SCHEDULE 4 – WORKS INFORMATION

TRANSPORT FOR LONDON
EVERY JOURNEY MATTERS

WORKS INFORMATION

STIP 2 Westway – Stage 1

Scope of Work for Targeted Investigations (Costain)

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1.0 Introduction

The STIP2 Westway project is currently at Stage 1 of Pathway, led by TfL Tunnels and Structures.

An Independent Assurance and IIPAG Review of the first batch (river bridges) of STIP 2 projects was completed in June 2015. The review panel were keen to understand how prioritisation of all the STIP 2 projects would be carried out. As a result it was decided to bring forward some targeted inspections and testing of key critical components/elements of the Westway, to allow a better understanding of the issues to be determined and a prioritisation exercise undertaken as soon as possible. Submission of an update to SAB on STIP 2 progress was deferred until September 2015 to allow these investigations to be undertaken.

In order to obtain this information, targeted investigations and desk studies are required. The elements been targeted are:

- Waterproofing/deck concrete
- Bearings
- Drainage
- Structural concrete elements
- Structural steel elements
- Half Joints

2.0 Scope of Works

The primary role for Costain is to facilitate the Technical Consultant (WSP/PB) to undertake the targeted investigations.

The scope of works includes:

- Undertake the CDM role of Principle Contractor
- Liaising with the Technical Consultant (WSP/PB) and TfL to confirm locations for targeted investigations (see section 3.0 for testing requirements and locations)
- Organise road space with TfL and the relevant London boroughs to facilitate the targeted investigations
- Liaise with TfL Client to organise access within Westway Trust properties
- Preparation of project plan and method statements. Costain to provide the overall RAMS. WSP/PB will provide RAMS for their elements of work which will then be appended to the overall RAMS.
- Preparation of a programme taking into account existing Westway Conway Aecom block closures (every 3 weeks), Hammersmith Flyover closures, other road space constraints.
- Preparation of cost estimates
- Provide and manage access equipment, as agreed with the Technical Consultant, for the targeted investigations
- Install and remove traffic management
- Dig trial holes on the bridge deck at the agreed locations to allow testing of the waterproofing and deck concrete
- Reinstate the carriageway to the approval of TfL following completion of the concrete deck testing
- Removal/opening of cladding/access hatches/chambers and the like to facilitate inspections and surveys and their subsequent reinstatement following completion of the inspections and surveys (see further details in Appendix A)
- Update of cost estimates, programme and risks in conjunction with WSP/PB.

A full list of responsibilities for the Contractor and Technical Consultant is contained in Appendix A.

All daily, factual and interpretative reports will be provided by the Technical Consultant.

3.0 Targeted Investigations Requirements

3.1 Waterproofing and top of deck inspection/testing Requirements

Recent emergency repairs to areas of the waterproofing/surfacing which had become detached from the deck surface revealed that there were some areas where the deck reinforcement was protruding from the surface of the deck concrete. Concrete condition testing was carried out a number of these areas in Sections 1, 5 and 6 during re-waterproofing works. Factual reports are available on BridgeStation (refer to the Concrete Condition Investigation carried out in 2014 by Nichols Colton B14/FMC/002 Reports 1, 2, 3, 4 & 6 contained in reports 60289076-M059-TEC-001, 002, 003, 004, 005 & 007).

Further trial holes are to be excavated on the bridge deck to facilitate inspection of the waterproofing and the inspection and testing of the top surface of the deck slab. The following locations have been identified:

- Section 1/Wood Lane Flyover – Spans 42 to 45, westbound, lane 1 (min of 1 trial hole, preferably 2 depending on access constraints)
- Section 4 – 2 locations as follows (1No. in each):
    - Between spans 57 to 62 on eastbound lane 1
    - Between spans 74 to 77 on eastbound lane 1
- Section 5 – Span 116 on eastbound lane 1
- Section 6W – None
- Section 6E - None
- Marylebone Flyover – 2No. trial holes. The location can be either on the EB or WB determined by ease of access.

The concrete testing shall include:

- Cover meter survey
- Half cell potential survey
- Chloride sampling
- Carbonation depth readings
- Record of any cracking or breakup of the concrete surface
- Record of any exposed reinforcement and its condition.

A factual and interpretive report shall be provided. The interpretative report shall provide an estimate on the likelihood and quantity of concrete repairs that may be required based on the findings of the factual report and the Concrete Condition Investigation carried out in 2014 by Nichols Colton B14/FMC/002 Report 1, 2, 3, 4 and 6. The interpretative report will confirm the extent/severity score which will be used to update BridgeStation.

3.2 Bearing Survey Requirements

A comprehensive inspection of the Westway bearing was carried out by Amey in 2011 (see report no. CO10CS0051/01 - A40 Westway Joint and Bearing Special Inspection). The majority of the bearings were inspected at the time but

a number were not due to access restrictions. It is proposed to carry out special inspections on the following bearings:

- Section 1/Wood Lane Flyover – None
- Section 4 – Where possible, all bearings within the vacant units below are to be inspected. It is not proposed to remove any fittings within these premises to undertake surveys. Individual roof tiles will be removed and replaced as necessary to facilitate visual inspections.
    - Office 1, 1 Thorpe Close
    - Office 3, 9 Thorpe Close

  WSP/PB and Costain are to liaise with TfL Client to arrange access.
- Section 5 – None
- Section 6W – No.'s 183N, 183S and 2 of No.'s 174N, 174S, 175N and 175S
- Section 6E - No.'s 184N, 184S, 200S and 201S
- Marylebone Flyover – No.'s 1, 2, 7 and 8 in the abutments.

The bearing survey will comprise

- a review of existing bearing reports
- a detailed touching distance inspection of the bearings,
- identification of potential maintenance work,

The bearing inspection is to be carried out to determine the condition and serviceability of the bearings, and to ascertain the integrity and residual service life of the bearings.

The general items of the inspection should include but not limited to:

- Preparation of a works methodology and risk assessment for the bearing inspection.
- Attendance at a site induction.
- A touching distance inspection of the bearings identified above.
- Completion of Bearing Inspection proforma in Appendix B, including photos.
- Production of survey sketches showing the location, type, and articulation arrangement of each bearing.
- Identify whether there is provision for future bearing replacement.

Reporting - Deliverables:
A daily site report shall be produced and issued to TfL in order to allow the Surface Board paper to be produced. The daily site report shall contain the following items:

1. A brief description on the condition of the bearing(s) inspected noting location and including relevant photos..
2. An overall extent/severity score for each bearing inspected.
3. An initial judgement on the expected residual life of each bearing using the following categorisation: replaced or refurbished in the short (2-3 years), medium (5-10 years) and long term (10 years +)

The final deliverable for the bearing inspection shall be a summary report scheduling the findings of the inspection undertaken in accordance with the above. The report is to contain the following information:

1. A clearly labelled / referenced photographic record of each bearing as evidence of the bearings condition at time of the inspection.
2. Completed Bearing Inspection proforma (see Appendix B)
3. Updated Bearing Inspection Data spreadsheet (see Appendix B of report no. CO10CS0051/01 - A40 Westway Joint and Bearing Special Inspection).
4. Summary sketches showing the location of each type of bearing, the location of defective or life expired bearings, and the location of those bearings coming to the end of their serviceable life.
5. Any available historical specifications, drawings and records of the bearings currently present within the structure.
6. A summary table showing an estimated residual serviceable life of each bearing to enable identification of which bearings will require replacement in the near future.
7. Recommendations to which bearings are to be replaced or refurbished in the short (2-3 years), medium (5-10 years) and long term (10 years +) to enable TfL to develop a scheme for the bearing replacement.
8. Cost estimates for any replacement bearings.

The report is to be provided in electronic format only by both e-mail and 2 no. CD copies by post. The completed report is to be provided in adobe.pdf format and Microsoft office format, photographs are to be provided as high resolution .jpg or .tiff file types, and sketches / historical records are to be provided in adobe.pdf format.

Exclusions:

- Hard copies of the completed inspection report need not be provided, only electronic versions are required
- Any quantitative assessment of the bearings, the scope of works is limited to inspection works only.

3.3 Drainage Desktop Study Requirements

There are known issues with the drainage system over the Westway being blocked leading to flooding on the carriageway during heavy rainfalls.

A desk top study is to be undertaken by the Technical Consultant to determine:

- the condition of the drainage system
- the capacity of the drainage system
- whether the system can be repaired or needs replacing
- state the current flood/storm risk event for which the Westway should be capable of dealing with (e.g. a 1 in 100 year flood/storm) and determine if there is adequate provision in the system to meet this requirement
- state if there is provision for a future increase in capacity of the system.

3.4 Inspection and testing requirements for structural concrete elements

The inspection and testing work is to be carried out by a Specialist to determine the current condition of the structural concrete elements. It is proposed to carry out special inspections at the following locations:

- Section 1/Wood Lane Flyover – None
- Section 4 – as follows:
    - Crossheads at supports 117 and 128
    - Undertake visual inspection of supports within the following vacant Westway Trust premises.
        - Office 1, 1 Thorpe Close
        - Office 3, 9 Thorpe Close

  WSP/PB and Costain are to liaise with TfL Client to arrange access.
- Section 5 – None
- Section 6W – None
- Section 6E – None
- Marylebone Flyover – None

Testing:
A summary of the concrete testing requirements is scheduled below:

1. A cover meter survey is to be undertaken to verify the cover to reinforcement present at accessible locations along the structure.
2. Half cell potential surveys at key locations on the structure are to coincide with dust sample locations. It should be noted that where impregnated with silane, half cell potential surveys at these locations may require adjustment to any test readings.
3. Extraction of dust samples from key locations on the structure to determine the chloride ion content. Testing will concentrate on elements located within the splash zone (either directly or through run-off from faulty drainage above) or which are subjected to high concentrations of air-borne chlorides.
4. Carbonation testing using phenolphthalein indicator liquid at spalled and key locations to identify whether the concrete cover has ceased to be effective.
5. Delamination (hammer tap) survey of all accessible parts of the structure to determine the extent of loose / spalled / de-laminated sections of the structure. Special attention should be paid when testing soffit areas in order to ensure that the extent of loose / spalled / de-laminated areas are properly identified and tested.
6. Concrete breakouts to confirm condition of reinforcement
7. Record of any cracking or breakup of the concrete surface
8. Record of any exposed reinforcement and its condition.

Reporting - Deliverables:
Daily site reports will be issued to TfL as per section 3.1. The findings of the site surveys shall be presented in a summary report, the report is to include the following information:

Cover meter survey results

- A series of summary sketches showing the range of covers recorded for each accessible structural element to demonstrate the range of covers present within the structure.
- Statements recording the methodology utilised for the cover meter survey, equipment specifications and test certificates to demonstrate the equipment used has undergone recent calibration checks (where available).

Delamination / Hammer-Tap Survey

- A series of summary sketches showing the extent and position of any delaminating surfaces identified during the hammer-tap survey. The sketches are additionally to record the position, nature and size of any spalled concrete removed from the structure.

Dust sample testing

- A series of summary sketches showing the location, diameter and depths of holes formed to recover concrete dust samples. The sketch is to additionally record the number of samples recovered from each hole and the depths at which each sample was recovered.
- A summary of the laboratory test results for each dust sample. The summary should additionally record whether the chloride concentration by mass of cement is deemed to be low / moderate / high as applicable.
- A schedule of which laboratories was used to undertake the dust sample testing in the event that a single laboratory was not used to undertake all tests.
- Copies of the laboratory testing results for each of the dust samples recovered.
- Copies of the NAMAS accreditation for any testing laboratories used.

Half-cell resistivity testing

- Plots of half-cell potential results for each test panel identified. The plots are to identify the key site measurements taken and whether corrosion activity is low / intermediate / high / severe.
- A summary sketch showing the location and extent of any concrete breakout (to expose reinforcement) undertaken to complete the half-cell resistivity testing.
- Statements on whether the test results incorporate adjustment for the presence of iso-butyl silane where identified on site.

Carbonation testing

- A summary sketch showing the location and extent of any concrete breakout undertaken to complete carbonation testing using phenolphthalein indicator liquid.
- A summary table indicating the depth of carbonation recorded at site compared to the anticipated rate of carbonation calculated below:
  Anticipated depth of carbonation (mm) $= (\text{Age of concrete in years})^{0.5}$
  $= (2015 - 1969)0.5$

= 6.78, say 7mm

- A photographic record of each carbonation test undertaken.

An interpretative report shall also be provided. The interpretative report shall include recommendations over which areas of the structure should be refurbished providing an indication of programme and cost. It should provide an estimate of area and specification for concrete repairs that will be required.

3.5 Inspection and testing requirements for structural steel elements

The inspection and testing work is to be carried out by a Specialist to determine the current condition of the steel portals/bents in Section 6. The tests will include:

- paint condition surveys – visual inspection and three paint samples for laboratory testing
- investigate if water is trapped within the legs of the portals/bents

The investigations shall be undertaken on the portals/bents at the same locations where the bearing surveys are to be undertaken as follows:

- Section 6W – Bent 183 and 1 of No.'s 174 or 175
- Section 6E - Bents 184, 200 and 201

An interpretative report shall be provided highlighting their condition, maintenance requirements and will ascertain their residual service life.

3.6 Investigation, testing and assessment of concrete half joints

As-built drawings (dwg 6401-6-6562) show the presence of half joints in span 141 over the canal in Section 6E. The "A40 Westway Asset Management Strategy" Rev1 by Amey (2013) notes that the current condition is unknown.

A visual inspection within touching distance of the half joints is to be carried out to determine its current condition. To comply with the first activities of the IAN 53/04 concrete half-joint strategy the Technical Consultant will also undertake a qualitative risk assessment, assign a priority score and report this in a brief Half-Joint Special Inspection Report.