Name [REDACTED]
.....
Job Project Director.
.....
Responsibilities Project Assurance and Project Direction
.....
Qualifications BEng (Hons), C.Eng, MICE, IStructE.
.....
Experience 27 years Tunnel Engineering.
.....
(2) Name [REDACTED]
.....
Job Project Manager.
.....
Responsibilities . . . Quality, budget and programme management. .
.....
Qualifications BEng (Hons), C.Eng MICE
.....
Experience 29 years Highways Engineering
.....
- The *staff rates* are found in the Pricing Schedule (Annex B1)

- The following matters will be included in the Risk Register
 - .. Programme risk associated with planning surveys during tunnel closures.
 -
 - ..Health & Safety risk associated with site-based survey work
 -
 - .. Ensuring adequate stakeholder engagement throughout project phase.
 -
 -
 -

SCHEDULE 1 – BIM PROTOCOL

Programme: STRUCTURES AND TUNNELS INVESTMENT PROGRAMME 2 (STIP 2)

Projects: BLACKWALL SOUTHBOUND AND ROTHERHITHE TUNNELS
REFURBISHMENT – STAGE 2 (FEASIBILITY STUDY)

BIM Protocol

TRANSPORT FOR LONDON
BUILDING INFORMATION MODELLING (BIM) PROTOCOL

This protocol is based on the Construction Industry Council Building Information Modelling Protocol (CIC/BIM Pro first edition 2013), the copyright of which belongs to the Construction Industry Council

1. DEFINITIONS

- 1.1 In this Protocol unless the context otherwise requires, the following words and phrases shall have the following meanings:
- 1.1.1 **Agreement** means the agreement or contract between the Employer and the Project Team Member to which this Protocol is attached.¹
 - 1.1.2 **Common Data Environment** shall have the meaning given in the Information Requirements.
 - 1.1.3 **Federated Model** means a Model consisting of connected but distinct individual Models.
 - 1.1.4 **Information Management Role** means a role in connection with the Project which includes, inter alia, the establishment and management of the processes, protocols and procedures set out in the Information Requirements.
 - 1.1.5 **Information Manager** means the person appointed, initially by the Employer and subsequently by the Contractor, to perform the Information Management Role.
 - 1.1.6 **Information Requirements** means the document(s) referred to at Appendix 2 of this Protocol setting out the way in which Models shall be produced, delivered and used on the Project, including any processes, protocols and procedures referred to therein.
 - 1.1.7 **Level of Detail** means the level of detail required for a Model as specified in Appendix 1 attached to this Protocol.
 - 1.1.8 **Model** means a digital representation of part of the physical and/or functional characteristics of the Project
 - 1.1.9 **Model Production and Delivery Table** means the table attached to this Protocol at Appendix 1, as updated from time to time, specifying the subject matter of each Model, the person who is to produce and deliver each Model (described in the table as “Model Originator”) at each Stage and the Level of Detail for each Model at each Stage.
 - 1.1.10 **Other Project Team Member** means any person having responsibilities in relation to the production, delivery and/or use of Models and appointed by the Employer in relation to the Project, excluding the Project Team Member.
 - 1.1.11 **Project** means the project to which the Agreement relates.
 - 1.1.12 **Project Agreement** means any agreement entered into between the Employer and an Other Project Team Member in relation to the Project.
 - 1.1.13 **Project Team Member** means the person appointed by the Employer pursuant to the Agreement.
 - 1.1.14 **Project Team Models** means any Models which Other Project Team Members produce and deliver as specified in the Information and Model Production and Delivery Table and any Federated Models (or any part thereof) produced and delivered by Other Project Team Members.
 - 1.1.15 **Protocol** means this Building Information Modelling protocol including the document(s) referred to at Appendix 1 and 2.

¹ Note: ensure that the Agreement incorporates all schedules and annexures including the Information Requirements

1.1.16 **Specified Models** means the Model or Models which the Project Team Member is to produce and deliver as specified in the Model Production and Delivery Table.

1.1.17 **Stage** shall have the meaning stated in Appendix 1.

2. **PRIORITY OF CONTRACT DOCUMENTS**

2.1 This Protocol forms part of the Agreement.

2.2 In the event of any conflict or inconsistency between a Model prepared and delivered in accordance with this Protocol and any document or information extracted from such Model, except where the Information Requirements states otherwise, the Model shall prevail.

2.3 The terms of this Protocol (including, without limitation, clause 5) shall not limit the Project Team Member's obligations and liabilities under clause [] of the Agreement.
²

3. **OBLIGATIONS OF THE EMPLOYER**

3.1 The Employer shall:

3.1.1 arrange for a protocol in substantially the same terms as this Protocol and for the obligations set out herein, or obligations which substantially reflect the requirements of this Protocol, to be incorporated into all Project Agreements; and

3.1.2 save to the extent that such obligations are within the scope of the Project Team Member's obligations under any other part of the Agreement³:

a ensure that until the end of the Project the Information Requirements and the Model Production and Delivery Table are reviewed and updated at each Stage; and

b ensure that the appointment of the Information Manager shall be changed or renewed as necessary to ensure that there is at all times until the end of the Project a person performing the Information Management Role; and

3.1.3 comply with the Information Requirements.

4. **OBLIGATIONS OF THE PROJECT TEAM MEMBER**

4.1 The Project Team Member shall:

4.1.1 produce the Specified Models (excluding any material forming part of the same which is provided to the Project Team Member by or on behalf of the Employer) to the Level of Detail specified in the Model Production and Delivery Table using all the reasonable skill care and diligence normally used by an appropriate and competent professional designer experienced in producing models similar to the Specified Models in connection with projects of a similar size, scope and

² Note: this optional clause has been included to seek to avoid ambiguity regarding the Project Team Member's responsibility for design if the Agreement imposes single point design responsibility on the Project Team Member (for example, if an NEC3 ECC contract is being used and Secondary Option X21 (Single Point Design Responsibility) is selected). If this clause is used, the appropriate cross reference to the Agreement will need to be inserted.

³ Note: in each case consider whether TfL will be responsible for these actions. If not the wording of this Protocol may need to be amended in consultation with TfL Legal.

complexity and at a similar location to the Project, provided that if the Agreement imposes a higher standard of care such higher standard shall apply;

- 4.1.2 deliver the Specified Models at the Level of Detail specified in the Model Production and Delivery Table at the Stage specified therein and in accordance with the Information Requirements;
- 4.1.3 use the Project Team Models in accordance with any procedures therefor in the Information Requirements;
- 4.1.4 comply with the Information Requirements; and
- 4.1.5 arrange for this Protocol to be incorporated into any sub-contracts that it enters into in relation to the Project to the extent required to enable the Project Team Member to comply with this Protocol.

5. **ELECTRONIC DATA EXCHANGE**

- 5.1 Without prejudice to the Project Team Member's obligations under this Protocol and the Agreement, the Project Team Member does not warrant, expressly or impliedly, the integrity of any electronic data during the course of its transmission via the Common Data Environment, provided that the Project Team Member has transmitted and verified such electronic data in accordance with the Information Requirements.⁴
- 5.2 The Project Team Member shall have no liability to the Employer in connection with any corruption or unintended alteration of the electronic data in a Specified Model which occurs after it has been transmitted to the common data environment and verified by the Project Team Member, in each case in accordance with the Agreement, save where such corruption or alteration is a result of the Project Team Member's failure to comply with this Protocol, the Agreement or its failure to use due skill and care in the transmission or verification of the electronic data.

6. **USE OF MODELS**

- ~~6.1~~ Clause [] of the Agreement shall apply.⁵

7. **TERMINATION**

- 7.1 Clauses 1, 2, 3, 5, and 6 of this Protocol shall continue to apply following termination of the Project Team Member's employment under the Agreement.

⁴ Note: if TFL does not wish to take any risk in connection with the integrity of electronic data transmitted through the common data environment then consider striking out this clause entirely.

⁵ Note: insert reference to the clause(s) in the Agreement which deal with transfer/licensing of intellectual property rights

SECTION 2 – SCOPE

**TRANSPORT FOR LONDON
COMMERCIAL, SURFACE TRANSPORT**

**Blackwall Southbound and Rotherhithe Tunnels
Refurbishment – Stage 2 (Feasibility Study)**

SCOPE

Project Reference Number: tfl_scp_001144_co005
Framework Reference Number: TfL 91313



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- 5.0 WI 500 – PROGRAMME**
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- 5.2 Revised Programme.....
- 5.3 Programme Requirements.....
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- 5.5 Resource and Cost Loading the Programme.....
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- 6.1 Quality Requirements
- 6.2 Quality Management System.....
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- 7.0 WI 700 – NOT USED.....**
- 8.0 WI 800 – MANAGEMENT OF THE SERVICES.....**
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- 8.4 Communications.....
- 8.5 Risk Management.....
- 8.6 Project Meetings.....
- 8.6.1 Risk Reduction Meetings
- 8.6.2 Progress Meetings and Reports
- 8.6.3 Commercial Meetings and Commercial Register
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- 8.6.5 Performance Meetings and Key Performance Indicators
- 8.7 Periodic Progress Report
- 8.8 Cost Management and Estimating.....
- 8.9 Applications for Payment.....
- 8.9.1 Template and categorisation
- 8.10 Lessons Learned
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- 9.1 Sharing the Working Areas with the *Employer* and Others.....
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- 9.3 Authorities.....
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- 9.4 Statutory Undertakers.....
- 9.5 The *Consultant's* Responsibilities.....
 - 9.5.1 General.....
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 - 9.5.3 Utilities Plan.....
 - 9.5.4 Utility Works Using the New Roads & Street Works Act 1991
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 - 10.2 Welfare Arrangements.....
 - 10.3 Facilities/Services Provided by the *Employer*.....
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20.4.3 (BWT-C) Replacement of CCTV System

20.4.4 (BWT-D) Installation of Video Accident and Incident Detection (VAID) System

20.4.5 (BWT-E) Refurbishment/Replacement of Variable Message Signs (VMS)

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20.4.7 (BWT-G) Refurbishment/Replacement of Cabling Infrastructure

20.4.8 (BWT-H) Refurbishment/Replacement of Power Systems

20.4.9 (BWT-I) Refurbishment/Replacement of M&E Infrastructure in Drainage System

20.4.10 (BWT-J) Refurbishment/Replacement of Linear Heat Detection

20.4.11 (BWT-K) Refurbishment/Replacement of Fire Safety Systems



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20.5.7	(RHT-G) Replacement of “Out of Bore” Lighting with LED Luminaires	
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20.5.11	(RHT-K) Upgrading of HV and LV Supply System	
20.5.12	(RHT-L) Replacement of Communication System Cabling (LTRACS)	
20.5.13	(RHT-M) Decommissioning of Flood Gate.....	
20.5.14	(RHT-O) Replacement of CCTV (Traffic) System (inc. in-bore and approaching roads).....	
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Annex 6	Health & Safety Requirements
Annex 7	Feasibility Options Report Content
Annex 8	Standards, specifications and guidance references
Annex 9	TfL Periodic Calendar
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TfL *Employer's* Scope

Section	Scope (<i>Employer's</i>)
WI 100	Description of the works
WI 200	General constraints on how the <i>Consultant</i> Provides the Works
WI 300	Consultant's design
WI 400	Completion
WI 500	Programme
WI 600	Quality assurance
WI 700	Tests and inspections
WI 800	Management of the works
WI 900	Working with the <i>Employer</i> and Others
WI 1000	Services and other things to be provided
WI 1100	Health and safety
WI 1200	Subcontracting
WI 1300	Not used
WI 1400	Acceptance or procurement procedure
WI 1500	Accounts and records
WI 1600	Not used
WI 1700	Not used
WI 1800	Not used
WI 1900	Not used
WI 2000	<i>Employer's</i> work specifications
WI 2100	<i>Employers</i> information requirements (BIM)



0.0 Definitions

3D	Three Dimensional
ALARP	As Low As Reasonably Practicable
ARM	Active Risk Manager
BEP	BIM Execution Plan
BIM	Building Information Modelling
BoQ	Bill of Quantities
BWT SB	Blackwall Tunnel Southbound
CDE	Common Data Environment
CDM	Construction (Design and Management) Regulations
ECI	Early Contractor Involvement
EDMS	Electronic Data Management System
EFC	Estimated Final Cost
EIR	<i>Employer's</i> Information Requirements
HORUS	A supervisory control and data acquisition system (SCADA)
ITT	Invitation to Tender
IMPDT	Information and Model Production and Delivery Table
LoHAC	London Highways Alliance Contract
M&E	Mechanical and Electrical
NDT	Non-destructive Testing
NRSWA	New Roads and Streets Works Act
PCI	Pre-construction Information
PPMP	Pathway Product Management Plan
QRA	Quantitative Risk Analysis
RAMS	Risk Assessment Method Statement
RHT	Rotherhithe Tunnel



SCADA	Supervisory Control and Data Acquisition
SDR	Scope / Design Review
STIP2	Structures and Tunnels Investment Programme 2
TAA	Technical Approval Authority
TDSCG	Tunnel Design Safety and Consultation Group
TfL	Transport for London
TM	Traffic Management
TMA	Traffic Management Act
TLRN	Transport for London Road Network
VfM	Value for Money
WLC	Whole Life Cost



1.0 WI 100 – Description of the Services

1.1 General Description of the Services

Structures and Tunnels Investment Portfolio 2 (STIP2)

TfL is doubling investment in its roads infrastructure over the next 10 years. The Structures and Tunnels Investment Programme 2 (STIP 2) shall deliver part of this investment to bring the Transport for London Road Network (TLRN) structures and tunnels up to a state of good repair and address risks to safety, functionality and environment.

STIP2 comprises the following six projects:

1. Lambeth Bridge Refurbishment
2. Vauxhall Bridge Refurbishment
3. Rotherhithe Tunnel Refurbishment
4. Blackwall Tunnel Southbound Refurbishment
5. Westway Structures Refurbishment
6. Brent Cross Structures Refurbishment

This document pertains to the refurbishment of two tunnels: Blackwall Tunnel Southbound (BWT-SB) and Rotherhithe Tunnel (RHT).

Blackwall Tunnel Southbound is a two lane carriageway road tunnel on the A102 which spans 1174m between portals and connects the Blackwall district of Poplar in the Borough of Tower Hamlets north of the River Thames to the Peninsular district in the Borough of Greenwich south of the River Thames.

Rotherhithe Tunnel is a road tunnel on the A101 which spans 1483m between portals and connects the Ratcliff district of Limehouse in the Borough of Tower Hamlets north of the River Thames to Rotherhithe in the Borough of Southwark south of the River Thames.

Information relating to the existing M&E assets is provided in Bridge Station, including a schedule of the available as-built information.

1.2 Pathway Stages

The *Employer* follows an integrated project management delivery methodology, Pathway. Pathway comprises of seven stages as set out below.

- Stage 1 – Outcome Definition
- Stage 2 – Feasibility
- Stage 3 – Concept Design
- Stage 4 – Detailed Design
- Stage 5 – Delivery
- Stage 6 – Project Close
- Stage 7 – Benefits Realisation



This commission relates to Stage 2 Feasibility (including survey, investigation and testing) only. New commissions may be let for future stages.

1.3 Strategic Project Objectives

- Eliminate or reduce unacceptable safety and functional risks; Upgrade essential safety equipment. (for both tunnels)
- Prevent increase in future lifecycle costs; Preventative maintenance interventions to prevent further degradation. (for both tunnels)
- Minimise reactive maintenance requirements and ongoing costs; Upgrade essential M&E equipment. (for both tunnels)
- Reduce operating costs by installation of energy efficient LED lighting; (for both tunnels)
- Ensure ventilation systems are sufficient for a 100MW fire, which is the minimum acceptance level for TfL, (for Blackwall Tunnel only)
- Upgrade and reconfiguration of ventilation system to meet current standards; (for both tunnels)

The key objectives for this stage of the project are:

1. Carry out site surveys to gain a better understanding of the type, condition, cable routes, installation dates, test performance, residual life and dependencies of the refurbishment items listed in WI100 (1.4) and (1.5).
2. Determine whether the strategic project objectives are achievable, develop options for their delivery and recommend a single option that will deliver the best value.
3. Establish robust cost estimates and programme to deliver the options to fulfil the project objectives for Stage 3 (Concept) to 5 (Delivery).

1.4 Project Scope - Blackwall Tunnel Southbound (BWT-SB)

The scope of the Blackwall Tunnel Southbound project comprises of the following refurbishment items which have been identified through the lifecycle plan as requiring refurbishment / replacement within the next 10 years.



1.4.1 Scope items

Scope Reference	Scope Title
BWT-A	The ventilation system is upgraded to ventilate a 100MW fire
BWT-B	Replacement of the existing lighting arrangement with Light-Emitting Diode (LED) luminaires
BWT-C	The CCTV system is replaced
BWT-D	Video Accident and Incident Detection (VAID) installed
BWT-E	Refurbish/Replace Variable Message Signs (VMS) Tunnel Lane Control Signs (TLCS) and Wayfinding Signs
BWT-F	Decommission Flood Gates
BWT-G	Refurbish/Replace cabling infrastructure
BWT-H	Refurbish/Replace power systems
BWT-I	Refurbish/Replace M&E infrastructure in drainage systems
BWT-J	Refurbish/Replace linear heat detection
BWT-K	Refurbish/Replace fire and safety systems
BWT-L	Refurbish/Replace Heating Ventilation and Air Conditioning (HVAC) in tunnel service buildings
BWT-M	Refurbish/Replace Electricity Distribution Points (EDPs)
BWT-N	3D model creation
BWT-O	Refurbish/Replace Radio System
BWT-P	Refurbish/Replace Loudspeaker Public Address
BWT-Q	Remove Maintenance Telephones

1.5 Project Scope - Rotherhithe Tunnel (RHT)

The scope of the Rotherhithe Tunnel project comprises of the following refurbishment items which have been identified through the lifecycle plan as requiring refurbishment / replacement within the next 10 years.

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- In Confidence -



1.5.1 Scope items

Scope Reference	Scope Title
RHT-A	Upgrade of LED Lighting & Replacement of Structural Support System
RHT-B	Replacement of Fire Main System
RHT-C	Provision of Resilient Power Supply
RHT-D	Upgrade and Reconfiguration of Ventilation System
RHT-E	Replacement of Linear Heat Detector
RHT-F	Replacement of Emergency Wayfinding Signs
RHT-G	Replacement of "Out of Bore" Lighting with LED Luminaires
RHT-H	Renewal of Drainage System – Pipes, Valves, Pumps and Control Systems within the Pump Room
RHT-I	Replacement of Public Announcement System, Emergency Roadside Telephone and Radio Systems and Removal of Maintenance Telephone System.
RHT-J	Renewal of Plant Room's Heating, Ventilation and Air-Conditioning (HVAC)
RHT-K	Upgrading HV and LV Supply System
RHT-L	Replacement of Communication System Cabling (LTRACS)
RHT-M	Decommissioning of Flood Gates
RHT-N	3D Model Creation
RHT-O	Replacement of CCTV (Traffic) System (inc. in-bore and approach roads)
RHT-P	Installation of Video Accident and Incident Detection (VAID) System
RHT-Q	Installation of Emergency Distribution Panels (EDPs)
RHT-R	Replacement of Fire Detection, Suppression and Monitoring System
RHT-S	Replacement of Cable Rack in Sub-Tunnel



RHT-T	Cable Management in Tunnel / Sub-Tunnel / Vent Shafts
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1.6 The *Consultant's* responsibilities

The *Consultant* shall take on the roles of Principal Designer as required by the CDM2015 requirements. The Project Team & *Employer's* organisation chart can be found in Annex 2.

The *Consultant's* work under this commission shall ensure economic, safe and timely completion of the project. The *Consultant's* major duties shall include the following:

- Developing specifications for testing, surveys and investigations.
- Witnessing testing, inspections and surveys.
- Producing factual reports for inspections, surveys and investigations undertaken by *Consultant*.
- Producing interpretive reports for inspections, surveys and investigations for all inspections.
- Appraising potential solutions, which enable the desired outcomes and benefits to be delivered, with particular focus on buildability, cost and programme.
- The consultant will undertake Cloud and Topo S surveys to create and build the 3D model as defined in the Employers Information Requirements (EIR). Access and Traffic Management will be provided by the Employer.
- Updating 3D models for use in the development of feasibility outline design in line with Better Information Management (BIM) requirements.
- Identifying constraints and dependencies.
- Identifying and appraising potential solutions which enable the desired outcomes and benefits to be delivered (Feasibility Study).
- Developing cost estimates and programme for each option.
- Identifying and analysing design risk and opportunities.
- Liaison and collaborative working with contractors procured for Stage 2.
- Producing Feasibility Report.
- The *Consultant* shall work collaboratively with the employers contractor
- The *Consultant* will be expected to provide the *Employer* with the requirements, specifications and standards of the site investigations in order to obtain the information needed to develop the feasibility and option study.

1.7 Detailed description of work to be carried out by the *Consultant*



The *Consultant* shall be responsible for identifying the extent of any Services planned to be carried out in Stage 2. They shall also utilise this period to familiarise themselves with the established tunnel operating regime to allow this information to be included in their construction proposals. The *Consultant's* work under this commission shall ensure economic, safe and timely completion of the project, activities shall include:

- a. The *Consultant* shall submit a contract execution plan for TfL's approval. The Plan shall provide details of any other information that the *Consultant* considers essential for the successful completion of the project, a project programme, a description of *Consultant's* proposed method for executing the commission as well as details of the *Consultant's* staff.
- b. The *Consultant* shall submit a quality plan that demonstrates that the requirements contained within W12000 have been fully understood and;
 - i. that appropriate resources shall be deployed on the project and,
 - ii. that there will be adequate management control throughout the progress of the commission.
- c. The *Consultant* shall engage with all internal and external stakeholders as detailed in the stakeholder engagement plan.
- d. The *Consultant* shall prepare a Feasibility Report to recommend the scope of works to be taken forward to the next design stage.
- e. The *Consultant* shall prepare cost estimates and update their forecast of overall expenditure on the project.
- f. The *Consultant* shall undertake the role and duties of the Principal Designer for the project as required by CDM 2015 Regulations.
- g. The *Consultant* shall attend Progress Meetings with TfL, which will be held at regular intervals during the course of the commission.
- h. The *Consultant* shall complete surveys, studies, and assessments in accordance with current good practice, as detailed in the most recent publications of relevant documents for this work including, but not limited to:
 - i. The Design Manual for Roads and Bridges BD78/99 (DMRB);
 - ii. The Manual of Contract Documents for Highway Works (MCHW); and
 - iii. Operation and Maintenance Manual, where available
 - iv. Refer to Annex 8 for reference list of standards, specifications and guidance.
- i. The *Consultant* shall produce feasibility options following liaison with the TfL Technical Approval Authority (TAA), and TfL Subject Matter Experts. During the development of the investigations and testing, the details of the tunnel structures, communications and



mechanical and electrical equipment will become more apparent, and any uncertainties shall be resolved.

The *Consultant* shall liaise with the Principle Contractor for tunnel access.

- j. The *Consultant* shall define testing, monitoring or investigation required in Stage 2.
- k. The Employer will commission a Contractor (Employer's Contractor) to undertake intrusive site investigations, surveys and testing in line with the Consultant's specifications and recommendations.
- l. For the purposes of CDM regulations, the designated LoHAC Contractor is Kier, who will be the designated Principal Contractor for all site works.

1.8 Project Workshops

1.8.1 Mobilisation Workshop

A mobilisation workshop shall be arranged by the *Employer* within 2 weeks of the *Start Date*. Prior to this workshop, the *Consultant* shall complete their review of the available documentation for surveys, investigations and testing to be undertaken as described in Section 20 (WI 2000) of this document. The aim of the workshop is to:

- Discuss and agree the remit of the surveys, investigations and testing, including any necessary consents and approvals required
- Discuss key stakeholder engagement requirements
- Discuss key risks and opportunities
- Discuss significant health, safety and environmental issues
- Discuss and agree the baseline programme schedule

1.8.2 Feasibility Options Workshop

The *Consultant* shall arrange a Feasibility Options Workshop with the *Project Manager* and other Key Stakeholders in order to ensure the feasible options are relevant to the *Employer* and acceptable to the TfL (TAA) team. The aim of this workshop is to:

- Ensure options are relevant to TfL and acceptable to TAA.
- Evaluate the survey data
- Consider temporary or enabling works requirements at implementation
- Provide justifications, advantages and disadvantages on each options
- Identify risks and opportunities



1.8.3 Feasibility Review Workshop

A Feasibility Review workshop shall be arranged by the *Consultant* towards the end of Stage 2 after the feasibility options report has been produced. Prior to this workshop, the *Consultant* shall complete their review of the feasibility options identified in the report. The aim of this workshop is to:

- Assess and evaluate the feasibility options with regards to:
 - Buildability and construction
 - Cost and programme schedule
 - Disruption to traffic, river and other modes of transport
 - Disruption to stakeholders
 - Whole life costings
 - Maintenance requirements
- Recommend preferred options or solutions for each of the refurbishment items identified in WI. 2000.
- Ensure that the proposed options provide value for money.

1.8.4 Lesson Learned Workshop

- Within 28 days of completion the *Consultant* and the *Project Manager* shall attend a lessons learned workshop, chaired by the *Project Manager*, to identify and record successes and failures during the project to ensure continuous improvement.

1.9 Cost Estimates

The *Consultant* will provide a cost estimate directly linked to the works programme. The costs will be broken down into the suggested headings:

- mobilisation setup
- site surveys
- staff allowance
 - desktop study
 - cost & programme
 - feasibility report.



The price and programme must be accompanied by a commentary to inform the *Project Manager* of the logic behind the build up.

The *Consultant* shall provide a staff cost allowance which must clearly show a breakdown of costs for each activity / item for each phase.

The *Consultant* shall submit all costs of staff (via time sheets) and any expenses to be received by the *Employer* on a weekly basis after the cost has incurred.

The *Consultant* shall provide an expenditure profile for the duration of the contract.

The *Consultant* shall assist the *Project Manager* with the calculation of Value of Work Done (VOWD) within the period. Any variations against the planned expenditure profile shall require a justification narrative.

The Consultant is expected to provide specifications and high level costs for later stages as part of the stage 2 deliverables. The *Consultant* shall work collaboratively with Employer's Contractor to provide Stage 3 to 5 design and implementation requirements, including cost and programme estimates for each feasible option of the refurbishment items and any temporary / enabling works.

1.10 BIM Requirements

Information on the BIM requirements can be found in Annex 4.

1.11 3D Model Requirements

The *Consultant* shall produce a 3D model at Stage 2 for the full life cycle of the project which shall include detail of the tunnel approaches, cut & cover sections, main bore, sub tunnel ventilation shafts and ventilation buildings/compounds.

Information from Stage 2 shall be input into the model as defined in the BIM requirements by the *Consultant*.

Additional information relating to the 3D Model requirements can be found in Annex 4.

1.12 Legislation

Include a list of applicable legislation to the contract. This list should comprise at least the following:

- Crime and Disorder Act 1998
- Construction (Design and Management) Regulations 2015 (CDM)
- New Roads and Streetworks Act 1991 and the Traffic Management Act 2004
- Housing Grants Construction and Regeneration Act Part II
- Crime & Disorder Act 1998



- Bribery Act 2010

1.13 Stakeholder Engagement

The *Project Manager* and *Consultant* shall manage stakeholder engagement as detailed in the Communications Stakeholder Engagement Strategy which can be found in Annex 5.



2.0 WI 200 – Constraints on Providing the Services

2.1 Constraints

The *Employer* requires that the *Consultant* take the following constraints into account when managing the Services:

- The TfL Lane Rental Scheme (TfL LRS) and permitted working hours
- Mayor's Roadworks Pledge
- Co-ordination with Statutory Undertakers
- Maintaining traffic flows on carriageways
- Delivery/storage of materials and spoil whilst maintaining traffic/pedestrian flow
- Noise pollution and the permitted hours for noisy works
- Control of noise, vibration, dust and mud
- Maintaining safe access to all public, retail and business properties during opening /business hours
- Maintaining safe access to residential properties
- Access to the tunnels
- Night time working hours
- Minimum Operational Requirements (MoR)
- Kier Maintenance Closure Programme

2.2 Management of Site Hazards

The *Consultant* shall cooperate, liaise and coordinate with the Principal Contractor's requirements and be responsible for the *Consultant's* own site works.

The *Consultant* takes appropriate action with regards to the site hazards identified by the Principal Designer and/or the *Project Manager* in association with the works contained in the Pre Construction Information. The *Consultant* also considers the hazards identified in the development of their concept/detailed design using the Design Risk Management principles of the Construction (Design and Management) Regulations 2015 (CDM Regulations). The *Consultant* ensures that they properly communicate the hazards on drawings or through risk registers and controls the residual risks via risk assessments, method statements and activity plans as part of their safe system of work so that they are understood by the workforce.



The *Consultant* also considers the site hazards that are normally associated with working on a construction site and on the public highway. These include, but are not limited to, confined spaces, working at heights, asbestos containing materials, buried services, overhead utilities, hazardous materials, contaminated land, uneven surfaces, high and low voltage cables, moving machinery, moving vehicles and pedestrians. The *Consultant* undertakes their own site hazard survey prior to starting work on site to verify the site information and identify any other risks that may affect the investigations.

For the avoidance of doubt, the *Consultant* shall comply with the Safe System of Working (SSOW) around all identified asbestos including removal. The *Employer* is responsible for the safe management of asbestos in/on existing Surface Transport structures/premises.

2.3 Security Arrangements with Others

The *Consultant* shall cooperate, liaise and coordinate with the Principal Contractor's requirements and be responsible for the *Consultant's* own site works. The *Consultant* may be required to:

- Provide up to date contact details to the Principal Contractor;
- Cooperate with the Principal Contractor in provision of records and evidence of checks pursuant to the issue of permanent passes
- Provide up to date site plans to the Principal Contractor;
- Attend regular meetings with the Principal Contractor, and the *Employer's* security team;
- Liaise with the Principal Contractor to ensure that electronic access control systems are compatible; and
- Develop the procedures required to meet the obligations of this clause and included in the Principal Contractors security manual.

2.4 Site Access

The *Consultant* shall cooperate, liaise and coordinate with the Principal Contractor's requirements and be responsible for the *Consultant's* own site works.

Access for the *Consultant* to undertake inspections, surveys, testing and investigations in Stage 2 will utilise the existing maintenance closures as much as possible. A limited number of additional closures may be available. Liaison with the Principal Contractor and the Tunnels Operations team will be necessary. The *Consultant* is required to liaise with the Principal Contractor in order to gain access to the tunnels. The *Consultant* shall ensure that they receive an induction from the Principal Contractor and follow their site rules.

The tunnels are routinely closed for maintenance works by the Principal Contractor. The closures process is well known and defined and well established diversion routes are in place. The impact of closing these tunnels has been appropriately assessed.



The Principal Contractor will hold a pre-closure briefing an hour before each of the tunnel closure commences. This is chaired by the tunnel supervisor for that shift. The *Consultant* shall submit RAMS along with works programme to the Principal Contractor at least two weeks in advance for review along with comments and final approval before booking / granting access to any of the tunnel bores / sites.

Additionally, the *Consultant* shall be responsible for obtaining all necessary consents, work permits and approvals from the relevant authorities for access to the site before any site works are undertaken. The *Consultant* shall advise the *Project Manager* on the access arrangements required to undertake the site works. The *Project Manager* shall assist the *Consultant* wherever possible in obtaining all necessary consents and approvals.

Due to network capacity issues, only one of the two tunnels can be closed at any one time.

Access to the shaft / switch and communications rooms / non-operational area is possible during the daytime without tunnel closures.

BWT SB has 2 no vent shafts:

- North Vent Shaft access is off Prestons Road. The gate / building is locked and the building is alarmed.
- South Vent Shaft access is in the O2 grounds. The gate / building is locked and the building is alarmed.

RHT has 4 no shafts located at various points throughout the tunnel at road level:

- Shaft 1 access is off Cannonbeck Road from A101. The gate / building is locked and the building is alarmed.
- Shaft 2 access is off Rotherhithe Street adjacent to the River Thames. The gate / building is locked and the building is alarmed.
- Shaft 3 access is via King Edward VII Memorial Park, on the River Thames, access via Glamis Road. The gate to the park is locked. The gate / building is locked and the building is alarmed.
- Shaft 4 access is at Heckford Street, off the Highway A1203 near the Limehouse Link Tunnel. The gate / building is locked and the building is alarmed.

2.5 Access to Road Network

The *Consultant* shall cooperate, liaise and coordinate with the Principal Contractor's requirements and be responsible for the *Consultant's* own site works.

The *Consultant* is required to avoid the lane rental charges in the undertaking of the surveys, testing and investigations for Stage 2. Lane Rental charge system will be operational and its impact should be considered at all times. TfL's general approach is to organise works outside of lane rental charging times. Exceptions to this may be required for specific



construction activities but these should be minimised. This should be carefully considered during development of construction methodology, staging and programme.

The *Consultant* shall be responsible for liaising with the relevant traffic authorities to obtain works notifications and permits to secure road space on the TLRN or Borough road network:

- TfL Network Impact Management Team
- Southwark Council
- Tower Hamlets Council

The *Employer* requires that members of the public are protected from site activities with adequate hoarding at all times.

When assessing hoarding requirements, the following considerations will need to be taken into account:

- The presence of schools, hospitals, persons with disabilities;
- Other issues specific to each location.

2.6 Control of Site Personnel

Not applicable.

2.7 Visitors

Not applicable.

2.8 Protection of Existing Structures and Services

2.8.1 Utility Supplies

Not applicable.

2.8.2 Damage to Works and Protection to Adjoining Structures

Not applicable.

2.9 Protection of the Works

Not applicable.

2.10 Cleanliness of Roads

Not applicable.

2.11 Highway Safety Inspections

Not applicable.



2.12 Condition of existing assets

Not applicable.

2.13 Industrial Relations

The *Employer* will promote a consistent approach to labour and industrial relations across the Project. To support this, the *Consultant* shall put in place policies and processes to ensure the effective management of labour and industrial relations on this contract. These policies and processes shall include (but are not necessarily limited to) those required to cover the following *Employer's* minimum requirements:

- Reduce or eliminate the risks of industrial unrest;
- Provide sound employment practices;
- Minimise accidents and work-related ill health;
- Ensure a ready supply of skilled labour and reward good performance;
- Reduce the turnover of employees; and
- Avoid incentivising the migration of employees between the *Consultant* and other TfL contractors, the *Employer* and the *Project Manager*.

This Scope covers the *Consultant's* activities that have a potential impact on the industrial relations environment within the contract and the ability of the workforce to safely deliver the Services required in the most effective and efficient manner.

The *Consultant* shall ensure that the *Employers* and employees use all available working hours as efficiently and productively as possible.

The *Consultant* shall ensure that all requirements and arrangements are applied consistently and transparently to all *Employers* and employees.

The *Consultant* shall be responsible for ensuring that all employees working on the contract:

- perform their work safely, with due skill and diligence and within their level of competence;
- participate in work that is effectively planned and organised;
- are supported by properly trained and effective supervisors and team leaders;
- are provided with appropriate plant, tools and equipment; and
- assess, manage and report performance as required.



Employees' competence is to be determined by taking into account all relevant information, including any representations made by a duly appointed safety representative under the Health and Safety at Work Act 1974 and associated regulations.

The *Consultant* shall implement policies to ensure that all *Employers* do not prevent or discourage employees from joining trade unions.

2.14 Site cleanliness

Not applicable.

2.15 Waste materials

Not applicable.



3.0 WI 300 – *Consultant's* design

3.1 *Consultant's* Design

The *Consultant* is appointed, and complies with its duties, as the Principal Designer in accordance with the CDM Regulations 2015.

The *Consultant* ensures that his designers are suitably qualified and competent to carry out the work.

Where the *Consultant* is responsible for design, the *Consultant* is, and complies with, its duties as Designer as defined in the CDM Regulations 2015. The *Consultant* appoints a design manager who is responsible for the coordination of the designs and all systems engineering.

The *Consultant* appoints a design manager (the "*Consultant's* Design Manager") who is responsible for the management, coordination, quality control and assurance of the design work. The *Consultant's* Design Manager is the primary interface with the *Project Manager* on design matters.

3.2 Design for the Services

The *Consultant* accepts entire responsibility for the *Consultant's* design and for any mistake, inaccuracy, discrepancy or omission contained in the same.

The *Consultant* warrants and undertakes to the *Employer* as a condition of this contract that his work and those parts of the Services for which the *Consultant* is responsible will be designed and specified using the best modern engineering principles and practices at the time of preparing the design and in accordance with good industry practice.



4.0 WI 400 – Completion

4.1 Completion

Sectional Completion is not envisaged for these Services. Completion shall be at the completion of the whole of the Services and/or when the Tfl *Project Manager* provides to the Consultant, written confirmation that the whole, or any part, of the Services have been completed.

Completion shall be achieved upon satisfactory submission of all documentation produced in accordance with the Employers requirements set out in WI2000.

Upon Completion, the *Consultant* and the *Project Manager* shall sign a Completion Certificate which shall be provided by the *Employer*. The Certificate shall state the date on which completion was achieved and the total monies due to the *Consultant* for performing the services set out in this contract.



5.0 WI 500 – Programme

5.1 Programme Schedule

The *Consultant* shall produce a programme for the duration of the contract, including all Services from parts in WI2000 of this document. The programme logic shall be optimised through identification of critical path and micro critical paths (sub-paths), analysing activities that can be brought forward, overlapped, or worked on concurrently to ensure programme logic is optimised (lean and efficient).

The *Employer* requires programme reviews in the form of Advance Project Thinking (APT). This shall be conducted as a joint effort between the *Project Manager* and Consultant's Planner. The purpose of APT is to monitor in detail the programme and look at progress through a 'buffer chart' which tracks the critical path and shows either positive or negative progress against planned progress (net buffer). APT also allocates actions, responsibility and close out dates which monitors each party input towards the programme.

Critical path, Time Risk Allowance (TRA), Project Constraints, Calendar type, Public Holidays (and any Christmas shut-down) and milestones (which shall be agreed with the *Project Manager*) shall be identified on the programme. The *Employer* expects programme logic to be optimised for 'lean and efficient' programming.

5.2 Revised Programme

Submissions of revised programmes shall be accompanied by an updated programme narrative, which includes the following:

- details of any significant changes including revisions to critical path since the previous Accepted Programme;
- details of changes to Key Dates, milestones, and associated float and time risk allowances and relative impact on costs;
- any delay mitigation measures incorporated.

The *Consultant* proceeds regularly and diligently to provide the Services in accordance with this contract, and uses all reasonable endeavours to prevent and/or reduce any delay in the progress of the Services.

5.3 Programme Requirements

The accepted Programme shall be used by the *Consultant* to direct his work by providing parameters for the more detailed implementation programmes and tools such as the weekly work plan. It is also used to identify and resolve schedule problems, measure the impact of compensation events and delays, assist in earned value calculations and develop recovery plans.



Programmes shall be developed by the *Consultant* using CPM / network analysis techniques to produce a coherent schedule that covers the entirety of the *Consultant's* awarded scope.

Information to be included in the programmes submitted for acceptance:

- The dates when the *Consultant* plans to submit any particulars of the design required by the Scope;
- The dates when the *Consultant* plans to submit any particulars of the design of any items of Equipment required by the Scope;
- The dates from the *Consultant's* Procurement Plan when any key items of Plant and Materials and Equipment are required at Site;
- The dates for any establishment of fabrication facilities and dates for fabrication of materials;
- The dates when any of the design information or other information provided by the *Employer* or Others will be required by the *Consultant*;
- the cost associated with each activity defined in the programme;
- the cost-loaded programme (including man hours, total of the Prices and quantities using suitable activities breakdown);
- details of any consents, permits and licenses development, submission and approvals allowing sufficient time for each stage of the process and also allowances for resubmission;
- details of any utility supplies development, submission and approvals allowing sufficient time for each stage of the process and also allowances for resubmission;
- details of any 3rd party (e.g. Network Rail, London Underground) interfaces and/or submissions development, submission and approvals allowing sufficient time for each stage of the process and also allowances for resubmission;
- the dates when the *Consultant* plans to submit design and construction certification as required by the Scope
- Work Breakdown structure (WBS) – The scope is put into a valid WBS consistent with the TFL WBS Strategy to allow for detailed planning in a structured format. The structure to give a clear reflection of progress against each of the work packages being progressed when rolled up to summary level;
- Clear visibility of all deliverables and key milestones; and



- Quantities and Measurement items (MI's) to be assigned within the relevant work packages showing the key quantities to be installed to deliver the project.

5.4 Methodology Statement

All programmes submitted by the *Consultant* for acceptance by the *Project Manager* shall be accompanied by a programme narrative and shall contain as a minimum the following requirements, at a level of detail to be agreed by the *Project Manager*:

- Staffing plan indicating total manpower required per reporting period, inclusive of Sub-contractors;
- Weather windows and other non-work periods;
- Description of the critical path(s);
 - Listing of key interfaces with the *Project Manager* or Others and the dates those interfaces are planned to occur; and
 - Listing of information required by the *Consultant* to meet his stated programme
 - Together with the date that information is required.

5.5 Resource and Cost Loading the Programme

The *Consultant* shall ensure that the programme for acceptance is fully loaded with man hours, the total of the Prices and quantities for performance measurement purposes using suitable resource profiles, agreed with the *Project Manager*, which reflect the work required for each activity.

For the purposes of performance reporting and measurement, the Accepted Programme shall only be adjusted upon agreement between the *Consultant* and *Project Manager*, to reflect the effects of implemented compensation events and/or significant changes to planned work sequences. The emphasis is to establish an accurate baseline from which to measure subsequent performance.

5.5.1 Cost Loading

The *Consultant* shall cost load the Programme for Acceptance at a suitable level, to be agreed by the *Project Manager*, in accordance with the Work Breakdown Structure at the activity level.

Each four weekly reporting period, the *Consultant* shall update, in the revised Programme, for Acceptance by the *Project Manager*, the cost loading to reflect PWDD and the *Consultant's* assessment of forecast costs to go, including the impact of implemented compensation events.

Sufficient cost shall be allocated to tail-end and finishing activities including snagging and completion package preparation, in order to avoid overvaluing work in the earlier stages.



5.5.2 Resource Loading

The *Consultant* shall resource load the Programme for Acceptance with resources and quantities, at a suitable level, to be agreed by the *Project Manager*.

Each four weekly reporting period, the *Consultant* shall update in his revised programme for acceptance the resource loading to reflect actual resources used to date and the *Consultant's* assessment of forecast to go including the impact of trends and implemented compensation events.

5.6 Budget Maintenance

The *Consultant* shall not change, or move cost or resources between activities on the Accepted Programme without the *Project Manager's* acceptance.

5.6.1 Planned Expenditure (BCWS: Budgeted Cost of Work Scheduled)

The Accepted Programme will be the basis of the planned expenditure unless the *Project Manager* instructs otherwise.

Each four weekly reporting period, data shall be exported at a summary level (the appropriate level to be agreed by the *Project Manager*) and formatted into a Performance Measurement Data Summary (PMDS) which will then translate the data into graphs for comparison with earned value, PWDD and forecast Defined Cost to completion data. The Earned Value graphs shall show the early start and late start BCWS profile envelope, which shall be generated from data downloaded to the PMDS within Excel.

5.6.2 Actual Cost (ACWP: Actual Cost of Work Performed)

Actual Cost of work performed, (including monies paid and accruals for Services performed up to the cut-off date of each four weekly reporting period) shall be related to each element of the project highlighted in the programme.

This data shall then be incorporated by the *Consultant* into the CVR, for comparison with Earned Value.

5.6.3 Cost to Completion (FTC: Forecast to Completion)

Each reporting period the *Consultant* will produce a forecast of the remaining expenditure (total Defined Cost less PWDD) phased over the remainder of this Contract, by four weekly reporting periods. This will show separately, the original scope of Services, and any implemented compensation events.

Separately, the *Consultant* will also show his forecast remaining expenditure associated with notified compensation events and early warning notices.



6.0 WI 600 – Quality management

6.1 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.

The *Consultant* shall conform to the BIM quality requirements. Refer to Annex 4 for details.

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 technical reviews, audit reports etc. and related documentation.

The *Consultant* may, from time-to-time, be asked to provide information to enable the *Employer* to develop the business case or obtain other internal or external approvals.

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.

6.2 Quality Management System

The *Consultant* operates a quality management system complying with ISO 9001:2008 for his performance of the contract. The management, organisation, responsibilities, procedures, processes, resources and programme for the quality management system from design (where applicable) to procurement, construction, completion, testing and commissioning of the Services until the *defects date* is contained in a quality plan which is submitted to the *Project Manager* in accordance with the *Scope*. Any *Sub-contractor* appointed by the *Consultant* operates a quality system enabling him to comply with the *Consultant's* quality management system.

The Quality Management System is to be capable of demonstrating by *Consultant* self certification that all the requirements of the contract and all relevant standards and regulations are being met. Self certification is the process whereby the *Consultant* can demonstrate that all the requirements of the contract have been fulfilled.

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 ensure that Sub-contractors and suppliers of any tier also supply a quality presence with adequate resources and appropriate authority to ensure the quality of work on this Contract.

The *Employer*, the *Project Manager*, the *Supervisor* and any third parties authorised by the *Project Manager*, including LUL, NR, DLR, TfL, statutory authorities and statutory



undertakers, shall have the right to conduct audits, inspections and tests of any part of the *Services* that are being executed in connection with their assets by the *Consultant* and to observe the execution of these activities.

The *Consultant* shall contribute to and participate in the identification, discussion and implementation of lessons learned initiatives agreed with the *Project Manager*. The *Consultant* shall make available for audit all records necessary to demonstrate that the *Services* have been executed in accordance with the contract. They also provide the *Project Manager* with documents that demonstrate that the *Services* are progressing in accordance with specified requirements. These documents are to be provided in a timely manner as the work progresses.

The *Consultant* may, from time to time, be asked to provide information to enable the *Employer* to develop the business case or obtain other internal or external approvals.

Quality issues shall also be identified in the *Consultant's* weekly reports which are provided to the *Project Manager*.

The *Consultant's* Quality Management System shall provide procedures for undertaking desktop study, site survey and investigation and development of feasible options of the *Services*. The *Consultant* shall develop, with the *Project Manager*, quality improvement initiatives.

Within 2 weeks of the *Start Date*, the *Consultant* shall produce a Contract Quality Plan (CQP) and submit it to the *Project Manager* for acceptance. In the case of the first submission of the Contract Quality Plan the *Project Manager* replies within 2 weeks of the date of submission. The *Consultant* shall agree with the *Project Manager* the submittal timings of the CQP to interface with the requirements of the Accepted Programme. Any further revisions, submissions and responses shall be made within the *period for reply*.

The *Consultant* shall not start any activity on any part of the *Services* for which the Contract Quality Plan, applicable QSPs or ITPs, are not accepted by the *Project Manager*. Where these documents together adequately address ongoing and imminent works but not the entire scope of the *Services*, the *Project Manager* may give limited acceptance to the *Consultant's* submission in order to allow limited activities to proceed.

6.3 Quality Assurance

The *Consultant* shall engage the allocated TfL Tunnels Technical Approvals Authority (TAA) via the *Project Manager* and consult on all aspects of the surveys and investigations in Stage 2 (Feasibility) including agreeing and endorsing documents.

Time shall be included in the programme for review and preparation of comments by the Technical Approval Authority, and for further iterations of deliverables. The period of time required for reviews shall be agreed in advance with the technical approval manager. The standard practice review period is 25 working days, however, collaborative working and issue of documents of the expected standard shall allow this to be reduced towards a minimum of 10 days. At the beginning of Stage 2 (Feasibility), the technical approval team shall be engaged by *Consultant* to agree method of working. As a minimum the following requirements should be considered:



The only documents that the TfL TAA is expected to sign off at Stage 2 will be related to the feasibility studies.

- The TAA shall be consulted sufficiently in advance about all technical matter / submissions, departures from engineering standards or specification, before they are submitted formally for acceptance into the feasibility study.
- The *Consultant's* Design Manager shall attend all technical meetings in person with the TAA.
- A meeting schedule / table matrix for the entire length of the feasibility study should be prepared and agreed at the beginning of the contract – stating location, timings, attendees, agenda.
- Some elements may need technical assurance by other teams such as TAA highways and TAA structures. The *Consultant* shall notify and highlight any potential technical approvals to the *Project Manager* and he shall co-ordinate such reviews for approval. The same level of review periods that are required by the TAA for structures will apply to the other disciplines.

The guidance set out in the following documents shall be complied with:

- Design Manual for Roads and Bridges
- Specification for Highway Works
- Eurocodes
- The Road Tunnel Safety (Amendment) Regulations 2009 (SI No.64)
- EU Directive 2004/54/EC
- TfL guidance notes:
- SMT/GN/03/14 – Technical Approval
- SMT/GN/02/14 – Requirements for the acceptance of proposals for structures and tunnels capital schemes
- TfL Streetscape guidance
- Other good practice guidance as agreed with the Sponsor and/or technical approvals manager.
- Asset Management - Condition Assessment Guidance



More information can be found in Annex 8.

Industry good practice guidance for design, maintenance and management of tunnels shall be followed and complied with where possible. If there are good reasons for deviating from good practice or standards, justification should be submitted to the technical approval manager for agreement before proceeding.

With regards to the site works, unless otherwise accepted by the *Project Manager*, Plant and Materials forming part of the *Services* or temporary works incorporated into the *Services* shall be procured from sources that hold appropriate certification from a United Kingdom Accreditation Service (UKAS) accredited certification body (or one that has mutual recognition with UKAS). The existence of UKAS or similar acceptable accreditation does not relieve the *Consultant* from ensuring the quality of the products.

The *Consultant* shall make available certification to demonstrate that Plant and Materials used comply with the relevant legal requirements and standards. For *Consultant* designed parts of the *Services* the material quality and traceability requirements shall be indicated on applicable drawings or materials and workmanship specifications or by reference to appropriate codes of practice.

Verification of the quality and material traceability of each element of the *Services* shall be the responsibility of the *Consultant* and shall be achieved through checks, tests, inspections, audits and reviews, planned and implemented in accordance with the contract quality plan developed by the *Consultant*.

1. Subject to the Scope and any changes to it the *Consultant* warrants that to the extent the *Consultant* either is obliged to specify or approve products or materials for use in the *Services* or does so specify or approve, the *Consultant* does not specify, approve or use any products or materials which are generally known within the construction industry to be deleterious at the time of use in the particular circumstances in which they are used, or those identified as potentially hazardous in or not in conformity with:
 - a. the report entitled "Good Practice in the Selection of Construction Materials" (1997, by Tony Sheehan, Ove Arup & Partners, published by the British Council for Offices and the British Property Federation) other than the recommendations for good practice contained in Section 2 of that report,
 - b. relevant British or European Standards or Codes of Practice, or
 - c. any publications of the Building Research Establishment related to the specification of products or materials.
2. If in the performance of its duties under this contract, the *Consultant* becomes aware that he or any other person has specified or used, or authorised or approved the specification or use by *Others* of, any such products or materials, the *Consultant* notifies the *Project Manager* in writing immediately. This clause does not create any additional duty for the *Consultant* to inspect or check the work of *Others* which is not required by this contract.



The *Consultant* obtains from and/or gives to others all licences, consents, notices and approvals necessary or appropriate to enable him to provide the Services other than those which the Scope states will be obtained or given by the *Employer* or *Others*. The *Consultant* ensures that, prior to Completion and wherever necessary during the course of the Services, the conditions and requirements of the licences, consents, notices and approvals, whether obtained by the *Consultant* or the *Employer*, are complied with and that the same are renewed whenever necessary or appropriate.



7.0 WI 700 – Not used



8.0 WI 800 – Management of the Services

8.1 Project Governance – Pathway Products

The *Consultant* shall assist the *Employer* during the preparation and /or updating of the following Stage 2 (Feasibility) Pathway products (but not limiting to):

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

The above list covers documents / products taken from the TfL Pathway Project Management Plan (PPMP) which can be found in Annex 3.

8.2 Management and Staff

The *Employer* shall have the following directly employed staff on site (either full or part time):

- Programme Manager
- Project Manager
- Assistant Project Manager(s)
- Commercial team

The *Consultant* is expected to have, as a minimum, the following site supervision and management staff:

- Contracts Director
- Project Manager
- Designer / Engineer / Specialist team



- Planning Manager/Project Controls Manager*

(* means that these roles may form part of the duties of others)

The *Consultant* shall be required to attend a number of regular meetings with the *Project Manager* throughout the duration of this commission as described below. These meetings shall be held either at the designated co-location office or at the *Employer's* offices.

8.3 Allocation of *Consultant* Staff

The *Consultant* shall obtain approval from the *Project Manager* before any staff resources are allocated to work on the project. The *Consultant* shall issue a request setting out:

- the name, role and rate of staff (proposed for mobilisation);
- proposed mobilisation date;
- planned demobilisation date.

The *Consultant* shall not be entitled to payment for staff time for any person who has not been approved by the *Project Manager* in line with the above requirements.

8.4 Communications

The *Consultant* does not remove any key person from the contract for more than twenty one (21) consecutive days without the prior written consent of the *Project Manager*, except where such key person is absent on sick leave, or other statutory leave (such as jury service/maternity/paternity or adoption leave) or has left the *Consultant's* employment.

Any formal claims need to be raised as a hard copy document as well as on the contract administration management system.

8.5 Risk Management

The *Consultant* submits, within 2 weeks of the *Start Date*, for acceptance by the *Project Manager*, a Risk Management Plan. The *Consultant* liaises with the *Project Manager* during this time to identify and agree the parameters to be used in the identification and evaluation of risk.

The focus of the Risk Management Plan should be reduction of risk exposure. It should be results-oriented and not place undue weighting on analysis at the expense of action. The *Employer* and the *Consultant* shall share relevant risk information and work collaboratively to prevent the realisation of risks where possible. The Risk Management Plan should identify the impact of occurrence at project activity level and link their manifestation to the project schedules and the Earned Value Analysis monitoring templates.

In conjunction with clause 16 of the conditions of contract the *Consultant* identifies any changes or newly identified risks to the *Project Manager*.

The *Consultant* identifies to the *Project Manager* any risks which have been realised and become issues.



The *Consultant* reports risks and provides risk related information in accordance with the requirements of this contract.

8.6 Project Meetings

The *Consultant* will be required to attend a number of regular meetings with the *Project Manager* throughout the duration of this commission as described below. These meetings shall be held either at the designated co-location office or at the *Employer's* offices.

8.6.1 Risk Reduction Meetings

The *Consultant* meets with the *Project Manager* not less than once in each four week period to review the Risk Register in accordance with clause 16 of the conditions of contract. The *Consultant* provides the appropriate level of representation at the meetings to review and action the identified risks and notified early warnings.

The purpose of this meeting is to review and update the risks and opportunities identified in the Risk Register. Risks and opportunities will be reported and managed effectively by proactively identify mitigation measures, clearly assign actions owner and address these actions in a timely manner.

This meeting will be chaired by the *Project Manager* and will be held once every four weeks. The *Project Manager* shall be responsible for recording and maintaining the Risk Register in collaboration with the *Consultant*. The *Consultant* shall contribute and participate in the review and analysis of the risks and opportunities.

8.6.2 Progress Meetings and Reports

Progress meetings will be held fortnightly (or more frequently if required). These progress meetings will review the progress to date and the work expected to commence in the following 4 weeks. The schedule shall be reviewed and amended in line with the progress, expected progress, mitigations of delay and compensation events.

The *Consultant* shall produce a progress report every fortnight. This will be staggered with the progress meetings (i.e. weekly communication between all parties). The *Consultant* is responsible for the submission of the report to the *Project Manager*. The sections of the progress report shall comprise of the following:

1. Health, Safety and Environment
2. Summary of Progress
3. Upcoming activities and decisions required (APT led)
4. Stakeholder Engagement
5. Risks and Opportunities
6. Programme Schedule
7. Commercial
8. Performance
9. Any Other Business

The *Consultant's* Project Manager, relevant design team members and appropriate commercial staff shall attend the fortnightly progress meeting.



The purpose of this meeting is to review overall progress and performance of the project. The focus will be to reflect on progress made since the last meeting and on the key activities and decisions required for the upcoming weeks ahead including any matters which require resolution. The meeting will also provide an update on health, safety and environmental issues, risks and opportunities, and stakeholder engagement. This meeting will be chaired by the *Project Manager* and will be held once every two weeks. The *Consultant* shall be responsible for recording and maintaining agenda and minutes of all progress meetings.

TfL undertake a programme review which is in the form of Advance Project Thinking (APT). This will be conducted as a joint effort between the *Employer's Planner* and *Consultant's Planner*. More information on APT can be found in Section 5.1.

8.6.3 Commercial Meetings and Commercial Register

The purpose of this meeting will be to review all applications for payments, financial and contractual matters including Early Warning Notifications (EWNs), Compensation Events (CEs) and Project Managers Instructions (PMIs) to enable ongoing management and control of the project costs. This meeting will be chaired by the *Project Manager* and shall be held fortnightly. The *Project Manager* shall be responsible for recording and maintaining the commercial register of all EWNs, CEs and PMIs.

Weekly activity sheets/reports and time sheet reports must be submitted to the *Project Manager* within 14 days of the services being provided. Time sheet reports submitted after this point will not be assessed.

8.6.4 Performance Meetings and Key Performance Indicators

The purpose of this meeting will be to review and assess the performance of the *Consultant* through an agreed set of Key Performance Indicators (KPIs). The KPIs will be set jointly with the *Employer* in the first meeting. This meeting is intended to facilitate the smooth running of the project and to ensure that there is a forum to quickly resolve issues above the Project Team if they are taking too long to resolve and hindering progress. KPIs will be on the following strategic themes:

- Health, Safety & Environment
- Quality
- Value
- Delivery
- Collaboration

This meeting will be chaired by the *Project Manager* and shall be held once every four weeks. The *Project Manager* shall be responsible for recording and maintaining the KPI register.

8.7 Periodic Progress Report



A full periodic summary report of project progress shall be submitted to the *Project Manager* every 4 weeks. The periodic report contents shall cover progress to match the TfL periods as shown in Annex 9. The report must include:

- A progress statement by reference to the accepted programme for the S services;
- Details of any matters materially affecting the regular progress of the S services;
- Key activities planned for next month;
- Earned Value Management (EVM) report (including all elements described Section 5.6);

8.8 Cost Management and Estimating

The *Consultant* shall undertake cost management.

The *Consultant* shall provide cost estimates for design and construction at the end of each TfL Pathway stage for internal management and budgetary purposes. An estimating template shall be agreed with *Project Manager*. This must be aligned to the *Employer's* estimating principles, which are as follows:

- The *Project Manager* shall work with the *Consultant* and agree the cost estimates as it is being compiled. All estimates shall account for any specific work methodologies and contain a quantified risk allowance. The accuracy of the cost estimates and the detailed data within them shall be commensurate with the stage of design;
- The estimate is to be confidently compared/benchmarked with other similar completed schemes that demonstrate their assessments are robust;
- The *Consultant* shall agree the estimate base date with *Project Manager* prior to commencing any other estimating activities;
- The *Consultant* shall prepare estimates in accordance with the TfL Cost Feedback Structure (CFS), Estimating Guidance notes and Cost & Estimating System Coverage & Inclusion Rules as defined in the cost capture template within schedule 17 which can be found in Annex 10;
- The Estimate shall be compiled, with indirect costs populated separately and assumptions logged;
- The *Consultant* shall not include any design, preliminary, testing and commissioning and overheads and profit costs within unit. The estimates for these costs (with the exception of overheads and profit) are required to be fully resourced, based on programme;



- The *Consultant* is not required to populate the agreed "Free Issue" and "Internal costs: Those values will be added by TfL at a later stage;
- The *Consultant* shall form a view on estimating uncertainty. A reference to this value and a justification for its selection shall be included in the Assumptions. Estimating uncertainty is not to be treated as risk but as a means to inform the *Employer* of the quality of design and price information available to the *Consultant* at the time of preparation of this estimate;
- The *Consultant* should note that all estimates require approval from the *Project Manager* who may ask to review/ revise certain elements within the estimate (quantities and/or rates) as part of the *Employer's* approval process;
- All documents used in the preparation of the estimate shall be listed within the estimate;
- All assumptions and exclusions applicable to the estimate must be described;
- The *Consultant* shall ensure that the estimate has been subject to an internal review by an experienced staff member who must satisfy himself that it is free from errors, that the scope of work has been accurately measured and that the level of pricing is appropriate;
- The *Consultant* shall provide details of the basis for establishing the level of any provisional sums and/or lump sum allowances where requested;
- The TfL CFS structure only defines works up to Repeatable Work Item (RWI) level. Beyond that level, the *Consultant* shall use industry recognised Highways works methods of measurement such as MCHW where possible and if applicable;
- The *Consultant* shall provide a measurement for each high level RWI in accordance with the unit of measurement suggested in the CFS as defined in the cost capture template within Annex 10. This is to enable the cost benchmarking of estimates against TfL's historical costs;
- The *Consultant* shall include for any "Temporary and Enabling" works as a subcategory within each of the direct works categories;
- The *Consultant* shall provide a reconciliation between estimates at each stage along with a commentary of the key changes;



- Risk shall be defined in accordance with the *Employer's* procedures and processes. The *Consultant* shall demonstrate how the risk value was obtained and to list out all risk considerations.

The *Consultant* shall provide cost feedback in the format specified by the *Employer* within the *Scope*, as indicated in the cost capture template within Schedule 17 (Annex 10) of the Framework Agreement. As a minimum, the *Consultant* must ensure this template is provided at the start and end of the commission for final accounting.

The *Project Manager* shall manage and administer the booking of the *Consultant's* costs to WBS codes which align to the work undertaken in the schedule. The *Project Manager* shall issue WBS codes to the *Consultant* for allocation of his cost and invoices.

The *Consultant* shall submit all costs of staff (via time sheets) and any expenses to be received by the *Project Manager* on a weekly basis after the cost has incurred.

8.9 Applications for Payment

8.9.1 Template and categorisation

The *Consultant* shall submit a proposed template for their applications for payment to the *Employer* within 2 weeks of the Contract *Start Date*. Periodic assessments shall be based upon this format thereafter unless agreed by the *Project Manager*.

Each application for payment should contain detail of the services provided by each of their personnel in respect to the project. The *Consultant* should submit with their proposed format a clear allocation system whereby their people can allocate time against agreed codes. New codes should be raised and agreed for any compensation events.

The following table is an example of how the *Consultant* may choose to categorise work streams and allocate costs. There may be sub categories within each of these work streams:

Scope Reference	Scope Title
BWT-A	The ventilation system is upgraded to ventilate a 100MW fire
BWT-B	Replacement of the existing lighting arrangement with Light-Emitting Diode (LED) luminaires
BWT-C	The CCTV system is replaced
BWT-D	Video Accident and Incident Detection (VAID) installed
BWT-E	Refurbish/Replace Variable Message Signs (VMS) Tunnel Lane Control Signs and Wayfinding Signs
BWT-F	Decommission Flood Gates



BWT-G	Refurbish/Replace cabling infrastructure
BWT-H	Refurbish/Replace power systems
BWT-I	Refurbish/Replace M&E infrastructure in drainage systems
BWT-J	Refurbish/Replace linear heat detection
BWT-K	Refurbish/Replace fire and safety systems
BWT-L	Refurbish/Replace Heating Ventilation and Air Conditioning (HVAC) in tunnel service buildings
BWT-M	Refurbish/Replace Electricity Distribution Points (EDPs)
BWT-N	3D model creation
BWT-O	Refurbish/Replace Radio System
BWT-P	Refurbish/Replace Loudspeaker Public Address System
BWT-Q	Remove Maintenance Telephones
RHT-A	Upgrade of LED Lighting & Replacement of Structural Support System
RHT-B	Replacement of Fire Main System
RHT-C	Provision of Resilient Power Supply
RHT-D	Upgrade and Reconfiguration of Ventilation System
RHT-E	Replacement of Linear Heat Detector
RHT-F	Replacement of Emergency Wayfinding Signs
RHT-G	Replacement of "Out of Bore" Lighting with LED Luminaires
RHT-H	Renewal of Drainage System - pipes, valves, pumps and control systems
RHT-I	Replacement of Public Announcement System, Emergency Roadside Telephone and Radio Systems and Removal of Maintenance Telephone System.
RHT-J	Renewal of Plant Room's Heating, Ventilation and Air-conditioning (HVAC)



RHT-K	Upgrading HV and LV Supply System
RHT-L	Replacement of Communication System Cabling (LTRACS)
RHT-M	Decommissioning of Flood Gates
RHT-N	3D Model Creation
RHT-O	Replacement and upgrade of CCTV (Traffic) System (inc. in-bore and approaching roads)
RHT-P	Introduction of Video Accident and Incident Detection (VAID) System
RHT-Q	Installation of Emergency Distribution Panels (EDPs)
RHT-R	Replacement of Fire Detection, Suppression and Monitoring System
RHT-S	Replacement of Cable Rack in Sub-Tunnel
RHT-T	Cable Management in Tunnel / Sub-Tunnel / Vent Shafts

The *Consultant* submits an application for payment to the *Project Manager* in the agreed format not less than fourteen days prior to each assessment date. The application states the sum that the *Consultant* considers to be due to him at the payment due date and the basis on which that sum is calculated.

Application for payment submissions to the *Employer* shall be made in the form of 2 No. hard copies and 1 No. electronic copy every 4 weeks.

In respect of all other matters referred to in the Conditions of Contract the *Consultant* shall separately show in the statement the amount which he considers himself entitled. For the avoidance of doubt, the following activities shall be deemed to be included in the *Consultants* fee:

- Production and Compilation of timesheets
- Providing additional detail or substantiation for timesheets as may sometimes be requested by the *Project Manager*
- The *Consultants* internal reporting and governance

Timesheets must be submitted to the *Project Manager* in a timely manner. The *Consultant* shall note that any timesheets submitted to the *Project Manager* later than 28 days after the services have been provided shall not be chargeable to the *Employer*.

8.10 Lessons Learned from Previous Projects



At the time of writing this document the STIP 2 River Bridges project had held a lessons learned session following the completion of the Stage 2 investigation works. Some of the key lessons are summarised below. The *Consultant* shall review these lessons to establish, where relevant, appropriate measures which ensure continuous improvement.

- Collaborative working – the first few weeks after contract award is key to planning the survey works between the *Consultant* and their Sub-contractors.
- Scope – this should relate the testing / surveys / investigations to the final project outcomes.
- Scope change / additional works – It is necessary to have someone with delegated authority to make decisions when changes occur on site. Ideally works should not be stopped.
- Single point of contact – this shall be the *Project Manager*.
- Workshops – to be held at key points in the programme where key decisions need to be made.
- Testing results – these should be provided to the *Consultant* as soon as they are available.
- Method statements – if there are unique methods of carrying out a particular element of work then this should be highlighted in the method statements so that it can easily be picked up by the user / reviewer.
- Commenting on reports – to avoid several iterations of comments, comments should be collated before issuing back to the *Consultant*.
- Commercial management – compensation events shall be dealt with in a timely manner. It is important that this project benefits from lessons learned from other projects at the same stage so that these can be embedded from the start.



9.0 WI 900 – Working with the *Employer* and Others

9.1 Sharing the Working Areas with the *Employer* and Others

The Scope have a significant interface with *Others* in a variety of locations. These interfaces will require the *Consultant* to co-ordinate his works with *Others*.

The *Consultant* shall liaise and co-operate with *Others* in obtaining and providing, via the *Project Manager*, information required in connection with the Services and the works of *Others*.

The *Consultant* shall hold and attend co-ordination meetings with *Others* who share the Working Areas. The *Project Manager* shall be invited to these meetings.

The *Consultant* is responsible for all co-ordination and co-operation within the Working Areas.

Certain operations not forming part of the Services may be carried out within or adjacent to the Site by *Others* under separate arrangements with the *Project Manager*.

In addition, certain parts of the project will also be carried out by *Others* under separate arrangements with the *Project Manager*.

The *Consultant* is responsible for the co-ordination of the Services with the activities of *Others* on the Site in respect of programme and technical interfaces. Failure to demonstrate this within accepted programme may give grounds for non-acceptance by the *Project Manager*.

9.2 Collaboration

The Project Team shall work collaboratively together as an integrated team to complete Stage 2 of the project effectively and efficiently within the agreed budget, programme schedule and quality. The following shall be applied throughout the project by all parties:

- building a collaborative project environment
- ensuring clear understanding of roles and responsibilities
- ensuring integration by undertaking specific and measurable methods of working
- promoting collaborative behaviours
- seeking continuous improvement through effective communication and engagement with all stakeholders

9.3 Authorities

9.3.1 Environmental – Section 61



The *Consultant* shall adhere to all requirements set out in the Principal Contractor's Section 61 approval.

9.3.2 London Underground

There are London Underground (LU) services that run through the sub-tunnels of both Blackwall Southbound and Rotherhithe tunnels. LU will need to be informed prior to any planned works taking place within the vicinity of these sub-tunnels. If there are any damaged LU cables discovered during the Stage 2 investigation works then the *Consultant* shall inform LU will in order for an assessment to be undertaken.

9.4 Statutory Undertakers

Not applicable.

9.5 The Consultant's Responsibilities

9.5.1 General

The *Consultant* shall cooperate, liaise and coordinate with the Principal Contractor's requirements and be responsible for the *Consultant's* own site works. It is not expected for the *Consultant* to undertake any intrusive site investigation.

9.5.2 Health and Safety

Not applicable.

9.5.3 Utilities Plan

Not applicable.

9.5.4 Utility Works Using the New Roads & Street Works Act 1991

Not applicable.



10.0 WI 1000 – Services and other things to be provided

10.1 Facilities/Services Provided by the Consultant (ECC 25.2)

The *Consultant* shall provide an estimate cost to provide a suitable office location for the purposes of co-location of the Project Team for the duration of the contract with suitable welfare facilities. The co-located office shall be large enough to accommodate at least 12 people with a dedicated room where meetings can be held.

The co-located office is so that the *Employer's* project team and the suppliers' teams can work together as an integrated team. Both the *Consultant* and the *Project Manager* shall promote the ethos of collaborative working and support the integrated team.

Office furniture and information technology (IT) equipment shall be provided by the *Consultant*.

As a minimum, the co-located office should contain four dedicated desks with chairs for the *Employer* and six laptops with the latest version of Microsoft Office (including MS Word, MS Excel, MS Outlook and MS Project) per laptop and robust high speed broadband connection (Min 20MB/s on WIFI or / Ethernet) to the internet with sufficient data capacity to prevent machine functioning at a reduced speed. The laptops shall be available to the *Employer* within 2 weeks from the contract *Start Date*. Note that TfL use Citrix Receiver / T-Snap to connect remotely to their secure servers, the LAN and PC's should be able to support this platform. At least two 4G mobile data dongles shall also be made available as a backup for occasions when broadband connection may not be available. All of the aforementioned laptops will transfer ownership to the *Employer* at the end of Stage 2.

The laptops shall conform to the specifications set out in the table below:

Laptop Specifications	
	WINDOWS
Operating System	MINIMUM Windows 7 Home Premium, or above excluding Windows 8, 8.1
Productivity Tools	Microsoft Office for Windows 2013/2016
Microsoft Project Professional	Microsoft Project Professional 2013/2016
Processor Type	MINIMUM Core i5 Processor
Memory	MINIMUM



	16 GB RAM
Hard Drive	MINIMUM 500 GB or higher
Graphics Card	MINIMUM 512 MB Video Memory or higher

A colour Laser MFP (multifunction printer), with standard quality A3 & A4 paper and copying and scanning facilities shall be made available for use by the *Employer*.

The office shall have a meeting facility suitable to host the routine meetings and workshops anticipated for the duration of the contract. Audio-visual equipment such as a large screen monitor shall be provided to enable presentation of project information to all attendees. This meeting room shall be the default location for all project meetings.

The purpose of co-location is to allow open interaction between the three parties and therefore an open plan arrangement with the co-located parties is essential.

10.2 Welfare Arrangements

It is expected that the Consultant will be utilising existing welfare facilities provided by the Principal Contractor for site investigation.

The *Consultant* shall adhere to all requirements set out by the *Principal Contractor*.

10.3 Facilities/Services Provided by the Employer

10.3.1 Access to Premises

Any Premises made available by the *Employer* to the *Consultant* in connection with this contract shall be free of charge and shall be used by the *Consultant* solely so the *Consultant* can provide the Services. For the avoidance of doubt, the *Consultant* is responsible for its own costs for travel including any congestion charging and/or low emission charging. The *Consultant* shall:

- Have the use of such TfL Premises as licensee and shall not have or purport to claim any sole or exclusive right to possession or to possession of any particular part of such TfL Premises;
- Vacate such TfL Premises upon the termination or expiry of the contract or at such earlier date as the *Employer* may determine;
- Not exercise or purport to exercise any rights in respect of any TfL Premises;



- Ensure that the *Consultant's* employees, Sub-contractors and Indirect Sub-contractors and persons connected to them carry any identity passes issued to them by the *Employer* at all relevant times and comply with the *Employer's* security procedures as may be notified by the *Employer* from time to time; and
- Not damage the TfL Premises or any assets on the TfL Premises.

Nothing in this clause shall create or be deemed to create the relationship of landlord and tenant in respect of any TfL Premises between the *Consultant* and any member of the TfL Group.

The *Employer* shall be under no obligation to provide office or other accommodation facilities or services (including telephony and IT services) to the *Consultant* except as may be specified in the Scope.

The *Employer* is responsible for maintaining the security of TfL Premises in accordance with its standard security requirements. The *Consultant* shall comply with all of the *Employer's* security requirements while on TfL Premises, and shall ensure that all of the *Consultant's* employees, Sub-contractors, Indirect Sub-contractors and persons related to them comply with such requirements. Upon request, the *Employer* shall provide the *Consultant* with details of the *Employer's* security procedures.

The *Employer* reserves the right under this contract to refuse to admit to any TfL Premises any of the *Consultant's* employees, Sub-contractors, Indirect Sub-contractors and persons related to them who fail to comply with any of the *Employer's* policies and standards referred to in this contract.

The *Employer* reserves the right under this contract to instruct any of the *Consultant's* employees, Sub-contractors, Indirect Sub-contractors and persons related to them personnel to leave any TfL Premises at any time for any reason and such personnel shall comply with such instructions immediately.

Where the *Consultant* is required to access (with appropriate permission and approval of the *Employer*) any areas under the control of any of the *Employer's* PPP or PFI Contractors, the *Consultant* must comply (and ensure that any Sub-contractors and Indirect Sub-contractors comply) with all of their rules, regulations and standards as appropriate.

10.4 Contract Management System

The parties agree to utilise a web-based contract administration management system ("CAMS") for the project, which shall be ASITE.



11.0 WI 1100 – Health and safety and Environmental

11.1 General Health and Safety Requirements

11.2 Requirements

The *Consultant* shall refer to Annex 6 – Health & Safety requirements for detailed information.

The *Consultant* complies with all of the requirements listed in the Surface Transport Contract Conditions when working on the highway and its structures.

The *Employer* is responsible for delivering the programme in accordance with the Surface Transport Health Safety and Environment Policy. The *Employer's* Health Safety and Environment Policy Statement sets the leadership framework for the delivery of the programme in line with this policy and the additional objectives set by the *Employer*.

The *Employer's* vision for health and safety is of a world class project delivery with zero harm. The *Employer's* strategy for delivering this is to implement effective health and safety management systems and behaviours.

The *Consultant* complies with the spirit and intent of the *Employer's* Health Safety and Environment Policy Statement and health and safety strategy.

The *Consultant* and their supply chain implements measures to mitigate and manage the key risks to as low as reasonably practicable (ALARP) through:

- Robust design risk management
- Effective processes for assessing risk and developing safe systems of work
- The submission of suitable and sufficient RAMS for surveying stages as well as construction activities must be submitted to the *Project Manager* for review two weeks before commencement on site
- Pre Construction Information will be provided by the *Employer*
- The *Consultant* must ensure that the *Project Manager* has submitted an F10 for the surveying/ construction stages of the scheme
- The *Consultant* and Sub-contractors must be able to demonstrate a continuous improvement plan throughout the duration of the project
- The *Consultant* and Sub-contractors must be able to demonstrate experience of working on Network Rail assets and be aware of the process required to obtain permits and track possessions



- Construction phase plan and emergency preparedness plan
- World class behavioural safety programme with full participation by all
- The *Consultant* and Sub-contractors must be able to demonstrate high levels of leadership commitment and supervision and engagement in monitoring and managing the Services, rectifying deficiencies and continuously improving
- The *Consultant* and Sub-contractors must provide adequate competent staff, suitably trained and qualified. The *Consultant* must provide the *Employer* with evidence of CV's and qualifications supported by a training matrix showing competence and identifying training needs
- High levels of leadership commitment and supervision and engagement in monitoring and managing the Services, rectifying deficiencies and continuously improving
- Personal competency, development and innovation
- Exemplary standards of health and safety performance and management whether in design, construction or procurement to ensure that the *Employer's* vision is delivered on the worksite and compliance with health and safety legislation
- Comprehensive occupational health management scheme
- Pre start meetings
- The *Consultant* and Sub-contractors work force must be fully inducted on the site before works through site inductions, toolbox talks and daily pre work briefings it may also be a requirement to hold CSCS cards or similar.
- *Consultant's* workers are ready for work through site inductions, toolbox talks and daily pre work briefings, which must be recorded and available for inspection by the *Employer*
- "One Team" culture, honesty, openness and engagement
- Rewarding good performance and challenging poor performance
- The *Consultant* submits on a 4 weekly basis an incidents summary report of which the *Employer* will provide the template of

The *Consultant* responds promptly if the *Project Manager* requests a meeting with a senior representative from the *Consultant* (typically a Director identified as responsible for the



Services) to discuss any reportable event, adverse trends or other evidence of a serious non-conformity with the legislation or health and safety requirements stated in this part of the Scope.

The *Consultant* ensures that all employees and Sub-contractors and suppliers of any tier are made aware of their responsibility for their own safety and the safety of others and for ensuring that the activities they undertake are safe and do not place others at risk. A banksman/signaller is used for all loading, unloading and lifting operations, for all vehicle movements across the public footway notwithstanding the presence of a dropped kerb and for all vehicle movements where the vehicle is reversing or the driver's view is restricted. All vehicle entry and exit movements to each worksite are managed using a banksman. The *Consultant* ensures that employees do not enter any areas where they are putting themselves or others at risk in doing so.

The *Consultant* ensures that his employees participate in the health and safety initiatives that the *Consultant* and *Employer* use to review and improve health and safety performance collectively with their supply chains. This includes the requirement to attend routine health and safety meetings, briefings and Sub-contractor forums.

The *Consultant* produces, cascades, communicates and circulates health and safety alerts and communications to all levels of the workforce. Records of these being briefed are retained by the *Consultant*.

11.3 Consultant's Health and Safety Management Systems

The *Consultant* and Sub-contractors must provide a description of their Health and Safety management system (e.g. OHSAS 18001 or similar) and demonstrate how the system is maintained to ensure that it is fit for purpose.

11.4 Health and Safety Advice

The *Consultant* provides CV's for all members of the health and safety Team in their proposal and ensures that these people once accepted are made available to provide the Services. The *Consultant* informs the *Project Manager* of any changes in personnel and provides CV's for new members of the Team.

11.5 Procurement and Supply Chain Management

During the procurement process and after the appointment of Sub-contractors, the *Consultant* is responsible for ensuring that Sub-contractors are aware of and understand the health and safety requirements stated within this part of the Scope. The *Consultant* coordinates and manages the interface between his Sub-contractors to ensure compliance with the health and safety requirements set out in this part of the Scope and monitors and reports health and safety performance periodically to the *Project Manager*.

11.6 Health and Safety Training

The *Consultant* ensures the delivery of health and safety training at all stages of the project for all of his personnel (including Sub-contractors and suppliers of any tier) engaged on the Services. In particular, training is provided early in the programme to raise awareness of how



health and safety initiatives can be incorporated into the design and construction phases to maximise performance in these areas and assist with mitigating any associated impacts. The *Consultant* meets all training, assessment and associated costs. The *Consultant* should be able to demonstrate staff competencies via a training matrix or similar which the *Employer* will review.

The *Consultant* puts in place systems that ensure all inductions/training are implemented effectively and that the persons providing inductions have received adequate training to do so. The *Consultant* ensures that these are carried out in a suitable place with appropriate visual aids.

The *Consultant* has a procedure in place that assists those personnel with learning, reading and language difficulties.

The *Consultant* maintains a written record of attendance for inductions and safety briefings. This record is available to the *Project Manager* on request.

11.7 Construction Skills Certification Scheme (CSCS)

The *Consultant* ensures that all employees, Sub-contractors and suppliers of any tier and other *Consultants* entering the site are in possession of a valid CSCS card. The *Consultant* ensures that the CSCS card held by any individual is appropriate to their specific job task(s).

An exception to this requirement is granted where the individual holds a valid card from a CSCS affiliated or amalgamated scheme or other accepted scheme which has been assessed as meeting similar standards. Special dispensation may be given by the *Consultant* to provide access to visitors when on an accompanied site visit.

11.8 Management of Site Hazards

The *Consultant* takes appropriate action with regards to the site hazards identified by himself or the *Project Manager* in association with the works contained in the Pre Construction Information. The *Consultant* also considers the hazards identified in the development of their detailed design using the Design Risk Management process of the Construction (Design and Management) Regulations 2015 (CDM Regulations) and Control of Asbestos Regulations 2012. The *Consultant* ensures that they properly communicate the hazards on drawings or through risk registers and controls the residual risks via risk assessments, method statements and activity plans as part of their safe system of work so that they are understood by the workforce.

The *Consultant* also considers the site hazards that are normally associated with working on a construction site and on the public highway. These include, but are not limited to, confined spaces, working at heights, asbestos containing materials, buried services, overhead utilities, hazardous materials, contaminated land, uneven surfaces, high and low voltage cables, moving machinery, moving vehicles and pedestrians. The *Consultant* undertakes his own site hazard survey prior to starting works on site to verify the site information and identify any other risks that may affect their work.



In addition to the hazards and risks normally associated with the types of work detailed in this document, the *Consultant* and their Sub-contractors shall consider the following significant residual risks whilst planning and undertaking the Services;

- Vehicular and pedestrian traffic
- Working at height
- Confined spaces
- Interface with electrical equipment
- Interface with services
- Known Asbestos presents

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

All identified hazards shall be recorded within the 3D Graphical Model and also logged in the Designers Hazard Log.

11.9 Compliance with Policies

The *Consultant* notifies its personnel Sub-contractors and Indirect Sub-contractors and the *Employer* of any health and safety hazards that exist or that may arise in connection with the provision of the Services of which the *Consultant* is aware or ought reasonably to be aware.

The *Consultant* undertakes that all its personnel and those of its Sub-contractors and Indirect Sub-contractors comply with all of the *Employer's* policies and standards that are relevant to the provision of the Services, including those relating to safety, security, business ethics, responsible procurement, work place harassment, drugs and alcohol and illegal substances and any other on site regulations specified by the *Employer* for personnel working at TfL Premises or accessing the *Employer's* computer systems. The *Employer* provides the *Consultant* with copies of such policies on request.

The *Consultant*:

- undertakes to procure that all the *Consultant's* Personnel comply with each *Employer's* policies and standards that are relevant to the performance of the Services, including those relating to safety, security, business ethics, drugs and alcohol and any other on site regulations specified by each *Employer* for personnel working at *Employer* Premises or accessing an *Employer's* computer systems. The Framework *Employer* or the relevant *Employer* provides the *Consultant* with copies of such policies and standards on request;



- provides the Services in compliance and ensures that the *Consultant's* Personnel comply with all requirements of all Acts of Parliament, statutory instruments, court orders, regulations, directives, European Community decisions (insofar as legally binding), bye-laws, treaties and other regulatory requirements relevant to either or both of the *Consultant's* business or each *Employer's* business, from time to time in force which are or may become applicable to the Services. The *Consultant* promptly notifies the Framework *Employer* and/or any relevant *Employer* if the *Consultant* is required to make any change to the Services for the purposes of complying with its obligations under this Section 11.1.2;
- without limiting the generality of this Section 11.1.2, complies with all relevant enactments in force from time to time relating to discrimination in employment and the promotion of equal opportunities;
- without prejudice to any other provision of this Section 11.1 or the Schedules, complies with any provisions set out in the Schedules that relate to traffic management and complies with the reasonable instructions of each *Employer's* Traffic Manager as may be made available to the *Consultant* from time to time. For the purposes of this Section 11.1.6, "Traffic Manager" means an *Employer's* traffic manager appointed in accordance with section 17 of the Traffic Management Act 2004; and
- promptly notifies the *Consultant's* Personnel and any relevant *Employer* of any health and safety hazards that exist or may arise in connection with the performance of the Services.

In all cases, the costs of compliance with this Section 11.1 shall be borne by the *Consultant*.

In providing the Services, the *Consultant* (taking into account best available techniques not entailing excessive cost and the best practicable means of preventing, or counteracting the effects of any noise or vibration) has appropriate regard (insofar as the *Consultant's* activities may impact on the environment) to the need to:

- preserve and protect the environment and to the need to avoid, remedy and mitigate any adverse effects on the environment;
- enhance the environment and have regard to the desirability of achieving sustainable development;
- conserve and safeguard flora, fauna and geological or physiological features of special interest; and



- sustain the potential of natural and physical resources and the need to safeguard the life-supporting capacity of air, water, soil and ecosystems.

11.10 The Construction (Design and Management) Regulations 2015

The *Employer* is the *Employer*. The *Consultant* is the Principal Designer as defined in the CDM Regulations as named in the Contract Data.

In accordance with its duties under the CDM Regulations, the *Consultant*, as Principal Designer, is responsible for developing the design(s) that meet the requirements of the CDM Regulations. The project shall be notifiable if there are 20 people or more working on site and last longer than 30 days.

The *Consultant* shall confirm as part of his tender submission that he is also capable to undertake the role of Principal Designer as defined by Construction (Design and Management) Regulations 2015.

Without limitation to its duties under the CDM Regulations, the *Consultant*, as Principal Designer:

- designs the works so that hazards are considered throughout the project lifecycles of construction, operation/use, maintenance and demolition and ensures that hazards are eliminated or reduced and controlled to ALARP;
- the *Consultant*, as Principal Designer and must ensure that regular design and build reviews are carried out and documented throughout the design life of the project in agreement with the *Project Manager*
- collates information for the Health and Safety File from others with whom the *Consultant* shares the worksite. The *Consultant* populates the Health and Safety File for each structure that is part of the Services with the information required. Such information will be in a format prescribed by the *Employer* and fulfils the requirements of the CDM Regulations. The Health and Safety File will include those items identified in clause 3 of Appendix 4 of the Health and Safety Executive's guide to the CDM Regulations, Managing Health and Safety in Construction. The format of the Health and Safety File will comply with Surface Transport Standards.

11.11 Incident Reporting, Investigation, Performance Monitoring

The *Consultant* shall report all HSE incidents, accidents and near miss events which occur during the contract immediately via the agreed electronic reporting mechanism.

The *Consultant* shall, within fourteen (14) days submit an initial written report and after twenty-eight (28) days a full report detailing as a minimum the following:



- description of the incident;
- immediate actions taken;
- immediate causes;
- root causes;
- actions taken to prevent a recurrence;
- skills, knowledge and experience of those involved – supervisors and operatives; and
- details of plant/equipment used including calibration and maintenance

With the agreement of the *Project Manager* a longer timescale to complete the final report may be agreed.

All investigation reports will be completed to establish root causes and to a level of detail acceptable at the time to the *Employer*. Any comments provided by the *Employer* shall be addressed by the *Consultant* and an updated report submitted if required.

Where serious accidents occur – Major injuries and Dangerous Occurrence (as defined in RIDDOR) - these shall be reported to the *Project Manager* immediately (by phone) and be subject to a thorough formal investigation.

Nothing in this document supersedes the *Consultant's* responsibility for statutory reporting of incidents/accidents.

To support the analysis of health and safety performance, the *Consultant* provides the *Project Manager* with the details of the number of hours worked (including for the avoidance of doubt, by Sub-contractors and other suppliers) for the work carried out and the number of personnel involved, in each four week period to be stipulated by the *Project Manager*. This data is to be submitted no later than Wednesday of Week 1 of the following period, and includes for all the *Consultant's* staff and personnel employed on the Services since last report. The cumulative report is broken down by management, site level supervision and operatives.

11.12 Non English Speaking Workers

Not applicable.

11.13 Personal Protective Equipment (PPE)

The *Consultant* shall assess and provide appropriate PPE for use of his employees and Sub-contractors as follows:

- PPE provided shall be free of charge to all personnel, as required and appropriate, for the job task; and



- PPE fits the individual and is laundered, maintained and/or replaced to ensure that it remains effective at all time

The *Employers* minimum requirements are:

- hard hat with company branding;
- eye protection (safety glasses or other suitable eye protection);
- hand protection (gloves) (subject to a task specific risk assessment agreed by the *Consultant*, gloves may be omitted);
- safety boots with ankle protection/support; and
- high visibility jacket (Class 3 – EN 471) and trousers with reflective strips for all works undertaken on the highway with company branding.

Dependant on the job task function and site conditions, personnel are also to be provided with:

- respiratory protection equipment (RPE);
- hearing protection; and
- hot, wet or inclement weather protection.

The *Consultant* ensures that all personnel wear PPE / RPE appropriate to the risks of each task and demonstrate that risk control systems are in place. Personnel must be properly fitted and tested for equipment i.e face fit test certificates, and copies of certificates recorded for inspection by the *Employer*.

The *Consultants* PPE and clothing requirements are to be provided for use on site of the *Project Manager*, his staff, visitors and other agents involved in the contract.

11.14 First Aid, Occupational Health, Drugs and Alcohol

The *Consultant* shall make suitable and sufficient arrangements for first aid based on the:

- nature and size of the works;
- size and distribution of the workforce;
- needs of traveling, remote and lone workers;
- hours of work; and
- multi-occupied worksites.

The *Consultant* shall ensure access to an occupational health services provider. The occupational health service will be active at all times when work is being undertaken.



The *Consultant* uses and consults specialist providers, where necessary, to promote health surveillance, health awareness and general occupational health arrangements.

The *Consultant* shall operate a drugs and alcohol policy and implements suitable arrangements to verify compliance with that policy including undertaking the necessary alcohol and drug testing. In addition the *Consultant* shall co-operate with the *Employer* who may require the execution of random and/or for cause alcohol and drug tests. The *Consultant* shall provide records of testing if requested by the *Employer*.

The following reactive occupational health services are provided for each individual engaged by the *Consultant* (including the employees of site-based Sub-contractors and suppliers of any tier including labour only supply):

- testing for drugs and alcohol in individuals in accordance with the *Consultants* policy;
- providing pre-employment medicals;
- providing health questionnaires on commencement for all individuals including site and office-based staff;
- providing specific health appraisals for those referred following evaluation of questionnaires;
- providing specific health surveillance for those requiring it where identified under regulations and/or risk assessment;
- providing occupational hygiene services to support and assess ill health prevention management;
- contributing to the effectiveness of attendance management, rehabilitation and return-to-work programmes and support for ill health incidence investigation where necessary; and
- providing health promotion programmes applicable to construction operatives' workplace, lifestyle and wellbeing.

The *Consultant* has agreed occupational health protocols for the following health surveillance:

- Hand Arm Vibration syndrome surveillance
- Fatigue management
- Stress management
- Respiratory health

These documents must be submitted to the *Project Manager* as part of the risk assessment demonstrating exposure rates.



11.15 Equipment, Materials or Substances Hazardous to Health

The *Consultant* gives the *Project Manager* such written notice as the *Project Manager* requires prior to the use under the contract of any equipment, materials or substances that may be hazardous and a risk to the safety, health or welfare of persons or property. The *Consultant* identifies the hazards and provides full details of any precautions to be taken on the use of such equipment or materials.

The *Consultant* only specifies substances and materials for incorporation in the S Services and incorporate substances and materials;

- which are in accordance with the relevant standards and general good building and engineering practice, and
- substances and materials which are not in accordance with the guidelines contained in any publication of the Building Council of Offices' Good Practice in the selection of Construction Materials current at the time of incorporation of such substances or materials into the S Services provided that this sub-bullet does not apply where an experienced *Consultant* would have judged at the time of the substances or materials being specified that there was no reasonable prospect of them being declared O by the scheduled date for their incorporation into the S Services.

The *Employer* will supply all information in his possession in respect of the presence of asbestos containing materials within the site/structure. The information will be included in the Pre-Construction Information. Based on this information, the *Consultant* shall liaise with the *Project Manager* to determine where additional surveys will be required and the type of survey to be undertaken.

Where no surveys exist the *Consultant* will consult with the *Project Manager* on the requirement for, number and type of any asbestos survey before the commencement of S Services.

Where the *Consultant* believes that they have disturbed asbestos as a consequence of their works, they shall stop works immediately, inform the *Project Manager* and report the incident as a Near Miss via the agreed reporting process. The *Consultant* will prepare a report of the incident and provide it to the *Project Manager* in accordance with the requirements described under Incident Reporting, Performance Monitoring and Meetings.

11.16 Emergency Plan and Fire Safety

The *Consultant* shall comply with the Principal Contractor's emergency and fire safety requirements.

11.17 Behavioural Safety

The *Consultant* implements a behavioural based safety programme with the aims of:

- lead by example;



- increase awareness of behaviours;
- develop a no name/no blame culture with the workforce;
- recognise safe behaviour, challenge and manage unsafe behaviour;
- identify and remove hazards;
- provide positive observations and feedback;
- reduce at risk behaviours/conditions; and
- increase immediate corrective action.
- The *Consultant* appoints behavioural safety leaders from within their workforce. The behavioural safety leaders are required to:
 - attend behavioural safety briefings;
 - manage behavioural safety logs;
 - lead by example on site and embody the values of behavioural safety;
 - walk the site and raise all safety concerns;
 - raise awareness and brief Site Team on behavioural safety and encourage all on site to raise safety concerns, remove hazards as they find them and record and report them as required;
 - liaise with the *Project Manager* and escalate any issues that may need resolving; and
 - attend behavioural safety leader meetings.

The *Consultant* recognises and rewards safe behaviours.

11.18 Health and Safety Innovation, Best Practice and Campaigns

The *Consultant* identifies, trials and implements health and safety innovations in consultation with the *Employer* or *Project Manager*.

During the lifecycle of the project it is anticipated that a number of industry best practices will be developed and rolled out across the project. Where identified the *Consultant* adopts such industry best practice to improve health and safety performance. Such industry best practice may comprise of health and safety standards and behavioural techniques and processes along with general site safety 'best practices' adopted from specific *Consultants*.



The *Consultant* engages with *Employer* or *Project Manager* to identify and deliver health and safety campaigns.

11.19 Site Mobilisation and Start of Services

The *Consultant* shall work collaboratively with the Principal Contractor.

11.20 Information

The *Consultant* ensures that:

- health and safety records relevant to the Services, including induction, training and equipment inspection and testing records, are kept on site and are available for inspection on request;
- copies of all relevant health and safety information to particular worksite activities is held by the team carrying out the work including method statements, risk assessments, written briefings, permits to work and safety alerts/bulletins;
- site safety briefings are provided to all persons carrying out work tasks subject to method statement, risk assessments and permit controls and written records maintained of briefings signed by all persons carrying out the tasks (these briefings are completed daily and when the task or condition changes);
- the Services are suitably supervised at all times and that operatives are aware of the person supervising their work activities and their whereabouts at all times;
- supervisors receive induction on the health and safety requirements and of their specific responsibilities for health and safety aspects; and
- good use is made of visualisation boards at each site/work area where daily group briefings take place with the task specific briefing carried out at the workface with the individual task team.

11.21 Site Supervision

The *Consultant* may from time to time be required to supervise the *Employer's Contractor's* works. The *Consultant* shall ensure that competent persons supervise and manage such works and that there are arrangements in place to specifically address the supervision of new personnel to site and any others at particular risk. The arrangements also include those for addressing foreseeable emergencies. The supervisory arrangements are reviewed for adequacy and suitability in connection with any lone or isolated work.

Persons appointed to supervisory and management positions have the necessary skills, knowledge and experience for the role and are regularly assessed throughout the works.



Training and induction includes demonstration by example of good practice and the impact of poor practice.

All persons employed by the *Consultant* who have supervisory responsibilities for others (including those from Sub-contractors and suppliers of any tier) hold a current CITB Site Supervisors Safety Training Scheme certificate (SSSTS) (or equivalent agreed by the *Project Manager*).

11.22 Confined Spaces

The *Consultant* evaluates the workplace to determine which spaces (if any) are confined spaces and develops a written risk assessment and method statement identify the controls required for the safe operation of a safe system of work in accordance with The Confined Space Regulations and INDG 258: Safe Work in Confined Spaces. The risk assessment and method statement shall include the confined space entry permit and the control systems required for working in confined spaces including communication, evacuation and rescue.

The *Consultant* eliminates the need to enter confined spaces wherever possible. Where entry to a confined space is necessary the *Consultant* ensures that a safe system of work is identified that documents all hazards, safety precautions and safe working practices associated with all confined space activities performed by employees.

The *Consultant* ensures their safe system of work includes:

- checks that employees have the necessary skills, knowledge and experience to enter a confined space, are appropriately healthy (e.g. lung function for BA use) and have received adequate training;
- an adequate communication system to enable clear communication between those inside and outside of the confined space;
- testing and monitoring of the atmosphere within a confined space for hazardous gas, fume or vapour and checks on the concentration of oxygen prior to entry; and
- a requirement for emergency arrangements to be in place before any person enters or works in a confined space and contingency plans appropriate to the nature of the confined space, the risks identified and consequently the likely nature of an emergency rescue.

11.23 Working at Height

The *Consultant* complies with the Working at Height Regulations and eliminates the need to work at height wherever possible. Where working at height is necessary the *Consultant* ensures that a safe system of work is identified that documents all hazards, safety precautions and safe working practices associated with all working at height activities performed by employees.



The *Consultant* ensures that the work is properly planned, appropriately supervised and that employees have the skills, knowledge and experience to work at height. The *Consultant* ensures that collective measures take precedence over personal protective measures i.e. fall prevention equipment.

The *Consultant* implements an inspection and testing regime for all equipment identified as assisting in any working at height operation to ensure that is compliant with statutory regulations, maintaining records of all inspections and test.

11.24 Lifting Operations

Not applicable.

11.25 Excavation

Not applicable.

11.26 Construction Plant and Equipment

Not applicable.

11.27 Traffic Management and Pedestrian Segregation

Not applicable.

11.28 Site Inspections and Assurance

Not applicable.

11.29 Senior Management Safety Tours

Not applicable.

11.30 Work Related Road Risk (WRRR)/Fleet Operator Recognition

Scheme (FORS)

Not applicable.

11.31 Method Statements

Detail the operations for which the *Consultant* is required to submit method statements and risk assessments to the *Principal Contractor* for acceptance.

All Risk Assessments and Method S tate ments need to be issued for comments at least 14 days in advance of the related activities commencing.



12.0 WI 1200 – Subcontracting

12.1 Requirements for all Subcontracts

The *Consultant* ensures that each subcontract he lets in relation to this contract contain provisions:

- requiring the proposed Sub-contractor (and sub-Sub-contractors of any tier) to meet the Conditions stated for a Key Date on or before such Key Date and to achieve Completion on or before the Completion Date and to minimise the level of Defined Cost;
- requiring the proposed Sub-contractor (and sub-Sub-contractors of any tier) to maintain accounts and records and grant audit rights to the *Employer* and its authorised representatives of an equivalent extent and nature to those required by this contract;
- requiring the proposed Sub-contractor (and sub-Sub-contractors of any tier) to assign to the *Employer* the IPR in all documents, drawings, materials, computer software and any other material or works prepared or developed by or on behalf of the proposed Sub-contractor in the performance of the subcontract;
- requiring the proposed Sub-contractor (and sub-Sub-contractors of any tier) to grant a non-exclusive, perpetual, irrevocable, royalty-free licence to the *Employer* to use Background IPR (including the right to grant sub-licences) of an equivalent extent and nature to those required by this contract;
- imposing equivalent obligations of confidentiality on the proposed Sub-contractor (and sub-Sub-contractors of any tier) to those required by this contract; and
- imposing equivalent obligations regarding Prohibited Acts and health and safety (including Safety Breaches) as required by this contract on Sub-contractors (and sub-Sub-contractors of any tier).

12.2 The Subcontract Procurement Plan

Not applicable.

12.3 Updating the Subcontract Procurement Plan

Not applicable.

12.4 Critical Subcontract Packages

Not applicable.

12.5 CompeteFor

March 2017

- In Confidence -



Not applicable.



13.0 WI 1300 – Not used



14.0 WI 1400 – Acceptance or procurement procedure

14.1 Acceptance or Procurement Procedures

When procuring his workforce, sub-contractors and suppliers, the *Consultant* shall adhere (as far as is practical given the nature of the *Services*/supplies required) to the Mayor of London's Responsible Procurement Policy. Evidence of the *Consultant's* efforts to meet this policy will need to be supplied to TfL as necessary.

Where the *Consultant* is obtaining quotes for the evaluation of a Compensation Event, a minimum of 3 quotes will be obtained.

Where, after receiving written approval from the TfL *Project Manager*, the *Consultant* enters into a sub-contract for the delivery of any part of the *Services*/ or the supply of any materials or pre-fabrication of components, the sub-contract shall use the NEC Conditions of Sub-Contract which shall include all the constraints contained in this contract.

Payment terms for both this contract and any sub-contract shall be the stated TfL standard terms of payment.

Where the *Consultant* has proposed a Sub-contractor in Contract Data Part Two for part of the *Services*, acceptance of Contract Data Part Two by the *Employer* without qualification of such proposal is deemed to be consent on the same legal basis as consent by the *Project Manager*. Any such Sub-contractor is not removed by the *Consultant* from the part of the *Services* for which he has been proposed without the prior written consent of the *Project Manager*.



15.0 WI 1500 – Accounts and records

15.1 Accounts and Records

The *Consultant* shall provide, submit and keep all Quality records as described in the Specifications for any part of the Services.

15.2 Payment

The payment applications submitted to the overseeing organisation in accordance with the Conditions of Contract by the *Consultant* shall, whenever dealing with matters covered by the Cost Plan, be set out under Part and Section headings similar to those in the Cost Plan and shall separately identify each item and specify quantity, unit, rate and value. Items not described in the Cost Plan but appropriate for inclusion as measured work shall be shown at the end of the relevant section or under section headings as appropriate indicating quantity, unit rate and value. In respect of all other matters referred to in the Conditions of Contract the *Consultant* shall separately show in the statement quantities, units and rates of goods and/or materials and also details of any other matters to which he considers himself entitled.

The *Consultant* shall allow the *Project Manager* to inspect invoices for services, goods or materials included in the statement as may be required.

The *Consultant* shall deliver weekly to the *Project Manager* a return showing in detail the number of the several classes of labour from time to time employed by the *Consultant* and their *Sub-Contractors* on the site and full details of all Construction Plant located on Site and available for use by the *Consultant* or their *Sub-Contractors*.

15.3 Invoicing for payment

The *Consultant* shall attach the TfL Certified Payment Approval Form (CPAF) to each invoice. When invoicing for payment, the *Consultant* shall send the application to:

TfL Surface Transport

Accounts Payable

PO Box 45276

14 Pier Walk

London, SE10 1AJ

When invoicing for payment, the *Consultant* shall include the following information:

- Back up information to substantiate any claim for payment i.e. invoices, plant/labour/materials returns, test results. Failure to provide full substantiation could delay payment.



15.4 Records, Audit and Inspection¹

“Records” means

- all necessary information for the evaluation of claims or compensation events, whether or not relating to Sub-contractors and/or Indirect Sub-contractors;
- management accounts, information from management information systems and any other management records;
- accounting records (in hard copy as well as computer readable data);
- sub-contract files (including proposals of successful and unsuccessful bidders, bids, rebids.);
- original estimates;
- estimating worksheets;
- correspondence;
- compensation event files (including documentation covering negotiated settlements);
- schedules including capital works costs, timetable and progress towards Completion;
- general ledger entries detailing cash and trade discounts and rebates;
- commitments (agreements and leases) greater than £5,000 (five thousand pounds);
- detailed inspection records;
- such materials prepared in relation to the invitation to tender and subsequent tendering process relating to cost breakdowns, in each case which have not already been provided to the *Employer*;
- accounts and records of the Price for Works Done to Date and all other amounts to be paid to the Consultant under this contract;
- risk mitigation plans and QRA; and



- Earned Value Management reports.

The *Consultant* maintains and procures in each subcontract that each of his Sub-contractors, maintains and retains the Records for a minimum of twelve (12) years from Completion with respect to all matters for which the *Consultant* and his Sub-contractors and Indirect Sub-contractors are responsible under this contract. The *Consultant* procures that each subcontract contains open-book audit rights in favour of the *Employer* and any novated *Employer* and their authorised representatives.

The *Consultant* undertakes and procures that his Sub-contractors and Indirect Sub-contractors undertake their obligations and exercise any rights which relate to the performance of this contract on an open-book basis. The *Employer* and/or any novated *Employer* and their authorised representatives may from time to time audit on an open-book basis and check any and all information regarding any matter relating to the performance of or compliance with this contract, including without limitation, inspection of the *Consultant's* technical and organisational security measures for the protection of personal data, any aspect of the *Consultant's* operations, costs and expenses, sub-contracts, claims related to compensation events, and financial arrangements or any document referred to therein or relating thereto. The *Employer's* and any novated *Employer's* rights pursuant to this sub-clause include the right to audit and check and to take extracts from any document or record of the *Consultant* and/or his Sub-contractors and Indirect Sub-contractors including, without limitation, the Records.

The *Consultant* promptly provides (and procures that his Sub-contractors and Indirect Sub-contractors promptly provide) all reasonable co-operation in relation to any audit or check including, to the extent reasonably possible in each particular circumstance by

- granting or procuring the grant of access to any premises used in the *Consultant's* performance of this contract, whether the *Consultant's* own premises or otherwise;
- granting or procuring the grant of access to any equipment or system (including all computer hardware and software and databases) used (whether exclusively or non-exclusively) in the performance of this contract, wherever situated and whether the *Consultant's* own equipment or otherwise;
- making any contracts and other documents and records required to be maintained under this contract (whether exclusively or non-exclusively) available for audit and inspection;
- providing a reasonable number of copies of any subcontracts and other documents or records reasonably required by the *Employer's* and/or any novated *Employer's* auditor and/or granting copying facilities to the *Employer's* and/or any novated *Employer's* auditor for the purposes of making such copies; and
- complying with the *Employer's* and/or any novated *Employer's* reasonable requests for access to senior personnel engaged by



the *Consultant* in the performance of this contract and/or the Services.

15.5 Documentation on termination

The *Consultant* shall provide all documentation produced in accordance with the Scope until the date of termination including items which have not yet been submitted to the *Project Manager*. This includes all documentation produced to provide the services by the *Consultant* and their Sub-contractors.

The documents shall be ordered and categorised according to their corresponding section within WI 2000.



16.0 WI 1600 – Not used



17.0 WI 1700 – Not used



18.0 WI 1800 – Not used



19.0 WI 1900 – Not used



20.0 WI 2000 – *Employer's* requirements

20.1 Summary

The main purpose of this Stage 2 (Feasibility) project is to gain better understanding of the condition, expected life, test performance, residual life and dependencies of the refurbishment items identified in the WI 2000. If refurbishment and/or replacement is required, then the feasibility study should be carried out to develop feasible options with estimated cost and programme. The *Consultant* shall assist with buildability assessments, value engineering, optioneering and whole life costing in order to provide sufficient evidence to support and recommend a single option for each item.

The *Consultant* shall assess cost and programme implications of undertaking Services for all refurbishment items identified in WI 2000. A detailed break down of cost and programme shall be developed by the *Consultant* through the completion of a Desktop Study, Site Surveys & Investigations and a Feasibility Study.

The *Consultant*, *Contractor* and *Employer* shall work collaboratively to ensure information are shared between all parties in a timely manner, create a positive working environment to promote constructive discussions and working together as one team to deliver the STIP2 – Stage2 (Feasibility) successfully.

Please refer to the following documents for further information:

- STIP2 Tunnels – Stage2 (Feasibility) TfL High Level Stage 2 Programme
- STIP2 RHT & BWT – Project Requirements

20.2 Existing Records and Archives

The *Consultant* shall have access to all available records and archived documents on the project including any previous surveys, investigations and testing undertaken. The most significant documents are listed in Site Information but further information in the form of inspection records, construction drawings reports and other information stored on the BridgeStation, and Tunnel Station databases are also available. The *Employer* will provide the *Consultant* read-only access to the system for three email addresses.

The *Consultant* shall ensure that all required record information is transferred and stored within the CDE (Asite), and BridgeStation records are updated.

Once all the inspections, surveys and studies are complete, the information will be entered onto BridgeStation by the *Consultant*, in accordance with TfL's file-naming convention and guidelines.

20.3 Project Scope

All identified refurbishment items are listed below. Please refer to the STIP2 RHT & BWT - Project Requirements for further background and detailed information. The *Consultant* shall



review the documents thoroughly and inform the *Employer* should there be any discrepancy or if further clarifications are required.

20.4 Project Scope for Blackwall Tunnel Southbound (BWT-SB)

20.4.1 (BWT-A) Upgrade the Ventilation System to Ventilate a 100MW Fire

At the present time there is no design information available for the existing ventilation system though it is estimated to be capable of controlling fire loads in excess of 20MW. The existing fans are thought to be capable of withstanding temperatures of 150°C for a minimum of 2 hours. Current Highways Agency and European Standards recommend that this should be improved to 250°C.

The *Consultant* shall undertake computer modelling and airflow tests to determine the adequacy of the existing ventilation system in controlling heat and smoke from various fire scenarios, including where vehicles are trapped on both sides of a fire. The nature of the scenarios to be considered and the appropriate response and control provisions shall be established through dialogue with the emergency services and other relevant bodies at the TDSCG meetings. Any assumptions made of the existing ventilation system should be clearly stated in the *Consultant's* Feasibility Report.

For the purpose of investigating the current and future ventilation system performance the *Consultant* shall propose a 'design fire load' of 100MW which will take into consideration traffic usage, response times, safety provisions and available accident statistics. A risk assessment of the likelihood, balanced against the consequences, such as potential loss of life and risk of loss of tunnel structure shall also be taken into account. The minimum 'design fire load' shall be agreed with the *Employer* prior to the commencement of any substantial modelling work.

Because the fans in the southbound bore shafts are located remotely from the tunnel interior, the *Consultant* shall assess whether the temperatures at the fans during a 'design fire load' would be expected to be lower. The findings of this analysis are likely to assist in the decision as to whether the fans should be replaced as part of the refurbishment works. If it is found that the fans should be replaced then the *Consultant* shall detail a specification for a replacement ventilation system in the Feasibility Report.

The *Consultant* shall recommend the best option to control the smoke from a 100MW (heat release rate) fire and the air quality from vehicle pollution in normal operations.

- This shall include evaluating the merits of changing from a semi-transverse to longitudinal method of ventilation with one-way traffic operations only.
- The ventilation system shall be suitable for traffic flow reversal (southbound to northbound) on occasions during off-peak and peak period operating periods.

The *Consultant* shall consider the merits of the following ventilation options as a minimum, to be evaluated:



1. Retaining the current method of semi-transverse ventilation, upgraded as necessary.
2. Installing reversible jet fans in the tunnel bore to achieve longitudinal ventilation.
3. Reconfiguring the use of the shafts to achieve longitudinal ventilation akin to that of the Blackwall Northbound Tunnel.
4. A hybrid solution that uses ventilation via the shafts and from jet fans in the tunnel to achieve longitudinal ventilation.

The *Consultant* shall carry out the following

- Develop feasible options with cost and programme for implementation.
- Include any enabling works and temporary works requirements.
- Provide justifications / Pros & Cons for each feasible option.
- Undertake workshop / value engineering / optioneering with all key stakeholders
- Prepare a feasibility report with a single recommendation.
- Identify risk and opportunities

The *Consultant* shall summarise (in a table) where expectations have not been met, highlighting significant issues demanding immediate / short-term intervention and a strategy proposed to continue the operation of the current system until at least 2040.

The *Consultant* shall

- Carry out structural condition survey of fan floor steelwork.
- Complete jet fan (tunnel envelope) modelling assessment.
- Fire Integrity Assessment of Tunnel & vent shafts.
- Carry out air flow survey in tunnel, vent shafts and sub-tunnel.
- Background noise monitoring & reporting.
- Refine programme for Stage 5 works.

20.4.2 (BWT-B) Replacement of Tunnel Lighting into LED Lighting

The Blackwall Tunnel southbound bore is illuminated in three sections with luminaires suspended from the tunnel ceiling. 400W High-pressure sodium light fittings control the entry (threshold and transition) and exit zones where higher intensity light is required. 50W



Fluorescent type lamps illuminate the interior of the tunnel bore. The Portals additionally have lighting at the side of the tunnel consisting of 400W high-pressure sodium and 58W fluorescent fittings. Much of this equipment has now reached the end of its useful life and will need replacing.

The Lighting B Scout controllers are obsolete and as well as the B Scout luminaire switches, these are currently being changed out and a shorting P1an installed on the Base Lighting and to give enough spare B Scout switches to manage Stages 3-6 Boost repairs as a Temporary Fix. A Single B Scout is having its Hard & Software updated by Philips and will cover the whole tunnel (there were 2 no B Scouts 1 at each end - There is currently no resilience in the S system until STIP 2, as the asset continues to be sweated).

The *Consultant* shall develop options for a new LED lighting system taking into consideration the whole life costs of maintenance and power consumption over a 25-year design life. The objective will be to achieve the optimum design that will keep the costs of lighting as low as possible. The *Consultant* shall consider the reflectance of road surfacing, tunnel linings and other permanent objects that may affect the performance of lighting system. Some of the other issues to consider include:

- Installation costs;
- Frequency of maintenance;
- Cost of spares; and
- Facilitate Installation of new CCTV and VAID systems

The *Consultant* shall:

- Provide options for the re-lighting all areas of the tunnel using LED with reference to the guidelines BS 5489 Part2:2016.
- Ensure the new LED lighting system will be compliment CCTV throughout the tunnel and enable Video Accident and Incident Detection (VAID).
- Assessment on power loading may be required for the main electrical system and the UPS system. Please also refer to scope reference C.
- Considerations on the temporary and enabling works are required and allowances on cost and time impact should be provided for as part of the Feasibility Study.
- Review and verify the suitability of site survey / investigation Scope and requirements.
- Review latest inspection reports (M&E and S tructural), including the General & Principle Inspections, Maintenance and Defects records and O&M Manuals.



- Identify information gap and inform TfL if additional survey / investigation is required to develop the feasible options.

The *Consultant* shall summarise (in a table) where expectations have not been met, highlighting significant issues demanding immediate / short-term intervention and a strategy proposed to continue the operation of the current system until at least 2040.

The *Consultant* shall:

- Assess the current lighting and cable support system, and establish if it will support the new lighting system for the design life.
- If renewal is required then review options for strengthening or replacing the existing system.
- Establish the existing cable route for lighting system and determine which lighting units are linked up to the UPS system.
- Prepare a feasibility report with a single recommendation.
- Identify risk and opportunities

20.4.3 (BWT-C) Replacement of CCTV System

The CCTV system consists of 22No. CCTV cameras (201-222) installed in 2006. The equipment includes; cameras, housings, lens, control boards, PSU/terminations and enclosures. These items are now approximately 10 years old, and are obsolete, currently being repaired using existing spares, and new spares are no longer available off the shelf.

Currently the cameras are connected on the 36c fibre that runs through the tunnel via the EDPs. The condition of the copper/fibre cable from EDPs to the CCTV is unknown and is likely to need replacement, however legacy fibre will become redundant with the migration to IP during early 2017. The general condition of the EDP enclosures is unknown.

The system is unreliable and will need to be replaced with new CCTV cameras to provide 100% coverage of the tunnel and its approach roads. The *Consultant* shall develop plans for new cameras to be provided with pan, tilt and zoom, screen wipers, washer bottles and IP 66 housings. The system shall be linked to the HORUS system via existing CCTV IP network, and designed in such a way that the operation of emergency equipment or changes in traffic flow will cause a pre-selected camera (or cameras) to focus on the location where the incident is occurring. The CCTV system will be compatible with the proposed new Vehicle Accident Incident Detection System (VAID).

The new system shall achieve the following:

- 100% coverage inside bores, no blind spots.
- Ensure clearance of traffic envelope.



- Cameras deployed on both walls of the bore to minimise risk of obscuration if high sided vehicles are stationary inside the underpass.
- Overlapping views so that cameras can cover each other in the event of an incident or an individual camera failure.
- Good coverage around the bore entrance as this is where the majority of traffic accidents occur.
- Cameras able to view both directions of traffic flow in case of contra flow or during an emergency
- Coverage of areas outside of the bore which are a security risk

The out of bore CCTV system will also be reviewed. Review installation date, expected life, current condition, test performance and advise on residual life.

The *Consultant* shall:

- Review and verify the suitability of site survey / investigation Scope and requirements.
- Review and verify existing information.
- Identify information gap and inform TfL if additional survey / investigation is required to develop the feasible options.
- Develop feasible options with cost and programme for implementation.
- Include any enabling works and temporary works requirements.
- Provide justifications / Pros & Cons for each feasible option.
- Undertake workshop / value engineering / optioneering with all key stakeholders
- Carry out condition survey of tunnel bore and shafts, to determine cable and duct routes.
- Identify potential additional CCTV locations, additional cabling routes.
- Complete assessment of existing CCTV System and carry out line of sight survey.

20.4.4 (BWT-D) Installation of Video Accident and Incident Detection (VAID) System



The existing CITILOG VAID system has been none operational for the past 6 years plus, the UK suppliers Smart CCTV have been in and advised that the whole system is obsolete and would need to be replaced.

There currently a preferred Solution provided by FLIR within the Data files for further review.

This uses the existing FLIR Flux servers for Northbound to minimise costs.

Costs and a detailed specification for Stage 4 have been obtained by the TfL Tunnel Employer and are available for incorporation into cost estimates. In Stage 2 there is no feasibility required although costs and programme for the activity shall be incorporated into the single preferred option. These will be provided by the Tunnels Employer.

The Vehicle Incident Detection System should be capable of detecting:

- slow moving vehicles, over speed flow of vehicles, wrong direction vehicles;
- pedestrians in the road or on the walkway; and
- debris in the road.
- Mask multiple alarms from the same incident

The system shall activate an alarm based on changes detected by the video image processing software. An alarm from the detector shall implement the following actions:

- a. CCTV alert via the HORUS system;
- b. Video recording to DVR/hard disc before and after the incident;
- c. Switch video monitors from blank to real time image with banner; and
- d. Switch the alarm camera plus the up stream and down stream cameras

Costs and a detailed specification for Stage 4 have been obtained by the TfL Tunnel Employer and are available for incorporation into cost estimates.

Costs and programme for the activity shall be incorporated into the single preferred option. These will be provided by the Tunnels Employer.

20.4.5 (BWT-E) Refurbishment/Replacement of Variable Message Signs (VMS)

VMS Signs

There are 70 off VMS and 96 off Tunnel Lane Control Signs (TLSC) fixed to the soffit of the tunnel. There are separate signs facing southbound and northbound traffic flows. The signs are in poor condition especially from the north portal heading south. A number of the VMS signs within the tunnel are regularly hit by high vehicles or their loads causing damage. There is damage both to the signs and support bracketry, 21no of the VMS have been hit.



It is the considered view that all the VMS and TLCS signs throughout the bore will need to be replaced due to their age.

The current signs are not IP signs, but they are driven by the Horus system with an NMCS 2 interface via MOXAs (IP to RS 485 convertors).

The *Consultant* will need to consider a more suitable sign and position, and how to install new signage to provide good line of sight, while also limiting conflict with the New LED lighting scheme they are to propose.

Way Finding Signs

There are also 92 way finding signs were installed in 2013/14, they are situated at either end of the EDPs, as they were a direct replacement for the old sign indications. The wayfinding signs are LED secret signs (Go black when switched to OFF by the LHD system), The current positioning of these signs does not meet current requirements in relation to the carriageway height, the *Consultant* will need to consider the safety implications to the Tunnel User.

In the event of total power loss they will continue to be illuminated and point motorists to the closest exit.

The Way Finder signs are on average spaced evenly at intervals of approximately 46m for the entire tunnel length. The *Consultant* shall consider options for replacing Way Finder signs with a slimmer design, since the current designs are shown to be highly susceptible to impact damage.

The *Consultant* will include in their feasibility report details of associated cabling and duct routes, and consider interfaces with CCTV and fire detection systems. To be validated.

- Assess existing Wayfinding signs and examine possible cabling routes.
- Wayfinding signs to interface with tunnel fire zones, linear heat detection zones, CCTV and ventilation plans.
- Provide recommend options for bringing up to the current standards using an ALARP assessment.
- Assess ducting and cabling to all signs identifying redundancy and spare capacity.

The *Consultant* shall

- Review and verify the suitability of site survey / investigation Scope and requirements.
- Review and verify existing information, to include all signs and supports, review installation date, current condition, test performance and advise on residual life expectancy. Include sign supports, cabling, power, and controls.



- Identify information gap and inform TfL if additional survey / investigation is required to develop the feasible options.
- Complete assessment of existing VMS and Way-finder signs and examine possible cabling and duct routes.
- Review positioning of signs, and methods of installation to provide good line of sight for vehicles, while allowing suitable clearance for new lighting scheme.

20.4.6 (BWT-F) Decommission Flood Gates

Flood defence gates are located at each portal and are used to protect the surrounding area from flooding if there is a tunnel breach. A paper is currently in production and advising decommissioning. It has not been formally issued and a clear plan of action for what measures will replace the gate is to be agreed. The scope of this item is to provide a cost for decommissioning and one for removal of the flood gate. This information will feed into the study. If the paper is agreed then its outcome will feed into the Stage 2 final option selection, if a policy decision is not agreed then there may be no activity carried forward under this scheme.

It is currently envisaged decommissioning shall involve ensuring there is secondary block against the gate dropping if the hydraulics are decommissioned, decommissioning the control mechanism (HORUS and local SCADA) and electrical isolation.

Removal would involve extracting all parts of the gate which can be reasonably removed. Some parts of the gate built into the structure may be left in situ if they do not pose an issue to future use of the tunnel and would be very expensive to remove.

The *Consultant* shall:

- Carry out condition survey of equipment, and cable/duct routes.
- Survey installation and determine what equipment can be safely removed.
- Determine how equipment can be electrically and mechanically isolated.
- Provide separate costs for decommissioning and removal of the Flood Gate and associated control equipment and cabling.

20.4.7 (BWT-G) Refurbishment/Replacement of Cabling Infrastructure

A longitudinal 36 core fibre cable has recently been installed within the bore, with connections to each EDP cabinet. TfL are currently installing new IP switches in the EDPs.



Any new assets such as CCTV and VAID to be connected to the HORUS system would need to be cabled back and terminated on the new EDP switches.

The condition of any cables between EDPs, vent shafts and assets located within the tunnel is unknown at present. TfL estimates that no work has been carried out on the cabling since the previous refurbishment c2006.

The design of the network would have to consider the likely increase of data traffic on the IP network, as well as resilience of the system.

The *Consultant* shall

- Review and verify the suitability of site survey / investigation Scope and requirements.
- Review and verify existing information.
- Identify information gap and inform TfL if additional survey / investigation is required to develop the feasible options.

20.4.8 (BWT-H) Refurbishment/Replacement of Power Systems

Each substation LV supply installation is 'backed up' by a UPS system providing continued power to certain essential services in the event of mains failure. The systems principally provide power for the emergency tunnel and substation lighting, computers and communications equipment.

The latest P.I which was carried out in November 2015 has details of current status of the UPS and components and notes that some parts are approaching the end of their serviceable life.

'UK Wiring Regulations, BS 7671 (ref 14), in the recent update, now includes particular requirements for non-combustible methods of support for cables / wiring in escape routes (Regulation 521.201). Plastic clips, supports, conduit and trunking must not be for cables along escape routes.

The *Consultant* shall evaluate the condition, suitability and performances of both existing the high and low voltage power supplies and make recommendations relating to design improvements to the system in terms of reliability, compliance to current regulations and cost.

The *Consultant* shall - Review HV, LV, emergency power (UPS), small power lighting distribution, earthing and lightning protection systems. Establish installation date, expected life, current condition, test performance and advise TfL on residual life.

The *Consultant* should consider when upgrading / replacing of UPS and main power switch board, additional power load from new / additional M&E assets.

- Review and verify the suitability of site survey / investigation Scope and requirements.



- Review and verify existing information.
- Identify information gap and inform TfL if additional survey / investigation is required to develop the feasible options.
- Establish the existing cable route for the UPS system and determine which systems are linked up to the UPS system.
- Carry out system load checks & install power monitor.

20.4.9 (BWT-I) Refurbishment/Replacement of M&E Infrastructure in Drainage System

Renewal of Drainage System - pipes, valves, pumps and control systems.

The *Consultant* shall assess performance and general condition of the existing drainage pipework throughout the tunnel and the approach roads, and recommend improvements where necessary.

The *Consultant* shall review DSEAR requirements and responsibilities and advise the *Employer* of any changes in requirements and provide recommendations.

The *Consultant* shall review and verify the suitability of site survey / investigation Scope and requirements.

- Review and verify existing information.
- Identify information gap and inform TfL if additional survey / investigation is required to develop the feasible options.
- Carry out a complete assessment of the existing pump and sump equipment.

Note areas of the some of the equipment locations are designate confined spaces.

20.4.10 (BWT-J) Refurbishment/Replacement of Linear Heat Detection

System installed in 2000 (15 years designed life) Verify this statement?

"The *Consultant* shall carry out a condition survey of the existing linear heat detection (LHD) to determine the cable locations and condition,

If a replacement LHD is required the *Consultant* shall recommend in their report which LHD system they consider most suitable for implementation in terms of reliability, whole life cost and ease of maintenance, and develop proposals for their installation in the tunnel.

The New Linear Heat Detection system shall be capable of being easily being extended to cover the Ventilation Shafts.

Note:-The LHD in the Sub Tunnel has recently been completed (2016) and commissioned as part of the Sub Tunnel Relighting Scheme.

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- In Confidence -



As the Linear heat Detector is mounted with the Tunnel Lighting, this item should be linked with the replacement of tunnel lighting works.

The *Consultant* shall establish installation date, expected life, current condition, test performance of the LHD and advise on residual life.

Provision on cost and programme is required to undertake feasibility study - TfL to confirm after site investigation.

The *Consultant* shall establish the existing cable and duct routes and associated control system for the linear heat detector.

Please note that some M&E systems are dependent from other scope items and may need to be packaged together when developing feasible options.

20.4.11 (BWT-K) Refurbishment/Replacement of Fire Safety Systems

The *Consultant* shall review fire alarm panels and gas suppression system. Establish installation date, expected life, current condition, test performance and advise on residual life.

For clarity, the fire main and hydrants within the tunnel have been excluded from project scope due to the most recent inspection detailing them in good condition and the next anticipated works on the lifecycle plan being 2032.

The *Consultant* shall review and verify the suitability of site survey / investigation information and requirements.

- Review and verify existing information.
- Identify information gap and inform TfL if additional survey / investigation is required to develop the feasible options.
- Survey and inspect fire alarm panels and gas suppression system in the South and North switch rooms, and ascertain their condition and life expectancy.

20.4.12 (BWT-L) Refurbishment/Replacement of Heating Ventilation and Air

Conditioning (HVAC) in Tunnel Service Buildings

- The HVAC Systems are approaching the end of their design life, which will lead to increased future maintenance costs and reliability.
- In extreme weather, failure could result in overheating of electrical systems and possible closure of the tunnel.

The *Consultant* shall establish the condition and location of HVAC units, the cabling route, ducting run and supporting system of the of existing HVAC System.



- Review and verify the suitability of site survey / investigation information and requirements.
- Review and verify existing information.
- Identify information gap and inform TfL if additional survey / investigation is required to develop the feasible options.
- Carry out an assessment of the Heating/Ventilation and Air Conditioning system.

Provision on cost and programme is required to undertake feasibility study - TfL to confirm after site investigation.

Please note that some M&E systems are dependent from other scope items and may need to be packaged together when developing feasible options.

20.4.13 (BWT-M) Refurbishment/Replacement of Electricity Distribution Points (EDPs)

There are 23 pairs Electrical/Emergency distribution points (EDPs) located above the walkway at approximately 50m intervals housing fire fighting equipment and emergency telephones.

The *Consultant* shall develop proposals for a new system in which the spacing of the emergency points is 50m to comply with the requirements of BD 78/99. Facilities provided at the EPs will need to comply with the relevant guidance and standards relating to telephones, information signs and fire fighting equipment. The requirements of the fire extinguishers, hose reels, fire mains and hydrants shall be agreed with the local Fire Service.

The *Consultant* shall review and verify the suitability of site survey / investigation information and requirements.

- Review and verify existing information.
- Identify information gap and inform TfL if additional survey / investigation is required to develop the feasible options.

The *Consultant* shall establish the installation date, expected life, current condition, test performance of the EDPs and advise on residual life.

20.4.14 (BWT-O) Replace/Refurbish Radio System

The leaky feeder is approximately 10 years old of a 20 year design life. It does not run into the vent shafts. A current TfL scheme is investigating installing a leaky feeder in the sub tunnel, so this area is out of scope of the project. A replacement feeder extending into the vent shafts should be investigated. Removal of decommissioned services to improve its



functionality should also be reviewed. Scope also includes cabling, transmitters, amplifiers and HORUS functionality.

The reserve leaky feeder is approximately 2 years old and in good condition.

Fire ground radio should be investigated with cost for replacement established.

The DAB is more than 10 years old with no voice break in. It is not EBU (European Broadcasting Union) compliant and replacement should be investigated.

The *Consultant* shall review and verify the suitability of site survey / investigation information and requirements.

Identify information gap and inform TfL if additional survey / investigation is required to develop the feasible options.

The *Consultant* shall carry out Radio communications system analysis.

Establish the condition and location of the cable route and supporting system of the existing Radio and PA System including all associated equipment.

- Leaky feeder survey, the *Consultant* should consider a dual system, due to the wide range of frequencies involved and extending into the ventilation shafts for emergency coverage.

20.4.15 (BWT-P) Replace/Refurbish Loud Speaker Public Address System

Bosch amps were recently replaced and the remaining Duran amps are not compatible with the rest of the network. They have a 7-8 year life and will be life expired by the end of STIP. Review what items require replacement along with condition, life expectancy, performance and residual life.

Items include Public Address, PC controller, speakers, feeder cables, amplifiers, fibres between amplifiers, recorders and microphones. The speakers are 10 years old and in poor condition with regular failures due to water and dirt in the asset. All pre recorded messages are out of date.

20.4.16 (BWT-Q) Remove Maintenance Telephone

Maintenance phones are no longer used in the tunnel. Establish removal options/costs. The scope includes phones and cabling.

- Carry out condition survey of equipment, and cable/duct routes.
- Survey installation and determine what equipment can be safely removed.
- Determine how equipment can be electrically isolated.



Provide costs for decommissioning and removal of equipment and associated cabling.

20.5 Project Scope for Rotherhithe Tunnel (RHT)

20.5.1 (RHT-A) Upgrade of LED Lighting & Replacement of Structural Support System

The outcome of Stage 2 (Feasibility) is to provide options on how the tunnel lighting can be upgraded with LED lighting and provide options to replace the structural support for the cabling system.

Existing main tunnel lighting and the support infrastructure which is suggested to be a galvanised uni-strut were installed in 1990 (updated in 1999) and is therefore at least 16 years old and subject to replacement.

The main tunnel lighting consists of a single row of 2x 58W fluorescent fittings at the tunnel crown, running along the centre of the tunnel. At the north and south portals there is boost lighting provided by 1x 400W and 2x 400W high pressure sodium fittings mounted either side of the main light fittings. As traffic flows in both directions within the tunnel the boost lighting arrangement at each portal is therefore the same. The lighting stages (1-6) are controlled via SCADA with input from photometers located at the north and south portals. Stages 1 and 2 are provided by the main tunnel lighting whilst stages 3 to 6 provide varying amounts of boost lighting. There is also a PLC based dimmable control system with Mod bus plus / TCP/IP interface with HORUS control system.

The lighting support system is severely corroded throughout the tunnel. The original support system is coming away from the tunnel crown in some places, especially where the tiles that originally lined the tunnel are being removed. At the northern end of the tunnel, safety chains have been installed around the existing support system because the boost lighting arrangement interferes with the steel support bar arrangement used elsewhere. (See Principal Inspection November 2015.)

Hybrid Principal Inspection report and Mouchel General Inspection report both advice of end of life of strapping and chains. These were installed 5-6 years ago to sweat the asset as the holding bolts were failing and the support system is unsuitable for another 15-20 years.

The *Consultant* shall develop options for a new LED lighting system with UPS backed emergency lighting, taking into consideration the whole life costs of maintenance and power consumption over a 25-year design life. The objective will be to achieve the optimum design that will keep the costs of lighting as low as possible. The *Consultant* shall consider the reflectance of road surfacing, tunnel linings and other permanent objects that may affect the performance of lighting system. The *Consultant* should also provide options for strengthening or replacing of the support system and provide options for the re-lighting all areas of the tunnel using LED with reference to the guidelines BS 5489 Part2:2016.

20.5.2 (RHT-B) Replacement of Fire Main System

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The existing cast iron fire main is buried in concrete and is unmaintainable. The flow rate at mid river tunnel section is well below the 2000 l/min minimum standard for effective firefighting from a hydrant.

Further investigation into the problems with water pressure should be undertaken, which are particularly problematic when multiple hydrant valves are open. Determine whether this will cause a problem for the emergency services, and if so propose solutions. Standard BS 9990:2015 (ref 18) recommends that either the hydrants are fed from a public water main capable of delivering 1500 l/min at all times, the adequacy of which is validated, or that this is supplemented by duty/standby pumps capable of maintaining 1500 l/m in the fire main whilst serving two separate valves open simultaneously at a pressure of 8 ± 0.5 bar when fully opened. (Refer to Principal Inspection November 2015.)

The fire main serving the hydrants and hose reels is located under the walkway and is fed directly off the Thames Water main from connections on both sides of the river. The system is not pressurised by a dedicated booster pump and is subject to fluctuation in mains pressure. The *Consultant* shall assess the overall performance of the system and recommend whether the system should be modified or replaced under the works contract. The *Consultant* shall also investigate the provision of either a pump and break tank arrangement or, fire brigade breaching inlets at both portals to permit the fire service to boost mains pressure.

The outcome of Stage 2 (Feasibility) is to provide the *Employers* with options on how the fire main can be replaced, determine where the fire main, hydrants and meter bypass valves (where fitted) should be situated and review condition of isolation valves, supply points and fire control measures. It is also expected the condition of the single return valves (2x no.) which stop backflow are to be checked and advise how these valves can be maintained.

The *Consultant* is to provide options for installing a new fire main fed by a new main situated in either the sub-tunnel (with / without trace heating) or in the main bore with consideration to protection of the pipework or to be placed back in the walkway with consideration of the structural implications of the road deck strength.

The *Consultant* should take into consideration of the overall design if Emergency Panels are going to be installed as part of the project within the Tunnel to bring together the Emergency Roadside Telephone (ERT), the hand extinguishers (2x no. 6/9kg AFFF) and the hydrant points (2x no. 50mm Pattern – see FST requirements) with appropriate valves.

The current fire main is not trace heated as this was installed prior to such technology being available. The *Consultant* should investigate and recommend the future trace heating requirements of the fire main. However if the fire main is to run in the sub-tunnel, due to the higher average temperatures, this may minimise the need for trace heating requirements.

The fire main is believed to be a 100mm dia pipe and with the length of run and potential pressure losses, this would suggest that the fire main is insufficient in size in order to meet the current fire standards and the option of relining (i.e. further reduction of the size) of the fire main would not be suitable.

In addition to the above, water pressure and potential flow rate of the fire main should be confirmed with Thames Water and reconsideration of the spacing of the hydrant (total 64no.)



currently position at 30m apart should be given as part of the feasibility study. Also introduction of /additional breaching points may be required to enable fire services to increase pressure within the fire main if necessary especially in the mid-section of the tunnel.

20.5.3 (RHT-C) Provision of Resilient Power Supply

The outcome of Stage 2 (Feasibility) is to provide an assessment of capacity, residual life and a preferred option for upgrading /replacement of Resilient Power Supply. HORUS updates shall be included within this item.

The emergency power supply is nearing the end of its design life and is in poor condition and difficult to maintain. UPS and Power Loading is at capacity and is life expiring. There are also systems, including lighting, that are not currently supported.

There are 2No UPS's in the Tunnel, Shaft 4 the UPS has been permanently wired to by-pass which needs investigation, and in Shaft 2 the by-pass keys are missing.

Upgrade of the UPS system to include an automatic switch between north and south main power supply. Upgrading /replacing of UPS and main power switch board should consider additional power load from new /additional M&E assets.

TfL require centralised systems as against battery backed luminaires and signs to reduce in bore maintenance. The system is to be designed for ease of maintenance.

The *Consultant* shall provide an assessment of residual life and a preferred option for upgrading /replacement of the UPS system.

The *Consultant* will need to ascertain the future additional loadings for Stage 1+2 base lighting in the bore along with the LED emergency lighting in the Sub Tunnel.

The *Consultant* will also need to satisfy themselves of any additional demand from Communications, Linear Heat Detection (LHD), Wayfinding signage, and any other safety critical loads which also require a UPS Supply.

The *Consultant* shall review and verify existing information, and identify information gap and inform TfL if additional survey / investigation is required to develop the feasible options.

The UPS shall support the loads for a min of 2 hours. The design should also have a spare capacity of 25% for future systems.

20.5.4 (RHT-D) Upgrade and Reconfiguration of Ventilation System

The outcome of Stage 2 (Feasibility) is to review all available reports and assess the nature and performance of the ventilation system and provide the *Employers* with options to upgrade and reconfigure the ventilation system to meet the current standard.

The Rotherhithe Tunnel ventilation system is a semi-transverse system used to minimise pollution levels during normal operations and to control smoke during an incident. It comprises four ventilation shafts, Shaft 1 and 2 to the south of the River Thames and Shaft 3 and 4 to the north.



For Shaft 1 and 4, they each contain three axial supply fans and each fan with a duty flow rate of 30m³/s at 1,100Pa (total pressure). For Shaft 2 and 3, they each contain four fully reversible axial fans and each fan with a duty flow rate of 59m³/s at 350Pa. These fans are arranged in a 2x2 layout. Fans at all four shafts are driven through variable speed drivers to enable control of the fan flow rate. Each of the fans is fitted with an isolation damper and noise attenuators.

In the Feasibility Report there shall be an identification of the tunnel ventilation requirements through the preparation of a computer generated mathematical model to accurately demonstrate the existing and proposed ventilation system performances during all operating conditions including:

- normal operation under free flow traffic conditions;
- normal operation with slow moving / stationary traffic, giving worse case pollution conditions; and
- fire, smoke, emergency and evacuation scenarios.

In the Feasibility Study the *Consultant* shall review the present guidelines relating to occupational exposure levels of carbon monoxide (CO), nitrogen oxide (NO) and nitrogen dioxide (NO₂). The *Consultant* shall then make recommendations for the upgrade of the sensing system as part of the refurbishment works. The new system should be capable of detecting:

- Carbon monoxide (CO);
- Combined oxides of nitrogen (NOX)
- Air velocity; and
- Temperature

In addition to the tunnel considerations, the local emissions from the four vent shaft buildings shall be included in the *Consultant's* Feasibility Study.

At the present time there is no design information available for the existing ventilation system though it is estimated to be capable of controlling fire loads in excess of 20MW. The *Consultant* shall undertake computer modelling and airflow tests to determine the adequacy of the existing ventilation system in controlling heat and smoke from various fire scenarios, including where vehicles are trapped on both sides of a fire. The nature of the scenarios to be considered and the appropriate response and control provisions shall be established through dialogue with the emergency services and other relevant bodies at the TDSCG meetings. Any assumptions made of the existing ventilation system should be clearly stated in the *Consultant's* Feasibility Report.

For the purpose of investigating the current and future ventilation system performance the *Consultant* shall propose a minimum 'design fire load' which will take into consideration traffic usage, response times, safety provisions and available accident statistics. A risk assessment of the likelihood, balanced against the consequences, such as potential loss of life and risk of loss of tunnel structure shall also be taken into account. The minimum 'design



fire load' shall be agreed with the *Employer* prior to the commencement of any substantial modelling work.

The existing fans are thought to be capable of withstanding temperatures of 150°C for a minimum of 2 hours. Current Highways Agency and European Standards recommend that this should be improved to 250°C. The *Consultant* shall assess whether the temperatures at the fans during a 'design fire load' would be expected to be lower. The findings of this analysis are likely to assist in the decision as to whether the fans should be replaced as part of the refurbishment works. If it is found that the fans should be replaced then the *Consultant* shall detail a specification for a replacement ventilation system in the Feasibility Report.

Further **Background Information**

The ventilation system is of a semi-transverse form. Ventilation fans in 4 shafts working in different supply and extract modes to distribute fresh air via the invert void (sub-tunnel) and removing vitiated (polluted) air and/or hot fire smoke from extraction point at the base of the shafts. Under this configuration there are 9 fire zones (Thames Tunnels Fire Plan Engagement v2.6d indicates 8 fire plan zones plus and invert fire plan) and corresponding ventilation modes.

There are steel 'spouts' that emerge through the walkways either end of the central section (fire zone) of the tunnel. These direct fresh air from the invert void into the traffic bores. There are no records of why these spouts were installed, what they were specifically designed to do and whether they were commissioned. They appear to be unique to Rotherhithe Tunnel.

Ventilation studies have been undertaken that indicate that the ventilation system is able to control the smoke with a 15MW fire in all but the central section / fire zone. However with two-way traffic operations causing turbulence and churning of the air in the bore the air quality is difficult to control effectively, especially in the central section. Moreover the air quality recommendations of PIARC Tunnel Air Emissions Standard do not consider the level of exposure to exhaust fumes of cyclists and pedestrians, especially pedestrians who take the longest time to traverse the bore.

It is judged, on the bases of the age and condition of the components and the systems limited capacity, that the existing ventilation system is nearing the end of its useful life and should be renewed and upgraded. Studies have been undertaken to evaluate the upgrade options, which includes the introduction of jet fans in the central section.

There has also been some work undertaken to assess the effectiveness of portcullis gates at the base of the shaft to prevent recirculation via the spiral staircase arrangements in the ventilation shafts. The gates close the entry to the spiral staircases from the tunnel bore and are principally used for maintenance. If the spiral staircases were used for emergency services access or as an escape route in the event of fire, smoke being extracted would expose the users to hot gases being expelled from the shaft. In addition the membrane that the portcullis door passes through is inadequately sealed to adequately prevent recirculation, thereby affecting the extraction efficiency of the relevant shafts.



The 4 tunnel shafts are listed structures which limit the available solutions to both pneumatically segregate the staircases from the potentially hot fire smoke being ventilated via the shaft and, possibly, avoid the need to the portcullis doors.

Further Scope Details

Review available reports and assess the nature and performance of the ventilation system from a site visit and, if necessary, undertaking flow measurements.

- Assess the fire risk of the tunnel and advise on the worst case scenarios to be considered, including fire growth and peak heat release rates. This should consider current tunnel use restrictions and the possibility of introducing a gross vehicle weight limit enforceable using ANPR technology on the tunnel approaches (dependency with Cycle Superhighway schemes both north and south of the tunnels).
- Consider and evaluate, applying whole life cost considerations, all reasonable and feasible ventilation options to manage the air quality and fire smoke in the tunnel for two way traffic options without pedestrians and cyclists using the tunnel bore. Thereafter advise on the scope to support pedestrians and cyclists using the tunnel, identifying the extent to which standards do or don't support this and any enhancements consider reasonable to adopt for these transport modes. The ventilation options considered shall assume the spouts are to be removed and there will be no recirculation via the portcullis gates and associated membrane.
- Evaluate the option to comply with the Equality Act. This shall, in particular, consider incorporating refuges at the base of shafts 2 and 3 covered in a historic report (NB: TfL is of the view these may prove risky in use given the principal evacuation route is via the entrance portals) (*see Mosen report saved on Tunnel/Station*). This evaluation shall consider the practicalities and logistics of evacuation considering human behaviour.
- Assess affects on ventilation of installing new plant/cabling (e.g. fire main moved to sub-tunnel, location of new lighting). Assess affects of removal/ non removal of doors (roller shutter doors, sub tunnel wall under floodgate).
- Review feasible options to improve the use of the shafts with solutions that will segregate the spiral staircases from the ventilation ducts so as to avoid recirculation and enable egress by the emergency services. The outputs are subject to assessment and approval of the design and associated operating principles by the emergency services, especially the London Fire Brigade.
- Review the adequacy of the existing fire life safety arrangements, based on the findings from the above activities, and advise on what adjustments would be required and any further mitigations (e.g. fixed fire suppression system), that should be considered. It should be noted that, being a single bore, there are no cross-passage doors for evacuation and the ventilation shafts are not currently considered a viable evacuation route. The risk assessments and associated recommendations shall be made applying ALARP based risk assessments.
- Investigate options for Fixed Fire Fighting Systems (FFFS) and the operational benefits including impacts to the ventilation system review. Dis benefits also to be assessed including upgrade of the drainage system and provision of water storage. Consideration should be given to reviewing the effectiveness of a fixed fire



suppression system particularly for the central mid third of the tunnel where the ventilation system is least effective.

- Review if Air Quality Monitoring is required and options for its installation.
- For clarity, it is not anticipated passive fire protection will be reviewed in this project as no large vehicles can enter the tunnel. Fire will be dealt with through active fire protection measures.
- Scope items include fans, ventilation ducts, dampers, filters, grills, attenuation floors, environmental monitors, air speed monitors, ventilation control, roller shutter door affects, implications into associated systems e.g. HVAC, Fire & Security, UPS, HV & LV systems, any other system or part of the structure which is affected by a ventilation change.

20.5.5 (RHT-E) Replacement of Linear Heat Detector (LHD)

The outcome of Stage 2 (Feasibility) is to provide option to replace the Linear Heat Detector with considerations to extending coverage into the vent shafts and highlight implications of tying this in with the wayfinding system.

The linear heat detection cable is located in the lighting cable trays and may need to be relocated during the replacement of the lighting system. It is expected the installation date, expected life, current condition, test performance and residual life is established.

System was installed in 2000 (15 years designed life) old Sensor Fibre optic system. The LoHAC maintainers are currently having problems with the Sensor controllers (age and obsolesce - the manufacturer has recently been bought out by management). TfL are currently installing LISTEC solutions in other tunnels. As cable runs on lighting containment replacement will be required. TfL would consider an update of whole system. As the Linear heat Detector is mounted with the tunnel lighting, this item should be linked with the replacement of tunnel lighting works.

To increase overall resilience of the system a dual controller configuration should be considered, with controllers fed from separate supplies.

The *Consultant* shall review and verify the suitability of site survey / investigation information and requirements.

The *Consultant* shall review and verify existing information. Identify information gap and inform TfL if additional survey / investigation is required to develop the feasible options.

The *Consultant* shall update the in bore Zone design and consider implications / advantages of extending to include spurs to cover the ventilation shaft plant areas, currently not covered by such fire detection systems.

The *Consultant* shall ensure that the Zonal arrangement ties in with the Way finding Switching within the Tunnel

The *Consultant* shall Identify potential location for new cabling, Tunnel & Plant Rooms, and shall confirm the risks for cable routing.



The *Consultant* should Identify potential location for control equipment, investigate possibility of using Heckford street plant room, and if not anticipated as suitable to put back in same location as existing equipment.

20.5.6 (RHT-F) Replacement of Emergency Wayfinding Signs

The outcome of Stage 2 (Feasibility) is to bring the Emergency Wayfinding Signs System up to current operational standards and to meet current regulations using an ALARP assessment.

There are also 33 No way finder signs within the tunnel, mostly on the east wall. These are also fitted with battery backup so that in the event of total power loss they will continue to be illuminated and point motorists to the closest exit. The wayfinder signs are on average spaced evenly at intervals of approximately 46m for the entire tunnel length. The *Consultant* shall consider options for replacing wayfinder signs with a slimmer design, since the current designs are shown to be highly susceptible to impact damage. The *Consultant* will include in their feasibility report details of associated cabling and duct routes, and consider interfaces with CCTV and fire detection systems.

The Emergency Wayfinding Signs System was installed in circa 2012/2013 and is currently switched on for 24/7/365. The LED panels (with a life expectancy of 7-10 years) are due for replacement in all emergency wayfinding signs. It was suggested that the cable containment is in a poor condition. The zonal connectivity to SCADA will have to be updated. These signs are believed to be daisy chained for power supplies and should be interleaved for resilience to CCT failure from the UPS. Clarifications are needed to confirm the status and condition of the internal battery due to the limited UPS availability when installed back in 2012/13. These batteries should be removed and upgraded from centralised UPS.

It is expected the *Consultant* to check a percentage of the internal of these signs for water or dirt ingress and inspect LED panel arrays for string failures of the LEDs which may not be easily identified externally.

20.5.7 (RHT-G) Replacement of “Out of Bore” Lighting with LED Luminaires

The outcome of Stage 2 (Feasibility) is to provide options to replace out of bore lighting with LED luminaires – including service building, vent shafts, plant rooms, portal staircase and approach roads.

The lighting in the sub-tunnel, ventilation shafts, portal staircases and the tunnel service buildings is beyond its expected design life, and in a poor condition. The lighting and emergency lighting need to be upgraded.

Condition of the lighting especially on the approaches outside the portals is not known. It is expected the condition, life expectancy, performance of the out of bore lighting are investigated. Provision of escape lighting shall be included in all options and HORUS updates shall be included in this scope item.

The north approach lighting is fed from the switch room located at the north portal. The south approach lighting is fed from the switch room / out building located by the south portal. The



lights come on individually via photo cells. The *Consultant* should review Blackwall Tunnel Southbound specification for guidance on sub tunnel lighting.

The *Consultant* shall establish the condition and cable route for the sub-tunnel, ventilation shafts, portal staircases and the tunnel service building lighting.

The *Consultant* shall review of existing lighting cable condition and support routing.

The *Consultant* should consider using pre socketed cabling to reduce installation time and spread over 3 phases. One circuit needs to be fed from the UPS for Emergency lighting requirements.

The proposed options shall include provision for connectivity to the HORUS system via local SCADA PLC for monitoring and switching.

20.5.8 (RHT-H) Renewal of Drainage System– Pipes, Values, Pumps and Control Systems

The outcome of Stage 2 (Feasibility) is to provide the *Employers* with options for replacement of the pumps and control system. Please note that this scope item do not include replacement of the drainage pipes and road side gullies as this is part of the structural assets. However it does include any pipes from the sump to outfall.

Pumps and the control systems are at or approaching the end of their design life.

It is expected that the *Consultant* to carry out complete assessment of existing sump equipment. Establish installation date, expected life, current condition, test performance and advise on residual life. Also include a condition review of the Ventilation, Gas Detection and Suppression within pump rooms and sumps.

20.5.9 (RHT-I) Replacement of Public Announcement (PA), Emergency Telephones (ERT) and Radio Systems and Removal of Maintenance Telephone System

The outcome of Stage 2 (Feasibility) is to provide options for upgrading and replacing the PA, ERT and Radio Systems and to provide options for removing the maintenance telephone system in the tunnel, vent shafts and service buildings.

This scope item includes Radio and PA system (including HORUS interfaces). Radio includes replacing the leaky feeder and associated infrastructure. Maintenance radio upgrade shall cover all areas including sub-tunnel and vent shafts.

The Emergency Telephones are known to be recently installed and in good condition. However a replacement /relocation exercise could be needed and reviewed if an EP /EDP is introduced (RHT-Q). There have not been any issues with the cabling and control system and these are currently out of scope for this reason (apart from reviewing in RHT-Q).

The maintenance telephones are not used and a cost for removing them is required.

The communications and radio systems are currently life expired, and ongoing maintenance costs are likely to increase with time. The existing maintenance radio communications do not



work effectively and increase the risks to personnel working in the sub-tunnel confined space.

There is also an opportunity to make provision for a new Communications System during installation of the new (lighting & cabling) supporting system. Systems shall ensure Long Term Evolution (LTE) compatibility.

Part of the PA system was upgraded in 2014 but a full review to the PA system is needed to ensure installation date, expected life, current condition and performance are understood.

Live emergency exercise reports going back to Goldtop 2009 have identified major issues with Radio systems in this Tunnel. TfL are currently running at Risk.

Airwave and the Fire ground cover is poor in a major incident, and cannot handle the capacity for communications required. The Airwave system is due to be replaced by either LTE or similar mobile technology. Radiating infrastructure needs to be able to meet 800mg - 2.6Ghz to meet current and future requirements. It should be noted that in the existing infrastructure that Vodafone are using the current antennae systems, these are due to be expanded to include O2 and EE (possibly 3) via future commercial agreements under way.

Maintenance radio is poor, especially around and in the ventilation shafts and sub tunnel which are required for safety of maintenance personnel. .By bringing in MNO it will allow maintainers to use broadband via 4G to assist with Drawings / O&M / system interaction during closures.

The *Consultant* should seek specialist radio communications advice on capacity around the leaky feeders during an emergency incident, especially when mobiles from Tunnels users may be adding to bandwidth requirements. This is required to meet current and future radio requirements.

It is not anticipated that TFL will be replacing DAB or DAB+ retransmission at this point but the leaky feeder systems will still need to be able to carry the capacity in due course.

The Health and Monitoring system needs to be updated to give us greater visibility of Faults especially on the Leaky feeder antennae. Auto Fault Monitoring System is required to cover the interface between ourselves and HORUS

20.5.10 (RHT-J) Renewal of Plant Room's Heating Ventilation and Air-Conditioning (HVAC)

The outcome of Stage 2 (Feasibility) is to provide options for replacement of the HVAC system. Please note that this scope item includes HV and AC units and associated ventilation ducting works.

The HVAC system is limited to Shaft 4, Heckford Street plant rooms, and Shaft 2 communication rooms. These HVAC systems are approaching the end of their design life. There have been noted a number of problems with the communication room at Shaft 2, with ductwork not shuttered off or terminated.



Air Conditioning / Cooling units are situated in both the communication room at Shaft 2 and the electrical switch room. Also in the communications room and MNO room at Heckford Street. A number of the AC units are coming to the end of their life expectancy and need replacing.

It is expected the *Consultant* to review the existing heat loads and recommend the correct sizing of air conditioning units. Also to review the condition, life expectancy, performance of the units and other associated items (e.g. duct insulation, fire dampers and seals of the doors and ducting through walls) which affect HVAC.

20.5.11 (RHT-K) Upgrading of HV and LV Supply System

The outcome of Stage 2 (Feasibility) is to provide an upgrade to an automated system with appropriate back-up supply to maintain minimum operating requirements on the HV and LV supply system.

The power supply to the critical systems system is estimated to be 35-40 years old and reliant upon manual switching operations. Failure of the supply could result in closure of the tunnel until power is restored. TfL are looking to upgrade to an automated system with appropriate back-up supply to maintain minimum operating requirements.

Moreover, due to the possibility of future operation of the tunnel with non skilled staff managing the tunnel, it is anticipated that specialist electrical contractors will only be brought in for maintenance and repair. In the event of a power failure, no AP1 staff will be on site to manually switch the power supply in order to keep the tunnel in operational.

Apart from the changes brought about by the ventilation fan upgrades required, there is likely to be a reduction in lighting loads as LEDs are introduced in the bore and sub-tunnel lighting.

The LV switch rooms at the bore level will need to have all switch gear replaced due to age, obsolescence, or containing re-wireable fuses and asbestos. Also if the tunnel continue to subject the catastrophic flooding risks, positioning of the LV switch gear may need to be carefully thought about to minimise loss of supplies.

It is expected that an assessment is needed to be carried out on the Primary Electrical distribution HV supplies from the DNO situated at Shaft 2 and 4 to ensure security of supply and identify what standby systems are needed to mitigate any identified risks after ALARP assessment.

It is also expected that the HV system protection needs to be assessed as is the requirement to automate this on intake failure. Similarly the LV system also needs to be automated. The system (and backup) is expected to deal with HV spikes, LV dips and a transformer failure.

The *Consultant* shall ascertain the DNO Supply security and resilience at both intakes with the DNO. Confirm that the 2 supplies are not taken from the same DNO HV ring. If the above does not meet standards, propose solutions to mitigate (i.e. standby generator / Bolstered UPS)

Review HV, LV and UPS networks to ensure automatic switching in the event of a Power failure with full protection.



20.5.12 (RHT-L) Replacement of Communication System Cabling (LTRACS)

The outcome of Stage 2 (Feasibility) is to provide options to replace the 36No core fibre cable and their enclosures and install a new fibre ring with a new cabinet in the shaft.

The IP fibre backbone feeds the cameras, PA and HORUS interface. There is a high risk of breakage if any works are carried out to assets feeding into it. It is currently understood the whole ring would require replacement, linking into the shafts with new cabinets upgraded and old kit removed.

This scope item refers to the cabling of the OP network and Communication backbone. There are 36No core fibre cable running through the tunnel and 16No core fibre cable running through the shafts. The 36No core fibre cable runs from the North Portal Equipment Room through the tunnel to the Jamaica Road cabinet. Termination cabinets are situated at the base of each of the 4 shafts and 16No core fibre cable has been spurred from the termination cabinets up to the switches which are in the shaft buildings.

It is suggested that the termination cabinets have been poorly installed with the 36No core fibre cable exposed at the fibre cartridge and in danger of fibre break when the cartridge is opened.

A new fibre ring shall be considered and brought up into the ventilation shafts for termination in a cleaner environment and it is expected the new cabinets should be located in the ventilation shafts and not at the base within the bore.

Please note that other Communication System Cabling (i.e. copper cables) is not part of the project scope.

20.5.13 (RHT-M) Decommissioning of Flood Gate

The outcome of Stage 2 (Feasibility) is to carry out a risk assessment of the current safety implications of the floodgate and recommend suitable actions. Also to revisit the lifting, locking and safety mechanism and provide options to remove / decommission the flood gate.

The flood defence gate is located at Shaft 1 and is used to protect the East London Line from flooding. The flood gate lifting mechanisms are in need of replacement, the winch is a 1939 hand winch motorised and the PLC controllers are now obsolete.

A report was written in 2008 by Butterworth (a specialist now out of business) looking at replacing the lifting mechanism and the costs were prohibitive at the time valued at £1.2m. TfL / Kier are currently writing a report on the possible area flooding implications and risks of keeping / removing the flood gate.

Should the decision be to keep the gate following ALARP assessment, then the project will need to consider the safety implications to the travelling public trapped by the gate and the flood water. Along with the potential safety implications of all in bore electrics failing during an incident as the tunnel floods.

There are also concerns on how to manage the gate during lowering (currently freefall and counter balanced) should a vehicle or person be seen to be in the critical drop area and there is currently no method to stop the gate once initiated.



It is currently envisaged decommissioning shall involve ensuring there is secondary block against the gate dropping, amending HORUS and electrical isolation. Components left in situ would include the gate itself, counterweight, connecting chains, mechanical winch and lifting gear.

Removal would involve extracting all parts of the gate which can be reasonably removed. Some parts of the gate built into the structure may be left in situ if they do not pose an issue to future use of the tunnel and would be very expensive to remove.

20.5.14 (RHT-O) Replacement of CCTV (Traffic) System (inc. in-bore and approaching roads)

The outcome of Stage 2 (Feasibility) is to provide a Digital CCTV (Traffic) solution to integrate with HORUS and the TfL CCTV systems and to extend the coverage in bore to allow for adjacent camera failure and resilience improvements.

Existing CCTV (Traffic) system was installed prior to 2000. Cameras and control board are approximately 10 years old, and are now obsolete. These cameras are currently being repaired or replaced using spares stock and there are no off the shelf replacements available.

There are a total of 14no (421-434) cameras, 6No (425-430) are within the tunnel bore and 8No are outside the tunnel. Equipment consists of analogue camera, housing, lens, control board, PSU/termination enclosure and 16 core fibre used for cameras outside the tunnel. Within the tunnel the cameras are connected via composite cable to the media convertor/encoder in the termination enclosure. There are some legacy fibre redundant cables due to migration to IP and their general condition is unknown.

The current CCTV system is unreliable and will need to be replaced with new CCTV cameras to provide 100% coverage of the tunnel and its approach roads. A new Digital CCTV (Traffic) system needs to be installed compatible with TfL's HORUS system. The CCTV coverage needs to allow for an adjacent camera failure cover, and be able to read a number plate at its farthest focal position. The cameras need to have high speed Iris at the portals to allow for considerable light changes as they pan and tilt from internal / external views.

The *Consultant* shall develop plans for new cameras to be provided with pan, tilt and zoom, screen wipers, washer bottles and IP66 housings. The system shall be linked to the HORUS system and designed in such a way that the operation of emergency equipment or changes in traffic flow will cause a pre-selected camera (or cameras) to focus on the location where the incident is occurring. The system shall be compatible, with proposed new Vehicle Incident Detection System (VAID).

20.5.15 (RHT-P) Introduction of Video Accident and Incident Detection (VAID) System

The outcome of Stage 2 (Feasibility) is to provide a suitable Video Accident and Incident Detection System to monitor for slow moving vehicles, debris, and fire scenarios and to link either via the FLIR Flux server and / or directly to the LSTOC HORUS system.

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- In Confidence -



There is currently no Vehicle Accident and Incident Detection System (VAID) in the tunnel.

The VAID system shall be capable of dealing with 2-way traffic in a single bore made up of two narrow lanes and activate an alarm based on changes detected by the video image processing software.

An alarm from the detector shall implement the following actions:

- a. CCTV alert via the HORUS system;
- b. Video recording to DVR/hard disc before and after the incident;
- c. Switch video monitors from blank to real time image with banner; and
- d. Switch the alarm camera plus the up stream and down stream cameras

20.5.16 (RHT-Q) Installation of Emergency Distribution Panels (EDPs)

The outcome of Stage 2 (Feasibility) is to provide options for installing combined EDPs and separate EPs / EDPs to meet the current regulations.

Review the feasibility of installing Emergency Distribution Panels (EDPs) in the bore to bring together the emergency points and electrical distribution panels. Items to be included (but not limited to) - ERT's, Fire Extinguishers, Fire Hydrants, Wayfinding and SOS "Toblerone" points.

Asset items included and accounted for in another scope items should be highlighted and only additional works / activities required for bringing these assets into an EDP be included in the cost of this scope item.

20.5.17 (RHT-R) Replacement of Fire Detection, Suppression and Monitoring System

The outcome of Stage 2 (Feasibility) is to provide options for replacing the fire detection, suppression and monitoring systems in the plant rooms at vent shafts, services building and within the tunnel.

Fire suppression and alarm systems are required at Shaft 2 in the LV switch room and comms room. At Shaft 4 they are required for the two switch rooms and comms room. Any installed UPS would also require suppression and alarm systems.

Fire alarms in the vent shafts and plant rooms are need to be investigated. Establish installation date, expected life, current condition, test performance and advise on residual life / replacement. Also investigate the condition, test performance and advise on residual life of fire suppression measures where they exist in the switch rooms / plant rooms

Please note that liner heat detection in the main bore and vent shafts is covered by item RHT-E and detection, suppression and monitoring in sumps and pump rooms are covered by item RHT-H.

20.5.18 (RHT-S) Replacement of Cable Rack in Sub-Tunnel



The outcome of Stage 2 (Feasibility) is to provide options for replacing the cable containment system in the sub-tunnel in order to ensure ventilation flow through the sub-tunnel is improved.

The existing cable rack is in very poor condition. Replacement will ensure ventilation flow through the sub-tunnel is increased, new cables / ducts are adequately supported and existing ones removed / diverted / replaced / slew into the new rack.

Investigate options for replacing the rack and implications of moving the current services. LU have 22kV cables and are a key stakeholder in understanding what options can be carried forward.

20.5.19 (RHT-T) Cable Management in Tunnel / Sub-Tunnel / Vent Shafts

The outcome of Stage 2 (Feasibility) is to review the current cable management infrastructure and provide options for effective cable management.

There are cable trays / ducting throughout the tunnel / sub-tunnel / vents in poor condition. Investigations and option study shall be carried out to effectively manage cable infrastructure. Proposed options for asset replacement in the tunnel will take into account how they interact with each other and how they will fit. Future proofing is to be incorporated in the design of any assets / cabling to allow for additional mechanical, electrical and communications equipment.

20.6 Desktop Study

The *Consultant* is to undertake Mobilisation Workshop with the *Employer* and other Key Stakeholders to understand the works requirements, expectation, desire outcomes and clarify any ambiguity from the Scope as soon as the contract is awarded.

The *Consultant* is to undertake a desktop study to establish where usable records exist and where there are gaps in information.

The *Consultant* is to undertake a review on the existing information and confirm and advise the *Employer* if Environment & Ecology Surveys are required prior to commencement of any site investigation works. (Please refer to Environment & Ecology Survey requirements below.)

The *Consultant* is to undertake a review on the existing Asbestos Surveys and confirm / advise the *Employer* if additional Asbestos Surveys are required prior to commencement of any site investigation works. (Please refer to Asbestos Survey requirements below.)

On completion of the desktop study the *Consultant* is to review, comment and update the Site Survey, Investigation and Testing Requirements for each refurbishment item to ensure the survey would cover any information gap identified as part of the desktop study.

The *Consultant* is to work collaboratively with the *Employer* and other Key Stakeholders in order to confirm and agree the Site Survey, Investigation and Testing Requirements.



Please note that it is expected that the Site Survey, Investigations and Testing Requirements will be issued to the *Employer* within 4 weeks from contract award date.

20.7 Survey & Site Investigation

The *Consultant* is to work collaboratively with the Principal Contractor & *Employers* Contractor to agree the tunnel access arrangement. The *Consultant* is to work collaboratively with the *Employers* Contractor to undertake site investigation work on the refurbishment items as agreed at Desktop Study stage.

The *Consultant* will be working collaboratively with *Principal Contractor* & *Employers* Contractor during the Stage 2 (Feasibility) and should comply with all their H&S requirements and site rules. All method statement, risk assessment and safe system of working should be submitted to Principal Contractor at least 2 weeks in advance of the works for approval.

The *Consultant* is to provide a site presence during the site investigation works to ensure the survey, investigation and testing collected are relevant and to specifications. The *Consultant* shall verify the accuracy of the survey data and ensure the survey data cover any information gap needed for feasibility study.

On completion of the site investigation works the *Consultant* is to compile the survey data and provide the *Consultant* and *Employer* with a Factual Reports within two weeks of obtaining the survey data. (Please refer to Factual Report requirements below.)

The *Consultant* is to provide the *Employer* with an Interpretive Report based on the Factual Report to summarise key findings within two weeks of receiving the Factual Report. (Please refer to Interpretive Report requirements below.)

20.8 Feasibility Study

The *Consultant* is to take a leading role in delivering the Feasibility Study on cost and programme estimate.

Develop Feasible Options

The *Consultant* is work collaboratively with the *Employers* Contractor to develop feasible options for each of the refurbishment item with a holistic view of the tunnel as a whole based on the information collected from the site investigation.

The *Consultant* is to work collaboratively with the *Employer* and other Key Stakeholders in order to ensure the feasible options are relevant to the *Employer* and acceptable to our Technical Assurance Approval (TAA) team.

Provide Cost and Programme Estimate

The *Consultant* is to work collaboratively with the *Employers* Contractor and provide an implementation cost and programme estimate for all feasible options of the refurbishment items and include any high level estimate on temporary and enabling works.



The *Consultant* is to work collaboratively with the *Employers Contractor* in developing implementation cost and programme estimate and highlight any specific installation or maintenance requirements. The *Consultant* shall provide constructive feedback and expert input to ensure the cost and programme estimate are robust.

The *Consultant* is to work collaboratively with the *Employer* and other Key Stakeholders in order to ensure the feasible options are value for money, relevant to the *Employer* and acceptable to our Technical Assurance Approval (TAA) team.

Value Engineering / Optioneering / Recommended Option

The *Consultant* is to work collaboratively with the *Employers Contractor* and incorporate all comments and suggestions, reassess the proposed feasible options with specific considerations on the project budget, cost & programme and whole life costing and provide the *Employer* with single recommended option for each refurbishment item in the Feasibility Study Report.

The *Consultant* shall work collaboratively with the *Employers Contractor* to provide the *Employer* with the risks and opportunities (i.e. Risk Register) and update any drawings, cost and programme accordingly based on the outcome of various Workshops.

20.9 Project Deliverables

20.9.1 Better Information Modelling & Management (BIM)

Information Modelling and Management is a new way of working which will transform the way TfL Surface Transport specifies, manages and uses asset related data and information. It will ensure that we have the right information at the right time to both deliver capital infrastructure projects and to manage and operate the assets through their life cycle.

At the heart of BIM requirements is the delivery of projects to Level 2 BIM maturity as documented in PAS 1192-2:2013. TfL has produced an *Employer's Information Requirements (EIR)* for Stage 2 (Feasibility) work, which details the who, what, how and when with regards to the generation and management of information. The *Consultant* is required to deliver a BIM Execution Plan (BEP), using a TfL template, as to how they will meet the requirements of the EIR.

Please refer to Annex 4 for *Employers Information Requirements* and BIM Execution Plan template.

20.9.2 BIM – 3D Model Requirements

The *Consultant* is required to produce the 3D model as detailed in the EIR and IMPDT. The *Consultant* is required to update the model as detailed in the EIR and IMPDT.

20.9.3 Asbestos Survey

Desktop surveys should be carried out by the *Consultant* and identify / specify if further Asbestos Demolition Surveys are required. It is expected the Asbestos Demolition Surveys will be carried out by others.



The *Consultant* shall investigate the presence of asbestos in areas where it will impact on the prescribed Services in Stage 2's site survey, investigations and testing and take appropriate precautions.

The *Consultant* shall also investigate the presence of asbestos where it will impact on the works in future stages and advise what control measures will be needed.

Existing information, asbestos survey reports, asbestos management plans are available on Bridgestation and CDM Datastore.

20.9.4 Environment & Ecology Survey

It is not anticipated that environment & ecology surveys of the tunnels will be required, however the consultant shall inform the project manager if they believe this not to be the case.

The purpose of the survey is to:

- Identify the habitat types present on the site and the presence or potential presence for protected and / or species on the site.
- Highlight any known or potential legal or planning policy constraints to the works in relation to ecology and recommend avoidance, mitigation and enhancement measures to satisfy legal requirements where appropriate.
- Identify, where necessary, the requirement for further ecology surveys

The survey is to be supplemented by an ecological desktop study to collate existing biological records relevant to the site.

20.9.5 Factual Reports

Factual reports shall be produced regarding the surveys, investigations and testing. The draft factual reports shall be submitted within four weeks of completion of site work, and the final report shall be submitted within one week of receipt of comments from the *Employer*.

20.9.6 Interpretive Reports

Interpretive reports shall be produced based on the contents of the factual reports. The draft interpretive reports 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*.

20.9.7 Feasibility Report

On completion of the Feasibility Study the *Consultant* shall present a report, or a selection of reports if appropriate, detailing their initial recommendations and proposals for all of the tunnel systems and features they have considered. The report(s) shall include the following:



- a. A review of the conclusions of existing reports, studies and assessments made available to the *Consultant* at the start of the commission.
- b. A review of the conclusions of additional reports, studies and assessments undertaken by the *Consultant*.
- c. An assessment of the existing tunnel structures and equipment.
- d. The requirements of the Tunnel Design and Safety Consultation Group (TDS CG) and the risk analysis and management plan.
- e. A detailed list of the necessary refurbishment works highlighted in previous studies and those revealed by further consultation or considerations.
- f. Preliminary proposals, specifications and cost estimates for each item of works in e).
- g. A first draft of the AIPs to BD 2/02 (DMRB 1.1.1) for the M&E works.
- h. An assessment of any Departures from Standard or Specification proposed by the *Consultant* with recommendations and advice to the *Employer* on aspects not covered by the current standards.
- i. An overview of the Health & Safety issues of the tunnel operations.
- j. Any conditions or restrictions on the refurbishment works.
- k. An assessment of the environmental issues related to the tunnel operation and refurbishment works;
- l. Recommendations for maintenance and operation of the Blackwall Tunnels (Northbound and Southbound) during the construction period of the southbound bore.
- m. An assessment of the working hours e.g. nights, weekends and the effect of maintenance operations in the tunnels.
- n. An estimated spend profile for the cost of the works and all associated fees and maintenance costs.

In the Feasibility Report there shall be an identification of the tunnel ventilation requirements through the preparation of a computer generated mathematical model to accurately demonstrate the existing and proposed ventilation system performances during all operating conditions including:

- normal operation under free flow traffic conditions;
- normal operation with slow moving/stationary traffic, giving worst case pollution conditions; and



- fire, smoke, emergency and evacuation scenarios.

The *Consultant's* solutions must consider the buildability, operations, maintenance, maintenance access, spares, whole life costing, emergency repairs, the control of any incidents and the tunnel minimum operating requirements (MoR) for a 25-year life.

20.9.8 Programme Schedule

The *Consultant* shall produce an updated programme schedule for Stage 3 (Concept), Stage 4 (Detailed) and Stage 5 (Implementation) following the outcomes and recommendations of Stage 2 (Feasibility). The updated programme schedule shall be reviewed and agreed in collaboration with the *Employer* and the *Consultant*.

20.9.9 Cost Estimate

The *Consultant* shall produce an updated cost estimate for Stage 3 (Concept), Stage 4 (Detailed) and Stage 5 (Implementation) following the outcomes and recommendations of Stage 2 (Feasibility). The updated cost estimate shall be reviewed and agreed in collaboration with the *Employer* and the *Consultant*.



21.0 WI 2100 – *Employers* Information Requirements (EIR)

21.1 BIM Requirements

Information on the BIM requirements can be found in Annex 4.

21.2 3D Model Requirements

The Consultant shall produce a 3D model during S tage 2 with detail of the tunnel approaches, cut & cover sections, main bore, sub tunnel ventilation shafts and ventilation buildings/compounds.

Information from S tage 2 shall be input into the model where appropriate by the *Consultant*.

More information on the 3D Model requirements can be found in Annex 4.

SECTION 3 – QUALITY SUBMISSION

Blackwall Southbound & Rotherhithe Tunnels Refurbishment – Stage 2 (Feasibility Study)

Quality Submission A – Quality Questions Response
07/04/2017

ATKINS

Notice

This document and its contents have been prepared and are intended solely for Transport for London's information and use in relation to Atkins' Tender Submission for the Blackwall Southbound & Rotherhithe Tunnels Refurbishment – Stage 2 (Feasibility Study) Contract.

Atkins PLC assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

Document History

JOB NUMBER: SN0132957			DOCUMENT REF: Quality Questions Response			
Revision	Purpose Description	Originated	Checked	Reviewed	Authorised	Date
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PART I: METHODOLOGY & APPROACH

1. Approach to Project Management

Our People

Atkins understands the strategic importance of TfL's Structures and Tunnels Investment Programme (STIP2) and appreciates that the outcomes of this Work Package has significant importance in directing the development of future stages within the overall programme. We understand there to be three key strategic objectives to the scope of this Work Package; to survey the existing condition of the assets, to develop and appraise options and finally to establish a robust cost estimate and programme for Stage 3 to 5 of the programme.

We understand that the scope of the project has many elements and requires the management of a number of disciplines, parties and stakeholders. Our Project Director, [REDACTED] has a wide range of experience in working with large, multi-disciplinary teams on TfL contracts and will assure that the project and programme objectives are focussed towards the overall TfL development strategy and key objectives.

Our project Manager, [REDACTED], has over 30 years' experience within the civil engineering industry and has a wide range of project management experience including managing large multi-disciplinary projects along with a strong background with collaborative working, risk management and commercial expertise. He also has experience working within TfL projects and will ensure that project resources are utilised effectively in achieving the project objectives. In addition, [REDACTED] and [REDACTED] have previously worked together on the Silvertown project for TfL and their partnership and experience will be essential to delivering excellence and value to this project.

The delivery of this work demands the allocation of suitably experienced engineers who can understand the work required to refurbish M&E and ventilation systems in tunnel assets in challenging traffic situations and are adept at identifying gaps in information through desk study.

We have assembled a recognised team of experts of M&E and ventilation engineers and specialists to conduct a thorough optioneering study to the highest engineering standards and deliver an insightful feasibility report adding value to the project and the overall STIP2 programme.

We understand the importance of staff continuity and retaining knowledge within the project community. We will ensure that an experienced team will be retained consistently on the project, and where exceptional circumstances arise all steps will be taken to ensure a smooth transition of role and retention of project knowledge. This will partially be achieved by use of an optimised programme which will utilise staff efficiently and by engendering a culture of collaboration and knowledge sharing within the team.

Approach to Project & Quality Management

We will adopt an approach that will encourage open collaboration between all project participants to engender a "one team" philosophy and foster an environment that supports continuous improvement and innovation. Continuous improvement within the project team will be achieved by constantly challenging convention and maximising the outcomes of the project. We have well defined and established systems and processes that will engender a consistent, right-first-time approach to our work to deliver the highest standards of service and avoid programme delays arising from rework.

All our work will be carried out in accordance with our Transportation Delivery Framework, which implements Atkins' seven high level Design Principles:

1. We have fully understood customer requirements, assessed these as being reasonable and translated them into a clear basis of design.
2. We have assessed what resources (e.g. key people, skills, accommodation and tools) are required and confirmed they are available.

-
3. We have understood our scope of work within the project lifecycle and have split this into appropriate phases. The work breakdown structure and deliverables for each phase are well defined.
 4. We have understood and communicated roles and responsibilities for our operations and our customer's and any third parties such as a regulator.
 5. We have put in place suitable processes for managing change, risk and information flow.
 6. We have put in place suitable processes to ensure that our deliverables meet the design requirements.
 7. We will capture lessons learnt during the project and feed these back into our design processes.

This Delivery Framework has been strengthened through the combining of our previous Highways and Rail businesses into one Transportation division. This has improved our transfer of skills and knowledge across highways and rail domains, strengthening the project teams we create, and has also improved our ability to carry out effective reviews and value engineering. We recognise that successful implementation of these design principles requires effective behaviours and we continue to invest in reinforcing these in our project leaders through our 'Developing Project Leaders' training.

Our team will call upon our well established project management systems, including Enterprise Advantage (EA), which provides a common platform for the management and review of Work Package performance and is linked to our JD Edwards cost capture system to provide accurate and timely financial reporting and invoicing. Additionally, our certified Business Management System's (BMS) project management processes foster and encourage customer and stakeholder involvement to ensure that project delivery is customer focused and cost effective.

The use of our ProjectWise common data environment will ensure our deliverables have gone through a robust quality control process ensuring responsibilities for Originator, Checker, Reviewer and Authoriser (OCRA) are fully understood and executed. Senior technical staff will be utilised to challenge the technical aspects of these reports and our Project Manager. The Project Manager will ensure timely delivery to programme and adherence to our Business Management System (BMS).

The BMS assures our clients through the certification of ISO 9001, OHSAS 18001 and ISO 14001, and forms a key part of the Atkins Governance Framework, which also includes our Group Policy Statements and Code of Conduct.

Budget and Cost Control

Our project forecasting process conducts a cost-value analysis and is an excellent tool for identifying overspend early through analysis of actual spend and indicators such as earned value and cost performance index (CPI) each month. Our planned forecast is driven from our resource loaded agreed programme changes in CPI will identify trends before the project enters an overspend situation, and by assessing the cost to completion allow the Project Manager in conjunction with TfL to proactively manage the situation at the earliest opportunity. Overspend issues will be picked up at both programme and project level. Options for remedial action would be considered in the context of compliance, business risk, impact on project and programme working in conjunction with stakeholders.

Approach to Risk Management

We recognise the need to provide TfL with a robust delivery model that proactively manages risk and has clear plans to respond to unexpected challenges to operations and your customers. Our approach to risk management is based upon industry best practice and our extensive experience obtained from operating in similar environments for a range of clients, both in the wider transportation industry and other high risk sectors, such as nuclear, petro-chemical and gas.

Risk will be allocated appropriately, to the party best able to manage it. We will categorise risk at programme, project and site level and deal with these risks in a structured way in order to minimise the impact. We will also look to identify value engineering opportunities as part of this process and continue to drive for efficiency in delivery.

Our risk management process considers risks from both the positive and negative aspects. It enables us to identify risks early and to implement appropriate actions to reduce the probability and potential threat. Residual risks that cannot be mitigated will be managed, as appropriate, through the project lifecycle, in liaison with TfL and its stakeholders. This approach also ensures that we are continually looking for positive opportunities to add benefit throughout the project lifecycle.

Our simple, yet effective, approach to risk management is based upon the guiding principles noted in ISO31000 and we will seek to establish a proactive risk management strategy which best compliments TfL systems and project needs.

We mandate the use of risk registers in order to capture and record risk status across delivery teams and core functions. The risk register will be controlled through the Project Manager and reviewed every 4 weeks with TfL. All risk registers are live documents and will be proactively maintained to ensure there is a current view of aggregated risk at all times.

To facilitate the reporting of risks as they materialise, we will ensure there are clearly defined channels for communicating risks to our Project Manager and also ensure that feedback is provided to create awareness of key and common risks.



Figure 1 - Risk Management Strategy Flow Chart

Stakeholder Management

We understand that it is critical that stakeholders are appropriately managed. Atkins has experience in working collaboratively with clients to ensure that stakeholder management plans are suited to individual projects. Atkins has also had experience in successfully managing “Quadrant 3” and “Quadrant 4” stakeholders on TfL’s Silvertown project, some members of which are shared with those in the Blackwall Tunnel Stakeholder Matrix. We will proactively engage with the stakeholders already identified within the Stakeholder Engagement Plan.

Reporting

The internal processes & project management tools within Atkins will feed directly into the project’s fortnightly reports and progress meetings which will inform the wider project team of the progress, budget performance, risks, opportunities, programme performance and other essential management information. These review meetings will provide an opportunity for the whole project team to take a holistic view of the overall programme and drill down into individual sub-tasks as necessary. At the commencement of the project we will prepare both the Contract Execution Plan and Quality Plan which will provide the basis for management of the project.

We are experienced at working in cost-reimbursable framework environments with our clients. We are therefore able to provide TfL with relevant, secure and transparent access to our robust project data. Our systems are flexible and enables us to provide TfL with cost management information customised to meet project specific needs. This will be key to ensuring a clear understanding of the project performance through accurate forecasting.

Clear monthly reports will be produced showing overall progress against the programme and deliverables. The report format will be agreed with the TfL team and will include an executive

summary that will highlight the critical items with programme review as well as key costs, risk, and performance indicators.

The reasons for any deviations in the previous forecasts will be communicated to the management team and a recovery plan will be agreed. This allows us to efficiently monitor progress at project level, so that we can plan and manage our resources effectively and efficiently across the tasks and deliverables.

Key Past Project Experience

Silvertown

- Atkins are familiar with the TfL commercial and financial requirements for projects, and have proposed modifications that were adopted to the Application for Payment template to help improve accuracy and efficiency.
- Worked closely with TfL's commercial team to a rigorous approach to change control. This approach ensured that discussions were held with the delivery and commercial teams to agreeing scope changes in writing before work is progressed.
- Atkins were able to respond quickly and decisively in a reactive programme environment during the DCO, by managing resources available and re-prioritising onto project critical task when required.

HS2 Country North EIA

- Atkins delivered with a strong commercial framework which prevented budget overspends on all tasks.
- Provided robust applications for payment and dashboard reporting (including forecasting) delivered on a large and complex project.
- Provided innovative programme solutions and total integrated collaborative approach developed deliver to programme within a highly dynamic project environment including multiple design, reporting and methodology changes. The corresponding dynamic approach to resource management ensured key project milestones were met.
- Close, collaborative and transparent approach adopted with HS2 commercial teams. Timely commercial responses to scope changes using Early Warning Notices to enable client to make an informed decision before progressing with change.

2. Approach to Programme Management

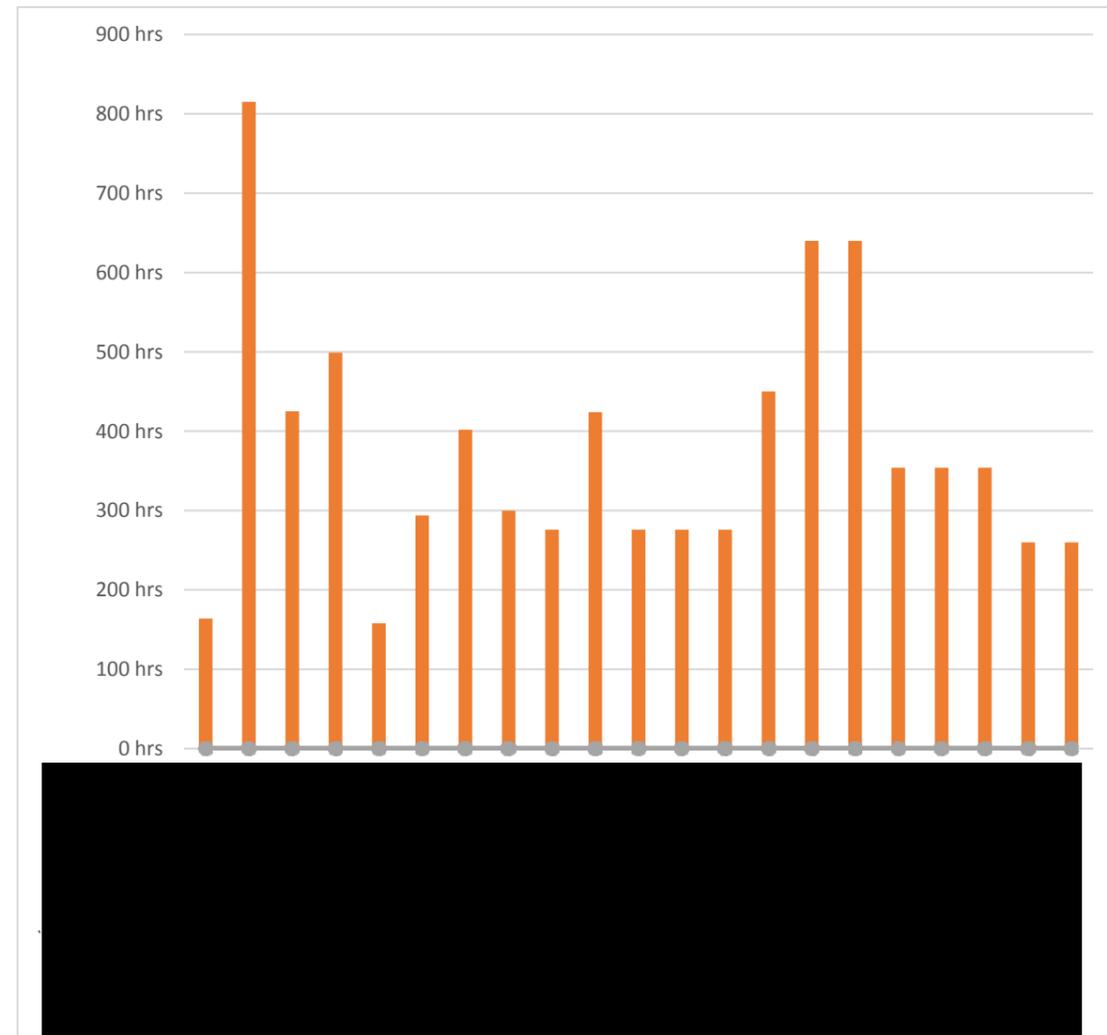
RESOURCE OVERVIEW

RESOURCE STATUS

Name	Start	Finish	Remaining Work
██████ (Project Director)	Fri 12 05 17	Mon 02 07 18	164 hrs
██████ (Project Manager)	Fri 12 05 17	Mon 02 07 18	815.2 hrs
██████ (Technical Design Lead)	Fri 12 05 17	Mon 02 07 18	425.2 hrs
██████ (Ventilation Lead)	Mon 15 05 17	Mon 02 07 18	499.2 hrs
██████ (BIM Manager)	Mon 15 05 17	Fri 19 01 18	158 hrs
██████ (H&S Lead)	Fri 12 05 17	Mon 02 07 18	294 hrs
Principal Systems Engineer	Mon 15 05 17	Mon 02 07 18	402 hrs
Fire & Life Safety Engineer	Mon 15 05 17	Thu 24 05 18	300 hrs
Noise/Acoustic Engineer	Mon 15 05 17	Thu 24 05 18	276 hrs
Electrical Engineer	Mon 15 05 17	Thu 24 05 18	424 hrs
Water/Plumbing Engineer	Mon 15 05 17	Thu 24 05 18	276 hrs
Mechanical Engineer 1	Mon 15 05 17	Thu 24 05 18	276 hrs
Mechanical Engineer 2	Mon 15 05 17	Thu 24 05 18	276 hrs
BIM Team Lead	Mon 02 10 17	Fri 19 01 18	450 hrs
CAD Technician	Mon 02 10 17	Fri 19 01 18	640 hrs
CAD Technician	Mon 02 10 17	Fri 19 01 18	640 hrs
Graduate 1	Mon 29 05 17	Fri 27 04 18	354 hrs
Graduate 2	Mon 29 05 17	Fri 27 04 18	354 hrs
Graduate 3	Mon 29 05 17	Fri 27 04 18	354 hrs
Graduate 4	Mon 29 05 17	Fri 27 04 18	260 hrs
Graduate 5	Mon 29 05 17	Fri 27 04 18	260 hrs

RESOURCE STATS

Work status for all work resources.



3. Approach to Collaborative Working

Certified & Successful Collaboration

Atkins are committed to helping TfL in achieving its goals by building upon our strong collaborative working relationship with TfL. We have significant industry experience, and are fully accredited (to BS11000, now superseded to BS ISO 44001) collaboration process.

Collaboration has been key in successfully delivering the A14 Cambridge to Huntingdon design. For this project we established joint working forums with our delivery partners, contractors and client. This approach **delivered a £70M saving on a £1B project.** On the A14 **Atkins led the way in employing collaboration tools** such as ProjectWise to implement a Common Data Environment (CDE). We will use our collaboration experience and tools to help TfL deliver this programme successfully.

Systematic Approach

Our systematic approach to collaboration is shown below. Our team will utilise the three phases of a collaborative working procedure, as prescribed by BS11000, to maximise the benefits realised by all involved parties of this project.

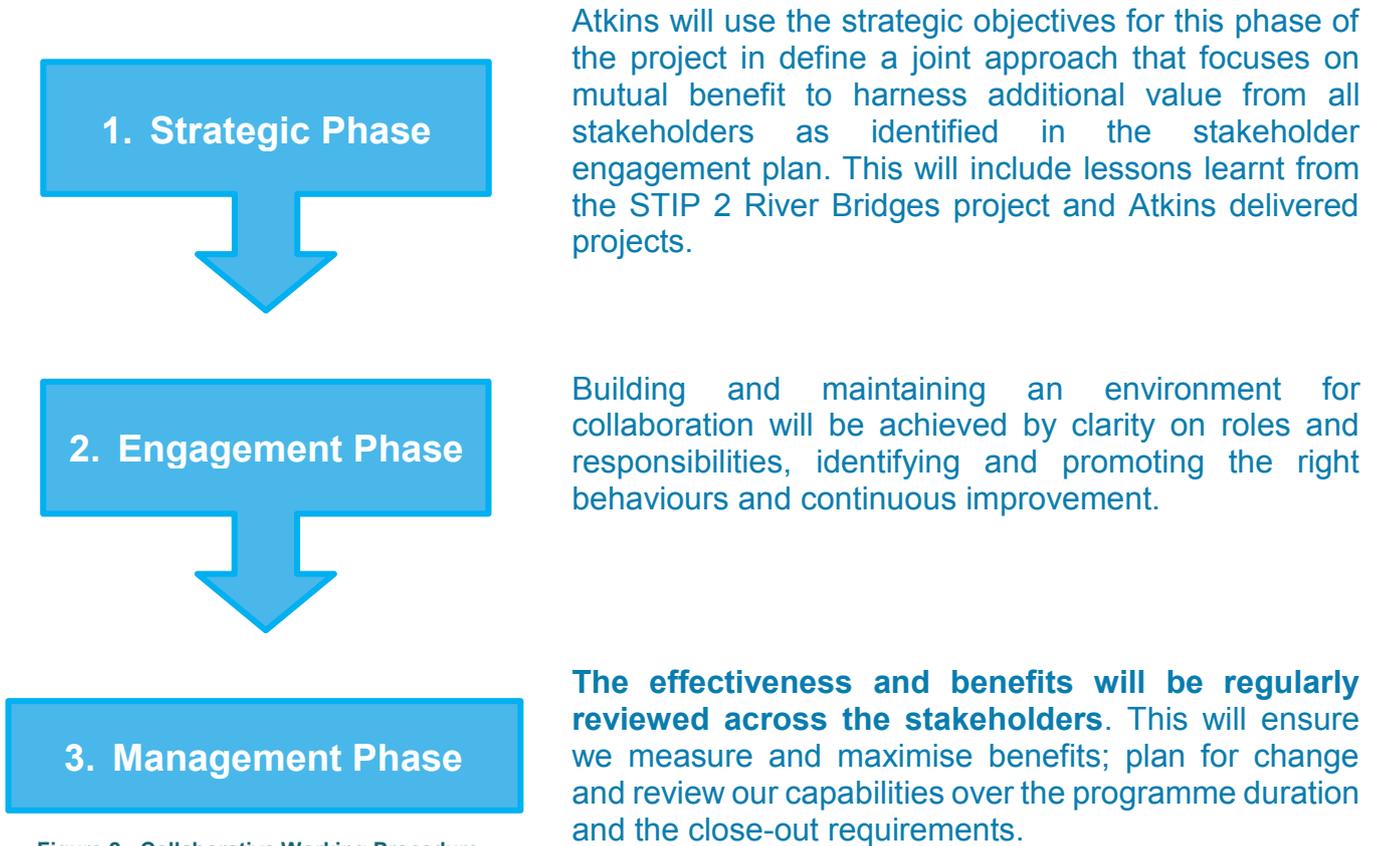


Figure 2 - Collaborative Working Procedure

‘One Team’ Approach

Atkins recognises the fundamental role that collaborative working plays in ensuring that contracts operate successfully, achieving the required outcomes for all parties. Our experience on many significant projects such as the A14 show that the required outcome is best achieved through a truly integrated delivery team. **We will build a team with shared objectives, a clear delivery strategy and an open, committed collaborative approach.**

Atkins will lead in ensuring that collaboration is achieved through ensuring that:

- Buildable and acceptable refurbishment options are developed
- Risks and opportunities have shared ownership
- Implementation costs and programme estimates are drawn from across the parties
- Recommended options are assessed through value engineering by all

Collaborative Systems & Tools

Atkins will bring an industry-leading approach to collaboration, data management and BIM (drawing on our extensive BIM experience – Atkins developed the BIM strategy for HS2), ensuring shared access to design and pre-construction information throughout the contract across organisations. Atkins will employ collaboration enabled tools – such as ProjectWise – to implement a Common Data Environment (CDE).

Atkins will utilise technology to ensure the team works effectively. We will use collaboration tools, including: Video Conferencing and SMART teams meetings for joint team planning, virtual stand up meetings and presentation of outputs.

There are **many benefits to be gained from the co-location** of staff from across the involved parties. **We will work with TfL and stakeholders to identify and implement the best approach for the team location and collaboration.** Atkins have offered working space in our Epsom office where the majority of our key team are located.

Silvertown Tunnel DCO: Atkins worked closely with TfL during this project, and co-located with the Key Staff across the project to maximise benefits realised through better collaboration.

Knowledge Share & Role Swaps

Shared training sessions will be carried out across organisations to maximise cost efficiencies and emphasise improvements in sustainability. Atkins’ are fully aware of the shortage of young professionals within the tunnel engineering sector, and **we will show full commitment to ensuring that a new generation of Tunnel Systems Engineers receives high quality on-the-job training.** We actively encourage job-swap opportunities, all parties benefit by professionals developing and expanding their skills.

4. Approach to M&E and Communications Investigations

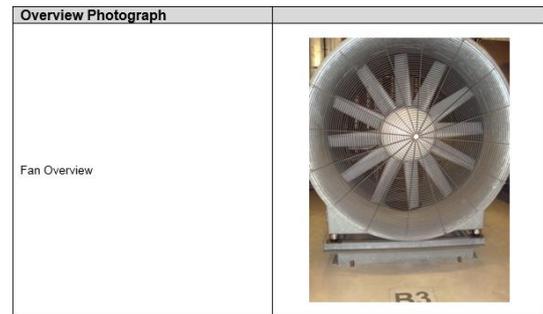
The main purpose of this project is to gain better understanding, by inspection and limited testing, of the condition, expected life, residual life and dependencies of the refurbishment items identified.

Atkins will take a similar approach to the way they carry out Principle Inspections for M&E and systems equipment as required by Highways England standard BD53/95 supplemented by output from the 3D model to gain further understanding of the assets. For these inspections, we put together a team of mechanical, electrical, technology and water engineers supported by junior staff as required, to study the as-built records, any previous inspection records, maintenance records and fault records. From these, we generate check sheets for the inspection team to use during the visual survey. Each system will have its own set of check sheets i.e. ventilation, lighting, power distribution, fire mains, detection systems and communications systems. One lesson we have learnt from our inspections on the M25 is that having a junior member of staff working with each senior engineer is that the quality of notes and photographs improve as it allows one person to hold open an item while the other photographs it and it speeds up the note taking. Using these check sheets, the survey team will carry out visual inspections, take photographs and notes as they proceed. These photographs and completed check sheets will form part of the factual report. These investigations will identify any requirement for any performance or safety testing. Once complete, we will develop the factual reports incorporating the inspection and test results.

We would normally relate the condition and quality of provision of equipment back to national provision standards but in this case BD78/99 is out of date so we will relate the condition and standard of provision to the RTSR, the EUD and other current and emerging good practice such as that published by PIARC. We identify and appraise potential solutions that would provide value for money and reduce the tunnel risk to As Low As Reasonably Practicable (ALARP). For the interpretive reports the ALARP principle will be used to evaluate options for upgrades that reduce risk to acceptable levels and apply the grossly disproportionate cost test to further risk reduction.

Part of this work will include a specific feasibility options workshop for each tunnel with TfL key staff including the TAA to understand and interpret the findings of the survey and Investigations. During this tunnel specific workshop, based upon the findings of the survey and investigation, the TfL scope requirements will be reviewed and confirmed to allow the next stage of study and development of feasibility options to commence.

Element:	Ventilation Fans	Element Ref:	B3
Location:	Bell Common EVB	Road:	M25



Element	Fan		
	Y	N	Notes / Photos
Is the fan clearly labelled?	✓		
Is the emergency stop button in place and undamaged?	✓		
Any sign of damage / corrosion to the fan body?		✓	
Any sign of damage / corrosion to the fan blades?		✓	
Any signs of damage / corrosion to the fan motor?			Not visible
Any sign of damage / corrosion to the fan AV mounts?	✓		Corrosion on some bolts and washers
Any signs of damage / overheating to cables?		✓	
Any signs of damage to cable terminal boxes?	✓		Corrosion and dirt on cable junction boxes – see photos of fans B4 and B5.
Any signs of grease / oil leaking from the motor?			Not visible
Are both grease nipples in place and fitted with a cover cap?	✓		

Figure 3 - Ventilation Fans Check Sheet

5. Approach to Ventilation Investigations, Modelling & Options

Our high level understanding and approach

TfL need to ensure the outcome of Stage 2 (Feasibility) provides recommendations for the upgrading and reconfiguration of both Rotherhithe and Blackwall SB tunnel ventilation systems that are technically feasible, bring the Transport for London Road Network structures and tunnels up to a state of good repair, address risks and are costed at this concept level and provide TfL with a high level of confidence to progress to Stage 3.

The first core element of the Stage 2 task is to **develop a comprehensive understanding of the existing tunnel ventilation systems, civil works and fire life safety concepts**. This is to be established by means of desktop study, site survey and tests of the tunnel ventilation systems for both tunnels. It is our understanding that the feasibility studies identify the potential for the use of the existing civil infrastructure and TV & MEP works to ensure the existing assets are used most efficiently given the complex interdisciplinary nature of this project.

The second core element of the Stage 2 task is to **develop the Feasibility Report**. This will bring the existing information together with new site-specific information from the survey and test phases to inform the assessment. This will comprise a combination of review of existing design & installed performance, new performance requirements and TfL project goals as set out in WI 2000. This will be followed by concept design development, computer modelling, consultation with Stakeholders and client tunnel operations and management teams together with TfL Technical Approval Authority (TAA) and TfL Subject Matter Experts. The approach we would adopt would be one of collaborative working between all parties as described in our Collobration response. The tunnel ventilation design has a number of interconnected impacts with other design elements of the project ranging from land take through operational performance and whole life costs.

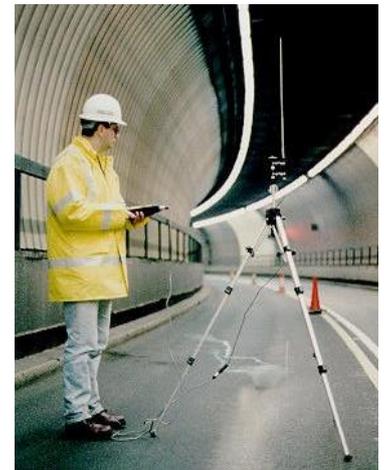


Figure 5 - Survey during Closure

We have recent and practical experiences of measuring tunnel ventilation performance in a built and operational road tunnel, which we obtain from Heathrow Airport Tunnels for HAL, Tyne Tunnel for TWA, Hatfield Tunnel and Holmesdale Tunnel for CPS. Our team has expert knowledge in 1D and 3D computer simulation modelling, conceptual design and feasibility studies to select tunnel ventilation concepts gained from Silvertown Tunnel for TfL, A303 Stonehenge Tunnel for Highways England, Heathrow Airport Tunnels for HAL. We will bring that team of experts having extensive UK and international road tunnel ventilation expertise to the Stage 2 tasks for TfL.

Our team have used, developed and offer a range of **industry standard 1-dimensional software tools** such as the Subway Environment Simulation (SES) program and the EQUA product IDA Tunnel for use in the work. The 3-dimensional software tools which come under the umbrella description of **CFD or computational fluid dynamics** that our team has deployed on tunnel ventilation tasks are STAR CCM+ a general purpose code and Fire Dynamics Simulator (FDS) a fire-specific code.

Our detailed approach, drawing on recent UK experience

Survey and Investigation Phase

Desktop Studies

Desktop studies will be undertaken in collaboration with TfL and key stakeholders to an agreed programme as part of Principal Designer duties. Our team will establish and confirm the objectives of the survey and testing; identify aspects of the works that will require advanced planning for access and H&S reasons; and drawing on extensive experience in this kind of work, we will ensure that the right information is gathered to permit future stages of scheme development to progress with confidence and certainty.

Work from the desktop studies will be used to inform the production of specifications, works information and ITT documentation for the Site Survey and Investigation activities to be undertaken by TfL appointed contractors.

Existing Assets

Ventilation systems survey in Rotherhithe and Blackwall SB tunnel need to be performed and integrated with the developed 3D BIM models to understand the extent and condition of the assets and their performance.

Site Survey and Investigations

An extensive range of Tunnel Ventilation System (TVS) site performance measurements are planned to be carried out, drawing on Atkins road tunnel modelling and design expertise coupled with our real world experience in the performance testing, evaluation, modelling and development of unique solutions for existing tunnels as evidenced in recent work at Heathrow Airport where the challenges of working on operational road tunnels with limited time windows and restricted space in the tunnel bores was a critical consideration.

Those tests for Blackwall Tunnel Southbound would be structured as follows:

- **Functional Tests.** Firstly, check equipment condition prior to performance tests. Identify the reason for 'Fan Tripping' in the previous survey 2015 by Hybrid Electrical Solutions Ltd to avoid the re-occurrence in the planned 2017 performance tests. This will provide for better planning and equipment preparations prior to future site tests.
- **Leakage Assessment & Flow Distribution of Supply Air in Sub-Tunnel Tests.** Understand the distribution of supply air in the sub-tunnel. Identify potential leakage paths. For this task and the fan performance test, ensure the correct permission and planned working practices are in place with the tunnel supervisor, who will issue permits, to allow access to air plenums for the collection of measurement data. Sub-tunnel measurement and fan performance tests may be conducted in parallel with appropriate planning.
- **Fan Performance Tests.** Obtain the relevant fan performance data (e.g. efficiency, pressure and air flow data).
- **Tunnel Tests.** Different types of tests will be performed during tunnel closure, for example:
 - No Forced Ventilation (Obtain temperature, pressure and wind effect at both portals - single point or Log-Chebyshev Method)
 - Forced Ventilation (Airflow and pressure measurements at 7 traverses @15 points, sub-tunnel and vent supply grilles)
 - Emergency Ventilation (Airflow and pressure measurements at 7 traverses @15 points)
- **Flow Decay Tests.** Ventilation system is activated until air speed inside the tunnel is stable. Ventilation system is then turned off to allow air speed to reduce due to tunnel resistances (wall friction, cable supports, lighting, etc.) This test can be done directly after Emergency Ventilation Tunnel Tests to establish pressure losses through the system.
- **Tunnel Monitoring System Tests.** Monitor the pollution & visibility levels, air speed and traffic flow. This information will be used in the feasibility study analysis and simulations. Historic data may also be obtained from the tunnel sensors database.

Those tests for Rotherhithe Tunnel would be structured in a similar manner to Blackwall SB with site specific adjustments as follows:

- **Portcullis Gates Recirculation Temporary Seal / Blockage.** Identify the needs to provide temporary blockage or seals on the portcullis gates to avoid re-circulation prior to performance tests.

The site survey and investigations into both tunnel ventilation systems will be specified and witnessed by members of the Atkins tunnel ventilation engineering team.

TVS Investigations and On Site Testing Results

Following completion of the TVS investigation and on site testing asset information and performance data will be received from the TfL contractors. That information will then be reviewed, interpreted and compiled into factual and interpretive report issued to TfL via BridgeStation. These reports will be used, in part, to inform the next core element of the work, the Feasibility Study.

Feasibility Study Phase

The Philosophy

The Atkins team will work collaboratively with the TfL project management, the TfL Technical Approval Authority (TAA) and TfL Subject Matter Experts across both tunnels to ensure the development of solutions that are safe, practical to construct, cost effective and will function as intended to ensure the TfL primary goals of Safe, Reliable and Efficient tunnels are met.

Workshop

The first activity planned in this second core element of the work will be to undertake a specific Feasibility Options workshop for each tunnel with TfL key staff to understand and interpret the findings of the Survey and Investigations. During this tunnel specific workshop, based upon the findings of the survey and investigation, the TfL scope requirements will be reviewed and confirmed to allow the next stage of study and development of Feasibility options to commence.

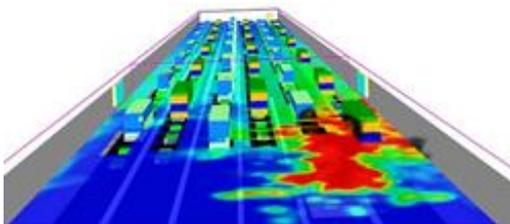


Figure 6 - Road Tunnel 3D Fire Simulation

Study and Development of TVS Feasibility Options

Atkins have a team of experienced tunnel ventilation modellers and engineers who have the right depth and breadth of knowledge in this specialist technical field from within the company. Key members of the team have direct and relevant experience of existing road tunnel ventilation performance site investigation, scheme design and modelling from operational road tunnel projects. This team

will progress the option engineering by interpreting the data and developing the appropriately calibrated 1D and 3D models to characterise the tunnel systems and undertake predictive simulation.

Feasibility Study Reporting

The ventilation team will assemble all the findings of the TVS investigation and on site testing, the output from the various workshops, the feasibility stage option engineering with supporting modelling and 3D models analysis based engineering design, cost and programme information to a level commensurate with concept stage and issue as part of Feasibility Study Report with the intention of making a single clear recommendation for both Blackwall Tunnel SB and Rotherhithe Tunnel.

Drawing on lessons learnt from previous projects

We are aware and will consider fully the TfL lessons learnt, as highlighted in ITT Volume 2 – Scope, section 8.10, from the recent STIP 2 River Bridges project. In addition, the Atkins tunnel ventilation team will bring and share our own lessons learnt from previous road tunnel site inspections, surveys and modelling where Atkins has undertaken monitoring and site measurement work itself, in-house, as well as specifying works for external specialists. A short list of some important examples is given below:

- Flow monitoring on the London Underground system to TfL and LUL requirements during engineering hours, highlighting the value of careful attention in the specification and planning
- Individual fan performance tests as well as tunnel airflow measurements can highlight any specific problem with an individual fan, saving time and effort in repeat testing
- Flow decay tests are important in characterising friction and pressure loss effectively
- Evaluation of uncertainty and variability in ventilation monitoring instrument performance is a critical element of site testing and measurement

6. Tunnels Technical Innovations

Atkins' Industry Leading ALARP Approach

Atkins is an industry leader in the design, analysis and assessment for road tunnel safety. We have established through experience an efficient and effective approach to the development of road tunnel safety requirements. We adopt the As Low As reasonably Practicable (ALARP) approach which has led to robust and affordable solutions for our clients and the traveling public.

Atkins will apply ALARP to this project. This will enable **robust design solutions** that are driven by **operational requirements** and meet **Stakeholder needs**. Figure 7 shows our overall approach which will allow informed overarching qualitative decisions to be made by TfL based on our risk assessments after consulting with all stakeholders.

Heathrow Main & Cargo Tunnels: Atkins used the ALARP approach for the refurbishment of these tunnels where Atkins were able to demonstrate risks were reduced to an appropriate level without over engineering solutions. Once the refurbishment is complete, Heathrow will be able to demonstrate targeted risk reduction and evaluation against their airport wide criteria.

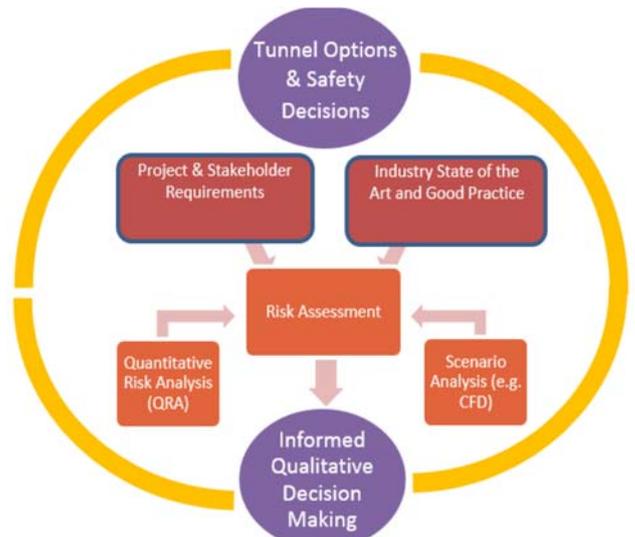


Figure 7 - ALARP Process

Good Practice & 'Value for Money' Innovation Screening

Our approach is to adopt and develop good practice. **Silvertown and Heathrow** have benefited from a **realistic and risk based approach** allowing the projects to be developed and implemented in a **safe and cost effective manner**. Our integrated design development processes are applied to all our projects. We do not simply employ practice at other tunnels without challenge to their applicability or value.

Our teams, located in London and Epsom, have been present in the industry for several decades and have **extensive experience and capability in delivering tunnel systems**, including **innovative design solutions**.

Technical innovations and safety enhancements will be assessed for the possible improvements that they are likely to bring. Improvements will be monetised and compared against the required investments to achieve the benefits. If the cost is not disproportionate, then it will be recommended to TfL for implementation. If the test gives a marginal benefit, it will be referred to the TDSCG for decision. Grossly disproportionate improvements will not be implemented and will be recorded in a decision log alongside a rationale.

Atkins' Use of Technology for Innovation & Safety

Working with the fire and life safety team, our technology experts will propose measures to manage and improve the Tunnel Safety Profiles – through ALARP – by **reducing the frequency of incidents** occurring within the Tunnel, and **minimising the severity of incidents** that do occur. These safety functions will be analysed generally in accordance with the principles of IEC61508 to give a required integrity performance (SIL). In generating these requirements, we will employ formal systems engineering principles to ensure that the behaviour of the final delivered system is traceable to the original requirements as well as the integration and test plans.

In addition to the safety functions, we will ensure that cloud based services have appropriate protection from cyber interference by both physical and IT measures. Our specialist information security experts will engage with TfL's specialists to ensure that an appropriate information security management system and code of connection is implemented. **Our Tunnel specialists are experienced in working on road tunnels that are controlled by TfL's new HORUS system**, and will ensure that the refurbishment considers the operating requirements of the tunnel control system.

Safety is key to us and all our stakeholders. On every project we are proactive in ensuring that the best practice is followed and we learn through recognising good practice, issues and incidents that have occurred. We hold weekly safety briefing and undertake significant staff safety training. Through collaboration we will develop the safety ethos throughout all of those involved in this framework.

Examples of our safety approach are:

- Minimising the need to go on site and working near live traffic by use of 3D models, clash detection and BIM.
- Ensuring staff have the proper qualifications and training. Our key staff selected for this project are all competent in site activities and hold appropriate accredited cards (e.g. ECS HE Sector 8 cards, CSCS cards),
- Atkins Operating Safely (AOS) system is mandatory for all staff and contractors on site. AOS is a key tool for all our staff in managing site visits, method statements and risk assessments.

Atkins will work closely with TfL, their Contractors, and Key Stakeholders to refine and develop **'Good Practice' into 'Best Practice'** processes and behavioural techniques that will deliver an **innovative and safe working culture**.

Highways England - For our design work for Highways England on the A14, M1 M6 and M25, Atkins developed 3D models for design visualisation and clash detection across all disciplines allowing a seamless view of the design to be developed saving significant time and costs.

Constraint Management

When carrying out works in a time limited window **we will ensure that works are undertaken in an organised and effective manner**. We will ensure that all team members understand exactly what needs to be achieved and what the key constraints are such as access and space restrictions and requirement of traffic management. We will work with all relevant stakeholders to develop and agree a detailed survey / inspection plan and assess alternative safe methods of working. Plans will be briefed in detail to all involved prior to any inspection and at the start of shift briefing. The proposed methodology will then be used to develop the RAMS for the site works. We will use lessons learnt from similar previous projects to ensure that Key Constraints are minimised as much as possible,

Quote from [REDACTED] TfL Project Manager – "The project to refurbish the Northbound Blackwall Tunnel has in every way been a success. We have been able to complete the works and the night-time closures 13 months ahead of the planned completion, bring it in on budget and maintain a working relationship that has been both professional and a pleasure to be a part of".

7. Building Information Modelling (BIM)

BIM – 3D Model (see Pre-Contract BIM Execution Plan attached in Appendix A)

Transport for London has a strategic approach for the consistent adoption of BIM. The strategy includes an approach to describing information requirements across all aspects of the asset lifecycle. Atkins has a strong experience in the production and use of 3D BIM models and we understand that there is opportunity to interrogate and utilise the available models to improve works on the project. There are two areas of significant impact, Health and Safety, and Programme optimisation.

The use of the 3D model will be integrated into the role of the Principal Designer to maintain regular and stringent control of the information that is being used and to ensure that the model is being utilised as much as possible.

The main aim of using the 3D model is to reduce time on site by maximising insights gained into the physical structure without physically entering the asset. Firstly, we will establish what existing information TfL have on the structure to begin building a 3D model, and then programme the point cloud survey early on such that we can develop a 3D model to work off of.

The existing information will be used to determine what further survey information is required. This enables us to target the areas of interest with the surveys and specifications such that the time on site is used most efficiently. In addition, the 3D understanding of the space within the asset will be valuable in helping us develop our method statements and risk assessments for further surveys. This understanding will help ensure that programme activities are efficiently targeted at achieving the key outcomes of the project, and may help identify activities which can be removed entirely.

In the development of the feasibility study the 3D model will be interrogated thoroughly to ensure that all proposed options are evaluated against the existing conditions of the asset. The model will be instrumental in determining qualities such as buildability and safety risks associated with the options. These will be included within the appraisals of the options.

Finally, the model will be developed to ensure that any relevant H&S information is included and such that it can continue to add value during the next phase of the STIP2 programme.

Specification of Model Survey

Atkins as the Principal Designer (PD) will ensure that the design team are brought together to agree the nature and extent of the survey required. To produce a suitable survey report, designers will need to ensure that the specification provides information about the existing “structure” in order to inform the design and later stages of design in the STIP2 programme. The following items are identified as key in specifying the survey & model:

- access and egress for construction, use, maintenance and emergency escape
- access to control and maintenance panels
- space for installation of new equipment
- clash detection
- location of hazardous materials built into the existing structure
- transfer of hazard information to the design risk register
- use of agreed symbols to identify hazards
- integration of information from other/existing condition reports into the model

As an ongoing process The PD will ensure that designers, throughout the design and construction phase, will update the model to track design changes and record the location of hazardous

materials found and to remain in place. The PD will agree with the tunnel operator the requirements for the model at handover to ensure that it contains accessible information for the user, and maintainer.

3D Model Integration with Principal Designer

The Principal Designer's (PD) CDM duties include reviewing the design in respect of health and safety (H&S) to ensure that the need to visit site is reduced. A key tool to assist in this process will be the 3D model.

Silvertown Tunnel: Atkins as PD used the 3D model during a presentation to HSE on the health effects during construction to demonstrate the location of the proposed tunnel in relation to existing structures, ground contamination, existing services, UXO, and alignment below the existing river Thames.

The BIM Manager will produce a management plan for the uploading of information to ensure that the 3D model is consistent and up to date including relevant key H&S information. The PD will produce a CDM management plan including the process for the management and review of H&S information linking it to the BIM model. The PD will review the information contained in the 3D model on a weekly basis.

Key dates will be identified in the CDM management plan for regular design team meetings /reviews/workshops using the 3D model including:

- Clash detection – an opportunity for designers from all disciplines to discuss space constraints/requirements for particular materials, components etc. this allows the design to be adjusted at an early stage to avoid impact with existing services for example.
- Buildability – designers meeting with stakeholders (including contractors) to identify difficulties such as space constraints for construction.
- H&S design reviews – identifying potential hazards at an early stage and in discussion with the PD offering alternatives to eliminate the hazards. Where hazards cannot be eliminated recording those residual risks in the design risk register and ensuring they are escalated.
- Ensure sufficient space for construction, use, maintenance of the “structure”.

The 3D model is particularly suited during the above workshops to trialling alternative options in real time and recording options for design changes. As an ongoing process The PD will ensure that designers, throughout the design and construction phase, will update the model through the BIM manager to track design changes and record the location of hazardous materials found and to remain in place. The PD will agree with the tunnel operator the requirements for the model at handover to ensure that it contains accessible information for the user, and maintainer.



Figure 8 - Point Cloud

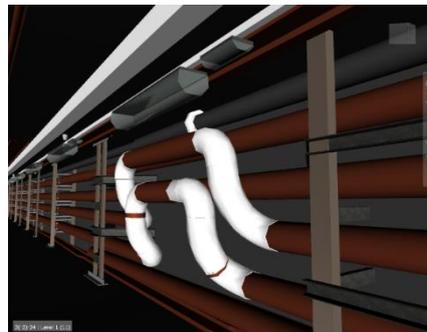


Figure 9 - LOD 200 Model

PART II: HEALTH & SAFETY

1. Principal Designer Role

A Strong Emphasis on Safety

Atkins Principal Designer (PD) will fully support TfL in its key client role under CDM 2015 (CDM) to actively drive integration of safety through the design. Atkins has a strong corporate approach to safety with a vibrant CDM network, and recognised as leaders in CDM by the HSE. When visited last year to review how we were implementing CDM, the HSE Inspector, Mark Carroll, provided a wholly positive assessment of Atkins, writing: *“It was clear that Atkins has actively considered the duties of PD, evaluated the skills, knowledge and experience required internally to fulfil the duties ...”*. It is crucial to provide the right support for the PD role. We propose [REDACTED] as CDM Health and Safety advisor (CDMA). [REDACTED] will support to TfL drawing on his considerable experience of CDM provided on large and complex projects.

Competence – Skills, Knowledge, Experience and Training

In preparing for CDM 2015 the Atkins QSSE Director was asked to support HSE on developing CDM industry guidance, reflecting our reputation in this area. Atkins is a member of the Consultants Health and Safety Forum (CHSF), involved in producing the leading guidance and training. Our CDMA is currently rolling out an IOSH Leading Safety course, commencing in April 2017, for senior members of the design teams in line with HE requirements and has run CDM PD training for our PDs. [REDACTED] has extensive experience of training relevant to CDM and the PD role.

Safe and Healthy by Design

Our PD, working with designers will ensure effective identification and elimination of hazards; risk reduction where hazard elimination is not possible. This will be a lifecycle approach from feasibility to detailed design, buildability and onto use, maintenance and demolition.

Silvertown Tunnel: Atkins as PD met with the HSE to improve construction worker welfare through better design and has adopted industry best practice such as that produced by Crossrail i.e. “Health by Design – A Guide for Crossrail Design Teams”

The Importance of Health in Design

Health considerations have often been the poor relation to safety.

HS2 Phase Two: We advocated a ‘treat health like safety’ approach (reporting potential health impacts in the same way as near miss reporting. Everyone is expected to ‘challenge and deliver’.

For example, off-site fabrication – conditions are better controlled in dedicated fabrication facilities (reducing hazards associated with chemicals, cement burns, etc.)

HS2 Phase One: We undertook optioneering for build offsite designs and were involved in a number of workshops that allowed risks to be challenged and reduced.

Support to Client

Our CDMA will support TfL in meeting client duties. We will ensure as PD, designers provide all information to members of the team, ensure H&S issues are identified early on and notified to TfL for action. Our CDMA will support TfL in this regard through his considerable experience in acting on projects such as A303 Amesbury to Berwick Down (A303), A14 Cambridge to Huntingdon (A14), Silvertown Tunnel and Smart Motorway schemes; M1, M25, M4, M6, M42, M62).

Cooperation and Coordination with Client

We will ensure all members of the design team cooperate, coordinate and communicate with TfL and the team. In practice for safety, health and welfare this includes: a detailed design brief; an agreed design input statement; arranging and attending meetings and workshops, being available to answer questions; information dissemination arrangements (reports, TQs, models, standards,

etc.); CDM awareness training to those that need it; reviewing existing information and advising of any additional needs; coordinating with other designers including contractors; Being aware of TfL’s share point site for works information.

Cooperation and Coordination with Design Team

We will develop an organisation chart for effective CDM delivery. This will show a team breakdown including design managers, discipline leads, and consultant links, links to contractors carrying out design (e.g. temporary works). We will draw on our JV experience with HE where we promoted shared standards via the following documents, also recommended to TfL as they worked well:

- CDM Management plan - identifies contact details for the design team, client standards, agreed design processes, forms and templates, arrangement for approvals etc.
- Health and Safety Management Plan - induction training, lone working arrangements, risk assessment and method statements, joint visits to minimise disruption and duplication etc.

Hazard Elimination and Risk Control

We will ensure that designers apply the “principle of prevention” (regulation 9 (CDM 2015) and adopt TfL processes for hazard identification and risk control. We will ensure cooperation, integration and access to our design risk register (DRA).

The inclusive design risk management process has been used successfully on schemes including A14; A303 and Leeds Station Master Plan.

Atkins has set industry standards for ‘designing out risks’ using an approach and resultant tools based on a traffic light (RAG) concept. This was backed by the HSE, being available through their website and has been developed by the CHSF. Hazards identified in the risk register will include those relevant to construction, maintenance, use and demotion. Residual risk information will be taken from the register and identified on the drawing ‘SHE’ box with hazard warning triangles. The scheme design risk management process commences with an inclusive design risk workshop to introduce the process of hazard elimination and risk control, to set standards and targets.

Design Change Management

As PD we will ensure the designers consider that the ‘structure’ is safe to build, use, maintain and demolish. Our team working on the A14 exceeded 240 staff. We adopted a rigorous design change approach incorporating health and safety through a shared portal, which ensured all documents were reviewed, amended and approved before issue. As with the A14 we offer our ten-point test to TfL to challenge the design:

How can it / will it be assembled? Satisfactory?	Anything sensitive to construction tolerances?
How will it behave during construction?	Important assumptions communicated?
What impact does sequencing have on design?	What might go wrong? How could I de-risk?
Have I assumed a construction method?	Is there a simpler way to do this?
What plant is needed? Transport of materials?	What does the Project technical Reviewer think?

Our online accident reporting procedure RIVO allows us to report safety, quality and security issues. Issues raised during check and review will be shared through RIVO to avoid duplication.

Asbestos

As PD we are aware that the tunnel(s) were built before 2000 we must presume asbestos containing materials are present. We will request a copy of the tunnel asbestos management plan from the tunnel operator and review against the proposed design. We will carry out a **desk study only** and identify where additional intrusive asbestos survey work is required. We will produce an asbestos survey specification and the PD will recommend to TfL that an asbestos surveyor is appointed to carry out any additional survey work required to inform the design. Based on experience of the A55 tunnel we may recommend sampling of the tunnel air handling and other systems. This asbestos information will then be used to commission any asbestos removal works prior to commencement of the main refurbishment works.

H&S CV – [REDACTED]

Health & Safety Lead

General

[REDACTED] is a Senior Health and Safety Advisor, Fire Risk Assessor and is Trained as an Asbestos Surveyor for Atkins. [REDACTED] has over 15 years' experience in inspection, audit, training, CDM and implementation of H&S management systems, and has a HNC and OND in Building Studies, as well as an NVQ Level 4 in Occupational Health & Safety.

Education, Qualifications and Experience

He is a Chartered member of Institution of Occupational Safety and Health and has the following key skills:

- Fire Risk Assessor
- CDM Co-ordinator
- Health and Safety Manager
- Health & Safety Advisor
- Asbestos Surveyor
- QSE auditor
- IOSH approved Safety Trainer
- Risk assessment and review (Designers', Workplace and Work Equipment)
- Site audits & control systems
- Accident reporting & statistics
- Appointing skilled persons to enter confined spaces under SRP06
- Site Manager

[REDACTED] has led the CDM as safety culture for many of Atkins major infrastructure projects including Highways England Smart Motorways Programme. Guidance on safe operating and maintenance practices.

[REDACTED] role is independent of the Project director to ensure that the CDM and Atkins safety culture are maintained. [REDACTED] will have an overarching safety role on the projects and will work closely with the team to ensure the projects is delivered safely and successfully. He will be a key team member to ensure successful delivery of the project and meeting the key objectives for Stage 2.

Selected Project Experience:

Atkins 2002 - Present: Senior Health and Safety Advisor Fire Risk Assessor, Senior CDM Co-ordinator, QSE Auditor, Asbestos Surveyor.

With various clients including Atkins Power, Atkins Telecoms, Cable and Wireless, Highways Agency Smart Motorways Schemes on M1, M62, Manchester, M25, Highways Agency Midlands TechMAC; Highways Agency North West TechMAC; secondment to

Midland Expressway on M6toll; Atkins Facilities Management; CDM Co-ordinator Environment Agency Schemes, construction of new premises or refurbishment of existing premises for Boots the Chemist, Tesco Stores, Northamptonshire County Council Waste Recycling Centres; CDM-C Services to NWTRA (including Gap Analysis and report of the Principal Contractor role within each Local Authority Provider) and SWTRA. Fire Risk assessments for Atkins Facilities Management and Severn Trent Water Depots in the Midlands area managed by Mitie FM.

Providing Health and Safety advice to internal management and design team; external clients and contractors. Producing and reviewing CDM documents, pre-qualifying contractors, site and office health and safety auditing and monitoring.

Current clients include Highways Agency (CDM-C on Seven "Smart Motorway Schemes" M1, M25, M62 and Manchester Motors); Oxfordshire County Council and Coventry County Council, Birmingham City Council – CDM-C on various Highway Improvement Schemes

WS Atkins Defence Services 1999 - 2002: Regional Safety Advisor

Health & safety Advisor to Ministry of Defence sites across the UK and in Europe (Kosovo).

Supported site managers and clients' representatives on MOD sites in the East, South-East, Wales and the South and ensured the appropriate risk assessments and control systems were employed and adequately recorded.

Carried out programmed audits of sites and assessed performance of site managers and their sub-contractors.

Kept staff informed of changes in regulations and procedures and provided safety awareness training for staff and managers as part of a rolling programme.

Assisted local management to investigate and report on serious accidents and maintained accident statistics.

Liaised with Company Health & Safety Manager and advised Business Director when changes were needed to policy.

Undertook workplace risk assessment; staff offices, workshops and construction sites.

Undertook work equipment risk assessments in workshops on fixed plant including wood and metal working machinery and mobile plant including HGV's and their attachments.

Prepared health and safety reports for Management Board.

Authorised person (confined spaces), trained to appoint and allow skilled persons to enter confined spaces in accordance with SRP06.

2. Safety of Tunnels & Traffic Management

Atkins recognise that the LoHAC contractor has key experience of operating these tunnels over a number of years. Atkins will engage with them at an early stage to understand their operational issues and maintenance difficulties. It is proposed that this be in the form of a structured workshop including the LSTOC operators to systematically consider each of the tunnel aspects and record the issues and expectations of TfL and their contractors.

Atkins understands the strategic nature of these tunnels and their critical importance to the TfL road network. All staff working on the project will be briefed regarding the need to ensure that during any site visits, closure times are adhered to, no equipment, tools or rubbish are left on site and that they check with the LoHAC that all systems are correctly functioning and the tunnel is ready to reopen on time. This is the process that we undertake with any tunnels work and has been the case with the work Atkins have been carrying out at Heathrow Airport where the criteria is similar.

Atkins understands the importance of the Tunnel Design and Safety Consultation Group (TDSCG) and will engage with this group at regular intervals throughout the project. It is proposed that an early stage meeting is held to establish relationships and explain the scope of the project and at key stages throughout. We recognise the importance that even during the early investigation phases of the study, it is important that all staff are clear of the end objectives, their responsibility under the CDM regulations and coordination with any contractors on site.

Atkins work on a regular basis on the M25 both on the open network and in the tunnels for Connect Plus Services on behalf of Highways England. We have built up good relationships with the operators and maintainers to understand the restrictions they face and to ensure that our work fits within their work schedules. Atkins staff attending site are regularly inducted into CPS's Health and Safety systems and we always make sure that our method statements and risk assessments are compatible with their working methods.

Atkins Operating Safely (AOS) system provides an online system for recording site visits, method statements, risk assessments, ensuring staff competence and tracking staff on site. This is used for all site visits and includes automated escalation processes for when staff do not check back in when scheduled to do so. This system would be used for works and visits to the Rotherhithe and Blackwall tunnels and would enable the staff to work in a safe manner and line managers to be able to review site activities. The system requires all method statements and risk assessments to be peer reviewed prior to any site activities to ensure a consistently high level of compliance. All staff attending site will carry appropriate CSCS or ECS Sector 8 cards. Our lead electrical engineer is City and Guilds G39 trained.

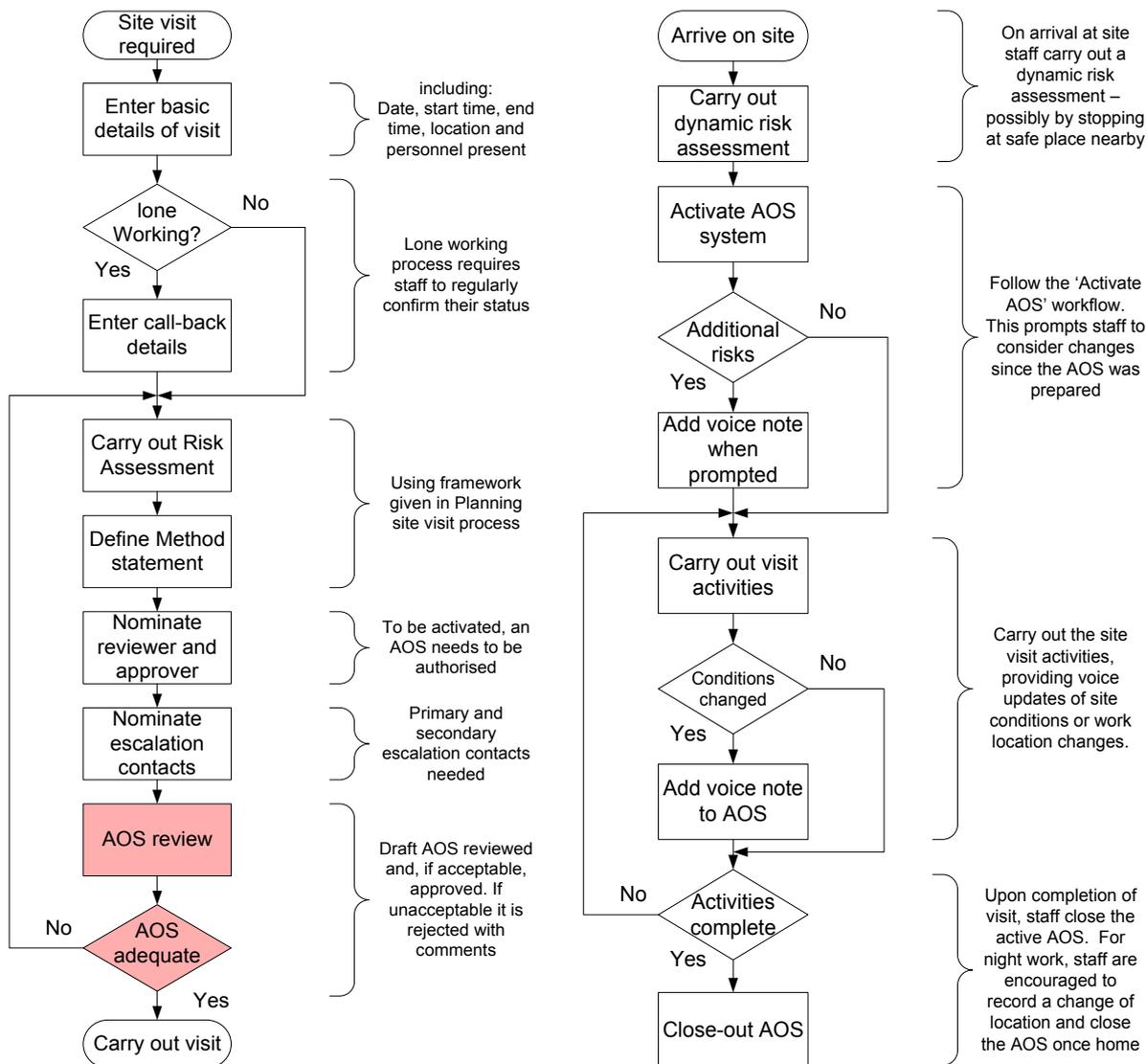


Figure 11 - Atkins AOS site visit process flow charts

Our key staff all have many years' experience working on site however we intend to mentor some more junior staff to gain experience and bring value to the project. However, it is important that until proven competent, any junior member of staff attending site will be supervised by an experienced engineer.

PART III: PEOPLE AND RESOURCES

CV 1 – [REDACTED]

Project Director

General

[REDACTED] leads Atkins team of experts in Substructure Engineering Bored Tunnelling, Fire Life Safety and Ventilation.

[REDACTED] has responsibility to commit resources to major contracts and the seniority to maintain effective communication channels with clients at a high level.

Education, Qualifications and Experience

A Chartered Civil & Chartered Structural Engineer, with BEng (Hons) degree and twenty-seven years' experience, who specialises in the design of tunnels, underground structures and ground engineering, including the design of foundations and earth retaining structures. A member of the Institution of Civil Engineers (MICE) and of the Institution of Structural Engineers (MStructE).

Relevant Work Experience spanning major Programmes:

[REDACTED] experience includes many major schemes for road and rail programmes including Crossrail, Silvertown Tunnel, A3 Hindhead Tunnel, Rikoti Ridge Highway Tunnel (Georgia), Bond Street Station Upgrade, Victoria Station Upgrade and Docklands Light Railway Extensions.

Delivery of projects with high value and complexity:

Delivery of the **Silvertown Tunnel DCO Reference Design** for new twin-bored tunnels below the Thames. The scheme budget is **approx. £1B** and includes complex interdisciplinary design aspects.

The **Bond Street Station Upgrade** is a **£300M** scheme that forms part of the Crossrail Project. Detailed design for all subsurface works for the largely tunnelled station upgrade.

Project Director for the Independent Category III design check of all shafts, tunnels and underground station works on the **Victoria Station Upgrade** scheme (value approx. **£700M**). Included extensive SCL tunnel adits driven both in, and above, London Clay.

Overall responsibility for project(s) and for supervision, control and development of subordinate personnel:

For delivery of the Silvertown Tunnel DCO Reference Design, [REDACTED] was responsible for all aspects of the engineering design and for the design staff working on the scheme.

Management responsibility and direction within the consultancy including client liaison, specialist skills or experience:

[REDACTED] is responsible for the managing the Tunnel and Underground Space Group with regard to all aspects of performance and sets the direction for this unit within the Atkins consultancy business. He personally engages with clients on a regular basis to ensure effective project delivery is

aligned with expectations. His extensive experience and specialist technical knowledge of tunnel design, particularly through a large number of projects for TfL, has provided an invaluable working knowledge of their processes, stakeholders and infrastructure.

Responsibilities

Drawing on his experience of complex, high value projects and management of a consultancy practice, ■■■ will carry out the responsibilities of the Project Director to ensure all aspects of the works are carried out in accordance with the requirements identified by TfL.

Key to the success of this role will be the maintenance of **communication channels** and the development of **good relationships**. ■■■ will seek to build collaborative relationships with TfL's representatives, external contractors and other stakeholders, as required, drawing on experience from previous schemes where good relationships have been essential to resolving issues and have formed the basis of successful project outcomes.

Managing change is an essential element of the design process and ■■■ will engage fully with enquiries for services and associated proposals. He will also supervise allocation of resources for additional works to ensure that the right people are in the right roles, have the necessary resources, including training, to meet the requirements and are suitably motivated to carry out their duties.

Finally, ■■■ will be responsible for ensuring work is carried out in accordance with all relevant statutory instruments procedures, rules, regulations, standing orders and instructions from TfL. This includes **full adherence** with all safety and quality assurance procedures and audits.

■■■ will lead by example from the front. His leadership will be evident in the way he carries out his own responsibilities, particularly with regard to relationships, communications, change management and adherence to procedures, whilst ensuring all members of the team follow this example. He will be accountable for successful delivery of the project and meeting the key objectives for Stage 2.

Other Selected Project Experience:

Park Lane Highway Undergrounding concept study, London (TfL) - The short concept study considered the technical viability of undergrounding part of Park Lane, to relocate the facility and to explore the potential for reuse of space created by the relocation.

Silvertown Tunnel, London, UK, Independent Peer Review (TfL) - Acted as expert tunnel design reviewer in conducting an independent peer review on behalf of TfL of the feasibility design of the Silvertown Tunnel project. The review covered the rationale and selection of preferred engineering solution for the crossing, considered key aspects of the scheme's engineering technical feasibility and also considered capital cost estimates, treatment of risk and risk contingency, and construction methodology.

CV 2 - [REDACTED]

Project Manager

General

An experienced and trusted Project Manager, [REDACTED] brings a wealth of knowledge and capabilities in management and control of design teams. He has the necessary skills to coordinate the day-to-day business of the project through effective control of resources and to deputise for the Project Director when required, having fulfilled this role on other projects. He provides leadership for design and support staff of all grades across a wide variety of highways projects.

Education, Qualifications and Experience

A Chartered Civil Engineer, with BEng (Hons) degree and twenty-nine years' experience, who specialises in Project Management of large and complex multi-disciplined major projects. A member of the Institution of Civil Engineers (MICE).

Relevant Work Experience spanning major Programmes:

[REDACTED] experience includes many major schemes for highways and other programmes including HS2, Silvertown Tunnel (TfL), Port Marchwood (Solent Gateway), A21 Tonbridge to Pembury (Highways England) and the M25 Controlled Motorway Project (CMP), amongst many others.

Delivery of projects with high value and complexity:

Delivery of the **Silvertown Tunnel DCO** Application and Examination for new twin-bored tunnels below the Thames. The scheme budget is **approx. £1B** and includes complex interdisciplinary design aspects. [REDACTED] undertook the role of Project Director for this work.

Country North is the first section of the **£42B HS2 Project** and includes 78km of high speed rail. [REDACTED] role as Project Manager included control of a large multidisciplinary team to produce the Environmental Statement and other deliverables for seven areas.

Transport experience and Project Management skills:

For delivery of the Silvertown Tunnel DCO Application and Examination, [REDACTED] provided project leadership, carried out senior peer reviews for the DCO deliverables and was responsible for liaison with the client's senior managers.

[REDACTED] has extensive experience of working as Project Manager for Highways schemes. Recent projects include:

A21 Tonbridge to Pembury - Responsible for managing multi-disciplinary team to review, scope, provide fee estimate and programme work needed to resume the Statutory Process to Public Inquiry. Liaised with the HE, DfT Legal, and Counsel.

M275 Tipner Interchange - Responsible for managing engineering team fast track delivery of HE Design Approvals and Planning Application for DfT Funding Submission. Provided Client advice on D&B Contract.

Walton Bridge, M1 Deansbrook Viaduct - Responsible for preparing fee estimates, developing design programmes, invoicing, and performance monitoring. Responsible for cost management, addressing potential overspends and change control.

M25 J7-10 CMP - Responsible for reviewing, challenging and monitoring the Contractor's construction programme. Took key role in lean programme initiative "Lastplanner" to develop innovative and lean process management to achieve very challenging construction programme.

Responsibility for project(s) and for supervision, control and development of junior personnel

As well as taking direct responsibility for managing projects, ■■■ is also a line manager for a team of six consultants within the Atkins business. His responsibilities include professional development of junior staff through identification of training and development needs, regular reviews and consultations. He supervises the team for all day-to-day business needs.

Management responsibility and direction within the consultancy including client liaison, specialist skills or experience:

■■■ is an Associate Director within the Atkins consultancy business. This is a senior, customer focussed position with responsibilities for business performance, strategy, work winning and project delivery.

Through many years' experience, ■■■ has acquired proven leadership skills in project performance management and monitoring. He is conversant with several Project Management tools and techniques, has extensive knowledge of Framework Contracts and is proficient in preparation of design fee estimates, financial forecasting and development of project cost estimates.

Responsibilities

Drawing on his experience of managing complex, high value projects, ■■■ will carry out all of the identified responsibilities of the Project Manager and be able to deputise for the Project Director when required.

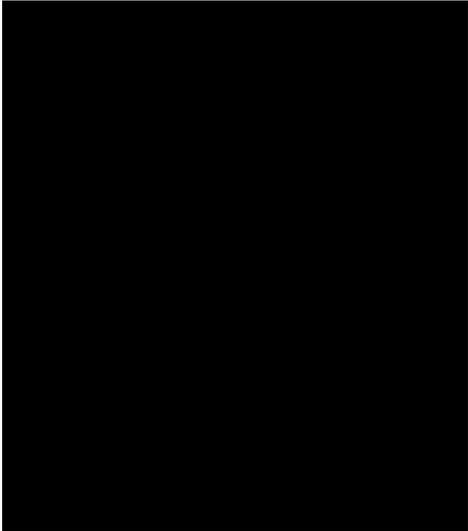
■■■ has strong client engagement skills and builds good professional and collaborative relationships with all stakeholders. This will be key to the success of the Project Manager role for this project along with ensuring staff have the necessary resources and training to meet the requirements and are suitably motivated to carry out their duties. He will also ensure the objectives of the commission are achieved and all safety and quality assurance procedures are adhered to. He will be responsible for successful delivery of the project and meeting the key objectives for Stage 2.

Other Selected Project Experience:

Project Director, Silvertown Tunnel (Transport for London): Providing project leadership and experience for delivering the Development Consent Order Application.

CV 3 - [REDACTED]

Tunnel M&E Systems Design Lead



General

[REDACTED] has over 25 years of experience in tunnel refurbishment projects to ensure that the best value is delivered by the project team. Having already designed systems for a number of existing tunnels, He will ensure successful compatibility with existing infrastructure is implemented. His proven skills in commissioning tunnel systems and project management will ensure the best quality of services are provided to the Client throughout the project.

Education, Qualifications and Experience

[REDACTED] is a Chartered Engineer with the IET, and has a HNC and ONC in Electrical Engineering and a Polytechnic Certificate in Computer Studies, and is Prince 2 trained and an active member of the UK Tunnel Operators Forum. He has delivered several multi-disciplinary tunnel projects successfully as Technical Director

Relevant Work Experience spanning major Programmes:

- [REDACTED] has been key in delivering Atkins major road tunnel projects including:
- Silvertown Tunnel Reference Design and development of the procurement specifications and paymech basis
 - Colorado DoT I70 Denver Tunnel
 - A3 Hindhead Tunnel
 - Brynglas Tunnel refurbishment
 - Blackwall Tunnel northbound and southbound refurbishments
 - Rotherhithe Tunnel communications upgrade
 - A1(M) Hatfield Tunnel refurbishment
 - Hatfield, Holmesdale, Bell Common and Dartford Tunnels Principle Inspections
 - Heathrow Main and Cargo tunnels refurbishment
 - Birmingham Queensway, St Chad's and Lancaster Circus tunnels refurbishment

All of these projects are high value, involved significant stakeholder liaison and resolving conflicting interests. [REDACTED] role as Technical Director on these projects is to ensure that the technical teams deliver effectively and to support the Project Director to ensure effective delivery. He is an active member of the Tunnel Design and Safety Consultation Groups (TDSCG).

The Heathrow Tunnels refurbishment is a key example of [REDACTED] skills and expertise. David led a team that oversaw the multi-million-pound refurbishment. [REDACTED] was responsible for the technical and commercial scoping of the refurbishment contract.

As a team leader [REDACTED] ensures that his team are briefed and trained appropriately. He chairs frequent team safety briefings to share lessons to be learnt and identify where additional training would help.

Responsibilities

██████ will lead the M&E and Systems design to ensure a robust and comprehensive solution is developed and will take an active lead in ensuring that the various disciplines work is co-ordinated. Liaison with TfL and other stakeholders will be key in this role. ██████ is expected to take a key role in the TDSCG for this project. He will be a key team member to ensure successful delivery of the project and meeting the key objectives for Stage 2.

Other Selected Project Experience:

Project Manager, Blackwall Tunnel Southbound Refurbishment, Highways Agency / Transport for London - Responsible for leading a multi-disciplinary design team producing the feasibility report and the refurbishment contract documents. The work was carried out in three contracts, the replacement of the ventilation system with 8 variable speed drives and new SCADA systems, update to the variable message signing and a £15M design and build scheme to replace all the M&E equipment within the tunnel bore. Systems include; emergency telephone, CCTV, public address, radio rebroadcast both domestic with break-in facilities and emergency services, mobile 'phone communications, incident detection both loop and video based, lane control signs, VMS, EMS, fire detection, fire main, emergency panels, drainage, lighting, UPS and cladding. The systems were designed to comply with the EU directive on tunnel safety and were carried out at night to minimise disruption to the public. Responsible for managing the contractors, design approval, testing, commissioning, TDSCG and liaison with emergency services, maintenance team and local authorities.

Technical Director, Blackwall Tunnel Northbound Refurbishment, BAM Nuttall - Responsible for leading the multi-disciplinary team carrying out the technical checks on the contractor's design prior to submission to Transport for London. This includes all M&E and communications equipment and systems.

Technical Lead M&E / Systems, Silvertown Tunnel, Transport for London - Responsible for the M&E & Systems Engineering aspects of the proposed Silvertown Tunnel under the River Thames in East London. Leading the team developing the Reference Design for DCO.

Technical Director, Rotherhithe Tunnel Radio Communications and Public Address, Transport for London. Responsible for the design of the voice evacuation alarm / public address element of the upgrade and the testing of the radio and PA systems.

CV 4 - [REDACTED]

Tunnel Ventilation & Fire and Life Safety Design Lead

General

[REDACTED] is recognised as a leader in the tunnels community for tunnel ventilation and safety design. He has over 20 years' expert experience in designing and delivering complex tunnel systems. He sits on PIARC Technical committee leading the way to new and improved standards for tunnel systems and is a ITA-COSUF Steering Board Member. He is a member of HE's Tunnel Design Advisory group and is an active contributor to the UK Tunnel Operators Forum.

Education, Qualifications and Experience

[REDACTED] is a Chartered Engineer with a BEng (Hons) degree and a Member of the Institution of Civil Engineers.

Relevant Work Experience spanning major Programmes:

[REDACTED] has successfully delivered a number of key schemes:

- TfL Silvertown Tunnel Reference Design for ventilation and tunnel safety including development of the procurement specifications.
- Colorado DoT, I70 Denver Tunnel Fire and Life Safety design
- Highways England, M25 Tunnel Safety Officer under the EU Directive and Road Tunnel Safety Regulations for the Dartford, Bell Common, Holmesdale and Hatfield Tunnels.
- Baa, Heathrow Technical Lead for tunnel safety aspects of a major tunnel refurbishment project. Lead for the development of risk analysis systems and acceptance criteria, safety system analysis and design of tunnel safety risk mitigation through ventilation, evacuation and fire suppression systems.
- Birmingham City Technical Lead for Tunnel Safety & Ventilation
- Blackwall Tunnel northbound bore technical and operational review
- South Wales Trunk Road Agency. Fire Capacity Study M4 Brynglas Tunnel.

[REDACTED] leads a team of skilled engineers who deliver large projects successfully. [REDACTED] is a Project Director for many of these projects and can deputise for the Project Manager or Project Director as required.

Responsibilities

[REDACTED] will lead the ventilation, fire and life safety design to ensure a robust and comprehensive solution is developed. He will be a key team member to ensure successful delivery of the project and meeting the key objectives for Stage 2.

Other Selected Project Experience:

NORTHERN LINE EXTENSION, LUL, LONDON, UK

Principal Engineer

Responsible for the tender design verification of the Tunnel and Public Area Ventilation concepts for this planned 2 station extension of the existing Northern Line south of Kennington Station in London. Atkins are the lead designer for a tendering contractor JV undertaking 1D modelling using the industry standard software computer program Subway Environment Simulation (SES) used in the prediction of conditions within the extension under Normal, Abnormal and Emergency states to the LUL requirements set out their Category 1 Standard and System Requirements Specification for the work.

CDoT, I70 COVERED HIGHWAY

Technical Lead for Ventilation, Fire and Life Safety

Technical Lead for tunnel ventilation and fire life safety system concept development. Assessment of risk-based safety requirements to NFPA 502, development of ventilation concepts for emissions and smoke control.

HEATHROW, BAA

Tunnel ventilation fire & life safety Technical Lead

Scheme Design. Technical Lead for tunnel ventilation and fire suppression system design. Responsible as Safety Concept Guardian for safety aspects of refurbishment for the two Heathrow Road Tunnels; one bi-directional single-bore tunnel and one uni-directional tunnel with four separate traffic bores. Lead for the development of design of tunnel ventilation, CFD analyses, evacuation and fire suppression system specification.

SOUTH WALES Trunk Road Agency

Technical Lead

Technical Lead for a Fire Capacity Study for the M4 Bryn Glas Tunnel. Assessment with CFD techniques of the temperature development in the tunnel and heat transfer to the tunnel lining during fires of different severities. Assessment of structural response and damage prediction.

HIGHWAYS AGENCY, M25

Tunnels Safety Officer

Tunnel Safety Officer under the EU Directive and Road Tunnel Safety Regulations for the Dartford, Bell Common, Holmesdale and Hatfield Tunnels. Responsible to the Administrative Authority for Safety Officer statutory duties.

NORTH WALES Trunk Road Agency

Technical Lead

Technical Lead for an Options Study for the Passive and Active Fire Protection of the Conwy Tunnel linings. Detailed options evaluation for passive systems (board & spray systems) and active systems (deluge and mist suppression systems).

CV 5 – [REDACTED]

BIM & Design Management Lead

General

[REDACTED] has 15 years' experience of leading 3D design and engineering drawing preparation for major projects for earthworks, tunnelling, infrastructure and building projects.

He is the Technical Authority for BIM within Ground Engineering and Member of the AGS Data Management Working Group.

Education, Qualifications and Experience

[REDACTED] qualifications are:

- 3D CAD advanced level (City & Guild)
- DEET European Diploma in Mechanical and Aeronautical Engineering (B.Eng. Aeronautical / Mechanical Engineering)
- BTS Productique Mécanique (HND Mechanical and Manufacturing Engineering)

Relevant Work Experience spanning major Programmes:

[REDACTED] has led the BIM aspects of Atkins key transportation projects including:

- **Silvertown Tunnel Reference Design (TfL):** BIM Manager for the project providing advice and coordinating BIM use on the project.
- **BIM for the Sub-Surface Research project (Innovate UK):** - Research Project with the BGS, Keynetix and Autodesk to improve 3D modelling technics, collaboration of geotechnical data and apply BIM process directly to ground investigation & subsurface infrastructure design
- **MSCF detailed and enabling work (Sellafeld Ltd):** - 3D modelling of proposed utilities and earthworks.
- **STIP 2 Feasibility - River Bridges (TfL):** – Information Manager Responsible for the BIM execution plan, 3D modelling strategy and management of information on the project. This Project is a pioneer project for TfL regarding BIM implementation.
- **Wylfa (Horizon):** Technical advisor for 3D geological model and AGS data specialist Over 1300 Holes with Lab testing results. Developed the 3D model into a 4D model.
- **Structures and Tunnels Investment Portfolio 2 (TfL):** BIM Manager providing advice on BIM approach for the project and ProjectWise support. Production of a draft Common Data Environment (CDE) specification.
- **M6/M54 Toll Link (Highways Agency):** Update and review of AGS Data from various sources.

Responsibilities

██████ will lead the CAD and BIM aspects of the project. He will be a key team member to ensure successful delivery of the project and meeting the key objectives for Stage 2.

Other Selected Project Experience:

East West Rail Phase 1 (Network Rail) - Responsible for the Earthwork modelling and drawing production of infrastructure (extent of approximately 16Km) using Civil 3D. Optimisation of earthworks modelling was achieved by writing project specific modelling routines which made the earthworks model partially automated and more easily interfaced with other design disciplines.

Drawing Office Manager – WS Atkins Bahrain 2011-2013

Ras Al Khair Industrial City Project near Jubail (Royal Commission) - Responsible for the Earthwork modelling and drawing production of infrastructure (extent of approximately 10 x 10 Km) using Civil 3D.

King Abdulaziz International Airport – Load Centres in Jeddah (General Authority of Civil Aviation) - Part of the coordination team doing clash detection and resolution using Civil 3D and NavisWork.

King Abdulaziz International Airport - Tree Nursery in Jeddah (General Authority of Civil Aviation) - Responsible for the supervision of the infrastructure drawing production, 3D modelling and clash detection using Civil 3D and NavisWork.

Dammam 3 (Modon) - Responsible for the supervision of drawing production and earthwork modelling using Civil 3D (extent of approximately 11 x 6 Km).

East Hidd Housing Development (Ministry of Housing) - CAD Manager responsible for earthwork modelling and the creation of CAD Standards and drawing production for multidisciplinary drawings.

AutoCAD Civil 3D user champion for Atkins Middle East.

Drawing Office Manager and Document Control Manager at K'Enyuka (RSV Linked Enterprise – South Africa) 2008-2010 - Responsible for drawings created by over 45 employees in all disciplines including Civil, Structural, Mechanical, Piping, Process and Architectural on various plant projects such as Platinum Concentrator & Smelter, Mineral Sands, Gold and Coal (including modular). He created, implemented and maintained the CAD standards, procedures and an extensive CAD library for the company. He developed / identified utilities in order to standardize, improve efficiency and ease the drawing production. He also implemented two data management systems (Vault (Autodesk) & ProjectWise (Bentley)).

(2007-2008) Seconded CAD Manager to WS Atkins & Partners Overseas, South Africa on the Gautrain project for 18 months - Responsible for a team of 15 CAD Draughtsmen preparing approximately 7000 drawings for Mechanical and Electrical, Civil, Geotechnical, Tunnelling, Structural and Architectural disciplines working on tunnels, shafts, and stations.



The Exchange, 3 New York Street

Manchester

M1 4HN

United Kingdom

Email: 

Telephone: 

