National Asset Delivery
Technical Surveys and Testing

Works Information for
M5 J11 A40 EB Onslip
Ground Investigation

CONTENTS AMENDMENT SHEET

Amend. No.	Revision No.	Amendments	Initials	Date
0	0	Original version issued with tender	ET	28/08/19

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LIST OF ANNEXES

1 DESCRIPTION OF THE WORKS

1.1 Project objectives

1.1.1 The principle objective of this project is to undertake intrusive ground investigation as stated in drawings HE570127C-KIER-HGT-M5_J11_A40-DR-CE-0600_01 and HE570127C-KIER-HGT-M5_J11_A40-DR-CE-0600_02 and to provide a subsequent factual report including AGS data in accordance with the requirements detailed in the specification.

1.1.2 The specification that applies to the *works* is included in Section 6

1.2 Scope of works

1.2.1 The *works* to be provided under this contract are:

(1) Intrusive investigation is proposed to provide information for design of repairs to geotechnical defects including the nature and strength of the embankment fill & underlying natural ground.

(2) The scope of the investigation comprises percussion boreholes (BH), dynamic (windowless) sampler holes (WLS), dynamic probes (DP) and hand dug inspection trenches (IT) to positively identify underground services and NRTS cables. Borehole installations include remotely read inclinometers and remotely read vibrating wire piezometers.

(3) Samples of soil shall be taken from the inspection pits for environmental tests. In the event contaminated ground is suspected or identified below the base of the inspection pits further samples shall be obtained.

(4) Testing will include in situ testing (SPT) and laboratory geotechnical, chemical and environmental tests. If bedrock is encountered the boreholes shall prove 100mm of rock.

(5) Full details are given in Schedule 2 and the drawings listed in Section 1.1.1.

(6) The works will be undertaken during traffic management.

1.3 Deliverables

1.3.1 The *Contractor* is required to produce the following deliverables:

(1) The factual section of the ground investigation report and AGS data, to include full details of the site works undertaken (the number, type and termination depths of all exploratory holes), the results of in situ

and laboratory tests, laboratory testing restrictions, exploratory hole records, drillers daily records and drawings showing the site location and exploratory hole locations.

(2) The exploratory hole locations given in Schedule 2 are provisional and the locations may be adjusted by +/-5m to avoid constraints imposed by utilities and other infrastructure. Locations may be further adjusted if necessary, subject to seeking the approval of the Investigation Supervisor.

(3) Drillers daily records to be submitted within 24 hours of completion of each exploratory hole, from which the Investigation Supervisor will schedule testing based on the daily records.

(4) The Investigation Supervisor has provided a testing philosophy and required tests in Schedule 2.

(5) The Contractor shall select suitable core sub samples and prepare a blank schedule of all samples recovered.

(6) The draft factual report including draft AGS data to be submitted to the Investigation Supervisor for review within six weeks of completion of the site works.

(7) The final factual report and AGS data to be submitted to the Investigation Supervisor within two weeks of receipt of comments on the draft report.

(8) During the period of the site operations, the elevation of the ground at each as-built exploratory hole, related to Ordnance Datum, shall be established to the nearest 0.05 m.

2 EXISTING INFORMATION

2.1.1 The Drawings listed below apply to this contract. Refer to the site information for details of existing site conditions including ground conditions, limitation on access, position of existing structures etc.

Drawing Number	Title	Revision / Date
HE570127C-KIER-HGT-M5_J11_A40-DR-CE-0600_01	Exploratory hole location plan, Sheet 1 of 2	C2 07/08/19
HE570127C-KIER-HGT-M5_J11_A40-DR-CE-0600_02	Exploratory hole location plan, Sheet 2 of 2	C1 19/06/19
HE570127C-KIER-HGT-M5_J11_A40-DR-CE-0600_05	Vegetation clearance	C1 19/06/19

3 CONSTRAINTS ON HOW THE CONTRACTOR PROVIDES THE WORKS

3.1 General

3.1.1 The *Contractor* Provides the Works in such manner as to minimise the risk of damage or disturbance to or destruction of third party property.

3.1.2 The *Contractor* complies with the constraints and meets with the requirements outlined in Appendix 1.

3.1.3 The *Contractor* submits information detailing how the *Contractor* will provide the Works to the *Employer* prior to the *works* commencing. This information will include any lifting plans, risk assessments, method statements, the *Contractor's* staff training information and any other relevant Health and Safety requirements.

3.2 Working hours & site specific constraints

3.2.1 The *Contractor's* working hours for site works shall be dependant upon traffic management constraints, but for tender price comparison purposes are assumed to be night working (20:00-06:00)

3.2.2 No site specific constraints on working methods and or conduct of the work apply to this contract.

3.2.3 The TM Provider will arrange for TM to be provided and will also arrange any necessary vegetation clearance and (temporary) removal of the VRS barriers for access. The requirements and instructions of the Traffic Safety Control Officer (TSCO) shall be complied with at all times.

3.2.4 All vehicles used on site shall comply with Chapter 8 marking requirements, which as a minimum comprises high visibility chevrons on the rear, high visibility side stripes and double amber flashing beacons.

3.3 Health, Safety and Environment & Risk Management

Health and Safety requirements

3.3.1 In Providing the Works the *Contractor* meets the requirements of Annex 2 of the supplementary constraints relation to health and safety duties.

3.3.2 The *Contractor* shall comply with the requirements of Highways England's safety passport scheme and ensure that all of his employees, and any of his subcontractor's, are registered in accordance with the implementation of the scheme. Details on the scheme can be found here: http://www.highwayssafetyhub.com/safety-passport.html

3.3.3 For details of the CDM duty holders, refer to the pre-construction information which can be found here FRM-04c-Pre-construction Information Pack (CDM 2015)_M5 J11 A40 EB Onslip.

3.3.4 Before commencing the construction phase of the *works*, the *Contractor* confirms to the *Employer* that adequate welfare facilities are in place. Where the facilities detailed in section 5 are not deemed adequate, the *Contractor* provides all necessary facilities to Provide the Works and to comply with the minimum requirements set out in HSE guidance document L153.

Environmental requirements

3.3.5 In Providing the Works the *Contractor* meets the requirements of Annex 2 of the supplementary constraints in relation to environmental duties.

Risk Management

3.3.6 The *Contractor* identifies, manages and mitigates risks in accordance with the principles of ISO31000.

3.3.7 The *Contractor* submits a risk register, which captures all risks associated with the delivery of the *works* including those identified by the *Employer*, with his tender and maintains it for the contract period. The risk register can be found here SHEMS-FOR-HIG-094 Designers Hazard Checklist and Risk Reduction Schedule_M5 J11 A40 EB Onslip.

4 REQUIREMENTS FOR THE PROGRAMME

4.1.1 The *Contractor* submits programme to the *Employer* with his tender.

4.1.2 The *Contractor* Provides the Works taking into account the following programme constraints:

(i) the *starting date* and *completion date* and any post site works, reporting and review period

(ii) The services and other things provided by *Employer* (see Section 5)

(iii) The site works shall be completed within the timeframe of the TM, to be advised, for which an allowance of 6 shifts has been assumed. The draft factual report and AGS data to be issued for review within 6 weeks of completion of the fieldworks.

(iv) The final factual report and final AGS data to be issued within 2 weeks of receipt of comments on the draft report.

4.1.3 The programme should be in the form of an activity and time related bar chart, produced as a result of a critical path analysis.

4.1.4 The programme should preferably be provided in either a PDF or MS Excel format and cover the full contract period including post site activities. Activities should be clearly defined and named and the programme should detail the following:

(i) dates and times associated with the project, including the *starting date*, *completion date* & *Contractor's* planned completion, and any other dates or times that will specifically impact the delivery of the project
(ii) activities associated with delivering the project

4.1.5 The *Contractor* updates the programme every 2 weeks. The *Contractor* submits an updated programme to the *Employer* upon request.

5 SERVICES AND OTHER THINGS PROVIDED BY THE *EMPLOYER*

5.1.1 The following temporary traffic management will be provided by the *Employer* to allow the *Contractor* to Provide the Works:

(1) The Employer's Traffic Management Provider will arrange for Traffic Management to be provided. The requirements and instructions of the Traffic Safety Control Officer (TSCO) shall be complied with at all times.

(2) At the time of preparation of this Model Works Information, the layout, type and details of the TM are not known. However, an allowance of 6 shifts should be used for pricing.

(3) For ground investigation it is anticipated the TM will be provided by the M&R, for which details will be provided when available.

(4) No welfare facilities are available on the site and the ground investigation contractor must provide mobile facilities.

5.1.2 The other things that will be provided by the *Employer* are as follows:

(1) Not used

6 SPECIFICATION FOR THE WORKS

6.1.1 The *Contractor* shall undertake the works in accordance with:

6.1.2 The UK Specification for Ground Investigation published by ICE Publishing, with information, amendments and additions as described in the following Schedules:

- Schedule 1. Information and site-specific requirements
- Schedule 2. Exploratory holes
- Schedule 3. Investigation Supervisor's facilities
- Schedule 4. Specification amendments
- Schedule 5. Specification additions

6.1.3 S1.2 Investigation Supervisor

- The Investigation Supervisor is Highways England.
- The named person is to be confirmed by Highways England.
- Contact number to be confirmed by Highways England.

6.1.4 S1.3 Description of site

- See Site Information.

6.1.5 S1.4 Main works proposed and purpose of this contract

- See Section 1.2.

6.1.6 S1.5 Scope of investigation

- See Sections 1.2, 1.3 and Schedule 2.

6.1.7 S1.6 Geology and ground conditions

- See Site Information.

6.1.8 S1.7 Schedule of drawing(s) and documents

- See Section 2.1.1.

6.1.9 S1.8 General Requirements (Specification Section 3) Particular restrictions/relaxations

- S1.8.1 Quality management system (Clause 3.3)
- Quality management to BS EN ISO 9001, BS EN ISO 14001 and BS OHSAS 18001 required.
- Records to demonstrate compliance shall be made available to the Investigation Supervisor on request.
- S1.8.2 Professional Attendance (Clause 3.5.2)
- The Contractor shall provide a ground engineer to provide full-time supervision of all site activities. Such engineer shall have not less than 12 months experience of or have supervised at least 3 similar or larger investigations.
- The Contractor shall detail in their tender the number, names and experience details of his proposed staff.
- S1.8.3 Provision of ground practitioners and other personnel (Clauses 3.6.1 & 3.6.2)
- No other personnel (see Specification Cl 3.6.2) are required during the course of the site operations.

6.1.10 S1.8.4 Hazardous ground, land affected by contamination and notifiable invasive weeds (Clauses 3.7.1 & 3.22)

- An asbestos action plan and an Initial Asbestos Report (Type 2 Survey, Report reference number: 1491098) were undertaken in 2010, which reported no asbestos containing materials (ACMs) on site.
- Whilst no ACMs have been recorded on site, in the event ACMs are encountered or suspected, all activities should cease until an assessment of the material can be made.
- Whilst hazardous ground, ground contamination and invasive weeds are not anticipated this will be confirmed by the site walkover survey, to be undertaken and the findings notified to all parties.
- The site is classified as “GREEN” in accordance with the Guidance for Safe Investigation of Potentially Contaminated Land, Part 4.

6.1.11 S1.8.5 Additional information on services not shown on Contract drawings (Clause 3.7.2)

- The Statutory Undertakers information has been combined into the exploratory hole location plan.
- Site drainage includes highways drainage near the defects. The HADDMS drainage inventory indicates the carriageway surface water drainage is by kerb and gully systems. The full extent of the carrier pipework is not recorded.

6.1.12 S1.8.6 Known/suspected mine workings, mineral extractions etc. (Clause 3.7.3)

- None.

6.1.13 S1.8.7 Protected species (Clause 3.7.4)

- See M5 Junction 11 A40 Eastbound Onslip Ecological Walkover Report.
- The wooded area is considered suitable for nesting birds. There was evidence of a mammal path along the length of the wooded area, however no further signs of badger were found. Although suitable for badger, badger presence is considered to be a lower risk due to the works being isolated to the splitter island. No other signs of species were found at the time of the walkover.
- There are no trees present that are considered suitable for roosting bats.
- The verge at this location is considered to have low suitability for other protected species.

6.1.14 S1.8.8 Archaeological remains (Clause 3.7.5)

- None.

6.1.15 S1.8.9 Security of site (Clause 3.11)

- Security of the site works is the responsibility of the Contractor. Fences or gates that are taken down for access shall be kept closed and/or secured during the works. Fences and gates shall be restored to their original condition on completion of the works.

6.1.16 S1.8.10 Traffic management measures (Clause 3.12)

- The TM Provider will arrange for TM to be provided and if required (see the Site Information document), will also arrange any necessary vegetation clearance and (temporary) removal of the VRS barriers for access. The requirements and instructions of the Traffic Safety Control Officer (TSCO) shall be complied with at all times.
- All vehicles used on site shall comply with Chapter 8 marking requirements, which as a minimum comprises high visibility chevrons on the rear, high visibility side stripes and double amber flashing beacons.

6.1.17 S1.8.11 Restricted working hours (Clause 3.13)

- The works to be carried out under TM for which the working window is dependent on TM restrictions - to be advised. The Contractor shall make allowances for working time restrictions in estimating the works.

6.1.18 S1.8.12 Trainee site operatives (Clause 3.14.1)

- Trainee operatives are permitted, providing this does not compromise delivery of the works. Trainee operatives in boring and drilling shall be under the direct supervision on site of a Lead Driller.

6.1.19 S1.8.13 Contamination avoidance and/or aquifer protection measures required (Clauses 3.15.2 and 3.15.3)

- Measures shall be implemented to prevent the spread of contaminated soils and water arising from the investigation. In particular, contaminated water, silt and grout shall not be allowed to enter the drainage network, surface water courses and carriageway foundation layers.
- Contaminated and non-contaminated samples and arisings shall be stored separately.

6.1.20 S1.8.14 Maximum period for boring, pitting or trenching through hard material, hard stratum or obstruction (Clauses 2.8, 4.3 and 6.4)

- The maximum period for progressing through hard material before seeking instruction is 1 hour.

6.1.21 S1.8.15 Reinstatement requirements (Clause 3.16)

- The exploratory holes are in the grass verge and embankment and can be reinstated with the turf or topsoil.
- In the event holes are moved to the hard shoulder they shall be reinstated with either a 600mm plug of cold-lay asphalt or 400mm of concrete plus 200mm surface of cold-lay asphalt, or a grade A cast iron instrument cover concreted and flush with the ground.
- Fences or gates taken down shall be reinstated "like-for-like".

6.1.22 S1.8.16 Hygiene facilities required (Clauses 2.20 and 3.16.1)

- The nearest depot to the site is Bamfurlong Depot, opposite the site off M5 J11/A40 GL51 6SU.

6.1.23 S1.8.17 Unavoidable damage to be reinstated by Contractor (Clause 3.16.1)

- Not required.

6.1.24 S1.8.18 Accuracy of exploratory hole locations (Clauses 3.19 and 3.20)

- The exploratory hole locations given in Schedule 2 are provisional and the locations may be adjusted by +/-5m to avoid constraints imposed by utilities and other infrastructure. Locations may be further adjusted if necessary, subject to seeking the approval of the Investigation Supervisor.
- During the period of the site operations, the elevation of the ground at each as-built exploratory hole related to Ordnance Datum shall be established to the nearest 0.05 m.

6.1.25 S1.8.19 Photography requirements (Clause 3.25)

- Sufficient photographs shall be taken to show the condition of the working areas prior to the start of investigation works with an analogous set of photographs taken on completion of the investigation.
- All cores arising from boreholes shall be photographed before sampling. Colour photographs shall be taken and supplied by the Contractor. Each photograph shall clearly show all necessary details and contain a graduated scale which shall be the same in every photograph of a particular type.
- A standard colour chart and monochrome step wedge shall also be included in each photograph.

6.1.26 S1.8.20 Access

- Access to the site is off the A40 Eastbound onslip. Traffic management will be provided.
- The Contractor will be required to provide mobile welfare facilities including provision of hot water, washing facilities and a dry refuge area.

6.1.27 S1.8.21 Induction

- All the Contractors' staff shall have received the Highways England Southwest DSC induction before working on the network.

6.1.28 S1.9 Percussion boring (Specification Section 4) Particular restrictions/relaxations

- S1.9.1 Permitted methods and restrictions (Clauses 4.1 to 4.4)
- The Contractor may propose any method of drilling, providing that it can obtain class 1 and 2 samples that in turn can be tested to obtain the required geotechnical data and a method that permits the required in situ testing.
- For access to earthworks the Contractor may choose one of the following options, or an agreed alternative, to progress boreholes on earthwork slopes:
  - Option A Slope Climbing Rig;
  - Option B Scaffold and Cable Percussion / Rotary Rig;
  - Option C Rotary drilling equipment mounted on a tracked or wheeled drilling boom;

- Hand held equipment where small diameter or shallow holes are required.

- Water shall not generally be used to assist advancement of the borehole through clay strata as it affects the consistency of the samples.

6.1.29 S1.9.2 Backfilling (Clause 4.5)

- Boreholes shall be backfilled with bentonite / cement grout, except where instruments are to be installed.

6.1.30 S1.9.3 Dynamic sampling (Clause 4.6)

- See Schedule 2 for the nominal target depths for dynamic (windowless) sampler holes, but it is acknowledged that bedrock may result in refusal at shallower depth.
- The rig shall be capable of facilitating the recovery, inter alia, of 102mm diameter thin wall undisturbed samples (UT100) and the performance of Standard Penetration Tests.

6.1.31 S1.10 Rotary drilling (Specification Section 5) Particular restrictions/relaxations

- S1.10.1 Augering requirements and restrictions (Clauses 5.1) - Not required.
- S1.10.2 Particular rotary drilling techniques (Clause 5.2) - Not currently required but if this method of investigation is chosen the rotary cored drilling techniques are to achieve the borehole termination depths given in Schedule 2.

6.1.32 S1.10.3 Drilling fluid type and collection (Clause 5.3)

- Not currently required but if this method of investigation is chosen, the Contractor to advise the flush proposed to maximize the quality of core recovered.

6.1.33 S1.10.4 Rotary core drilling equipment and core diameter (Clauses 5.4.1 and 5.4.2)

- Not currently required but if this method of investigation is chosen, triple tube core barrels shall be used. The Contractor may propose wireline or sonic drilling methods, which may be considered as an alternative if these are likely to improve sample recovery, see S1.10.11.
- Core shall be an absolute minimum diameter of 76mm.

6.1.34 S1.10.5 Core logging (Clause 5.4.6)

- Logging of the exploratory holes shall include assessment of the weathering grade in accordance with Table 13 of BS EN ISO 14689-1:2003 Geotechnical investigation and testing - Identification and classification of rock.
- Core logging on site is not required.

6.1.35 S1.10.6 Core sub-samples for laboratory testing (Clause 5.4.7)

- Class 1 subsamples are required for laboratory testing and are to be taken after core preparation during core logging, within one week of core retrieval.

6.1.36 S1.10.7 Address for delivery of selected cores (Clauses 5.4.8 and 5.4.9)

- Not used.

6.1.37 S1.10.8 Rotary open hole drilling general requirements (Clause 5.5.1)

- Not required.

6.1.38 S1.10.9 Rotary open hole drilling for locating mineral seams, mine workings etc. (Clause 5.5.2)

- Not required.

6.1.39 S1.10.10 Open-hole resonance (sonic) drilling (Clause 5.6.1)

- Not currently required, see S1.10.11.

6.1.40 S1.10.11 Resonance (sonic) drilling with sampling or continuous coring (Clause 5.6.2)

- Not currently required but the contractor may propose this technique if likely to improve sample recovery or drilling progress. However, the sonic drilling shall not affect the natural water content of the soil / rock samples or the quality of the samples for chemical / environmental tests.

6.1.41 S1.10.12 Backfilling (Clause 5.7)

- Holes shall be backfilled with bentonite / cement grout to the underside of any specified instrument, see Schedule 2.

6.1.42 S1.10.13 Core photographic requirements (Clause 5.8)

- If coring is proposed, prior to photography, labelling of the core is to be added to show where it has, or may have been affected by SPTs or core loss.

6.1.43 S1.11 Pitting and trenching (Specification Section 6) Particular restrictions/relaxations

- S1.11.1 Indirect detection of buried services and inspection pits (Clauses 3.8.3 and 6.1)
- All exploratory hole positions shall be scanned using CAT and/or GPR prior to excavation. In addition, an inspection pit to a depth of 1.2m below existing ground level is required at each exploratory hole position, to confirm the absence of services. If the presence of services means that a safe location cannot be found, the inspection pit should be extended laterally as a slit trench until a safe location can be found. Such shall be paid for in 1m horizontal increments as a new inspection pit.
- Inspection trenches are required to positively locate services and NRTS cables, see Schedule 2.

6.1.44 S1.11.2 Restrictions on plant or pitting/trenching methods (Clauses 6.2 and 6.3)

- Excavation is to be carried out as described in the ICE Specification for Ground Investigation, Note for Guidance 6.2.
- Topsoil is to be stockpiled separately from other excavation arisings.

6.1.45 S1.11.3 Entry of personnel (Clause 6.5)

- No person should enter any excavation without assessing the risks and consequences of collapse of the excavation and implementing appropriate measures to ensure stability.

6.1.46 S1.11.4 Alternative pit and trench dimensions (Clause 6.7)

- Inspection pits and inspection trenches shall be of sufficient dimensions to enable them to achieve their target depths as given in Schedule 2.

6.1.47 S1.11.5 Abstracted groundwater from land affected by contamination (Clause 6.9.2)

- No contamination expected.

6.1.48 S1.11.6 Backfilling (Clause 6.10)

- Excavation arisings to be placed in layers not more than 0.3m thick (measured on loose arisings) and compacted. Bedrock arisings shall be placed at the base of the pit.
- All trial pits shall be backfilled on the same day as they are excavated.

6.1.49 S1.11.7 Photographic requirements (Clause 6.12)

- All inspection pits and trenches to be photographed to show a general view of the pit and excavation arisings plus separate views of each excavated face.

6.1.50 S1.11.8 Artificial lighting (Clause 6.12.2)

- If natural daylight is insufficient, artificial lighting to be used to give clear views of all strata exposed in the trial pits.

6.1.51 S1.11.9 Provision of pitting equipment and crew for Investigation Supervisor's use (Clause 6.13)

- Not required.

6.1.52 S1.12 Sampling and monitoring during intrusive investigation (Specification Section 7) Particular restrictions / relaxations

- None.

6.1.53 S1.12.1 Address for delivery of selected geotechnical samples (Clause 7.6.1)

- Not used.

6.1.54 S1.12.2 Retention and disposal of geotechnical samples (Clause 7.6.2)

- No special requirements.

6.1.55 S1.12.3 Frequency of sampling for geotechnical purposes (Clause 7.6.3 to 7.6.11)

- See Schedule 2.
- Samples of groundwater to be taken at each groundwater strike.

6.1.56 S1.12.4 Open-tube and piston sample diameters (Clause 7.6.5)

- 100mm diameter samples to be taken using thin-wall sampler type UT100 (OS-T/W), unless cobbles or stiffness of clay prevent.

6.1.57 S1.12.5 Retention of cutting shoe samples (Clause 7.6.5)

- Cutting shoe samples to be retained for laboratory testing and logging.

6.1.58 S1.12.6 Delft and Mostap sampling (Clause 7.6.12)

- Not used.

6.1.59 S1.12.7 Groundwater level measurements during exploratory hole construction (Clause 7.7)

- Groundwater strikes shall be monitored for a maximum of 20 minutes, or until equilibrium conditions are achieved, at 5-minute intervals. The date, time, hole depth and casing depth shall be recorded.

6.1.60 S1.12.8 Special geotechnical sampling (Clause 7.8)

- Not used.

6.1.61 S1.12.9 Address for delivery of selected samples (Clause 7.9.2)

- Not used.

6.1.62 S1.12.10 Retention and disposal of contamination/WAC samples (Clause 7.9.3)

- No special requirements.

6.1.63 S1.12.11 Frequency of environmental sampling (Clause 7.9.4)

- In the event contaminated ground is identified or suspected, one environmental sample is to be taken from each inspection pit and preserved for environmental testing. Care shall be taken to avoid accidental contamination with bitumen / asphalt.

6.1.64 Groundwater samples shall be taken from purged standpipes.

6.1.65 S1.12.12 Sampling method (Clause 7.9.5)

- As a minimum, a single environmental soil sample shall comprise the following sub-samples or as specified by the testing laboratory:
  - 1No. 1kg sample in a polythene tub with a snap lid;
  - 1No. 500g sample in an amber glass jar; and
  - 1No. Glass vial with a rubber membrane cap (if volatile organic contaminants are suspected).
- As a minimum, a single purged environmental water sample shall comprise the following sub-samples or as specified by the testing laboratory:

- 1 litre plastic bottle;
- 1 litre amber glass bottle; and
- 2 No. Glass vial with a rubber membrane cap (if volatile organic contaminants suspected).

6.1.66 S1.12.13 Headspace testing (Clause 7.9.8)

- Not required.

6.1.67 S1.13 Probing and cone penetration testing (Specification Section 8) Particular restrictions/relaxations

- S1.13.1 Type(s) and reporting of dynamic probing (Clause 8.1.1 and 8.1.2)
- A DCP or a DPSH shall be carried out alongside selected cable percussion and dynamic (windowless) sampler holes to obtain a density profile as defined in the Site Information document. The size and drop of the weight and dimensions of the cone shall be included in the factual report and AGS file. Where the TRL DCP is used, an equivalent CBR value shall be determined and presented in the report and AGS file.

6.1.68 S1.13.2 Capacity and equipment requirements for cone penetration testing (Clause 8.2.1)

- Not used.

6.1.69 S1.13.3 Reporting of cone penetration testing parameters (Clause 8.2.4)

- Not used.

6.1.70 S1.13.4 Seismic cone equipment requirements (Clause 8.3.1)

- Not used.

S1.13.5 Interpretation of seismic cone tests (Clause 8.3.4)

- Not used.

S1.13.6 Other cone or specialist probes (Clause 8.4)

- Not used.

6.1.71 S1.14 Geophysical testing (Specification Section 9) Particular restrictions/relaxations

- Not used.
- S1.14.1 Geophysical survey objectives (Clause 9.1.1)
- Not used.
- S1.14.2 Requirement for Ground Specialist geophysicist (Clause 9.1.1)
- Not used.
- S1.14.3 Trials of geophysical methods (Clause 9.1.1)
- Not used.
- S1.14.4 Types of geophysics required (Clause 9.1.1)
- Not used.
- S1.14.5 Information provided (Clause 9.2)
- Not used.
- S1.14.6 Horizontal data density (Clause 9.3)

- Not used.
- S1.14.7 Level datum (Clause 9.4)
- Not used.
- S1.14.8 Geophysical survey report (Clause 9.7)
- Not used.

6.1.72 S1.15 In situ testing (Specification Section 10) Particular restrictions/relaxations

- S1.15.1 Tests in accordance with British Standards (Clause 10.3)
- For Standard Penetration Tests, where the tests reach refusal on obstructions/bedrock, the tests may be terminated once 50 blows have been achieved.
- S1.15.2 Hand penetrometer and hand vane for shear strength (Clause 10.4.1)
- Where embankment fill / superficial clays / weathered mudstone are encountered in inspection pits inspection trenches, a hand shear vane test shall be carried out to give a preliminary estimate of undrained shear strength of the soil tested.

6.1.73 S1.15.3 Self-boring pressuremeter and high pressure dilatometer testing and reporting (Clause 10.5.1)

- Not used.

6.1.74 S1.15.4 Driven or push-in pressuremeter testing and reporting requirements (Clause 10.5.2)

- Not used.

6.1.75 S1.15.5 Menard pressuremeter tests (Clause 10.5.3)

- Not used.

6.1.76 S1.15.6 Soil infiltration test (Clause 10.6)

- Not used.

6.1.77 S1.15.7 Special in situ testing and reporting requirements (Clause 10.7)

- Not used.

6.1.78 S1.15.8 Interface probes (Clause 10.8)

- Not used.

6.1.79 S1.15.9 Contamination screening tests (Clause 10.9)

- Not used.

6.1.80 S1.15.10 Metal detection (Clause 10.10)

- Not used.

6.1.81 S1.16 Instrumentation (Section 11) Particular restrictions/relaxations

S1.16.1 Protective covers for installations (Clause 11.2)

- Where instruments are installed in a paved area, lockable grade A steel or cast iron covers to be set in a concrete surround flush with the ground. In verges or fields, a lockable cover standing proud by up to 450mm is required and painted in a high visibility colour to aid identification. Metal covers shall have no sharp edges.

S1.16.2 Protective fencing (Clause 11.3)

- Not required in grassed verge, but the location of each instrumented exploratory hole is to be marked with a secure 1m high wooden post clearly marked with the exploratory hole number.

S1.16.3 Standpipe and standpipe piezometer installations (Clause 11.4.1 and 11.4.2)

- Not required.

6.1.82 S1.16.4 Other piezometer installations (Clause 11.4.3)

- Remotely read piezometers of the vibrating wire type are to be installed, see Schedule 2.
- The response zone shall not cross strata boundaries and the response zone shall extend 0.5m above and below the piezometer tip.
- The data shall be downloaded to a website with the website address, username and password provided in the Factual Report.

S1.16.5 Development of standpipes and standpipe piezometers (Clause 11.4.5)

- Not required.

6.1.83 S1.16.6 Ground gas standpipes (Clause 11.5)

- Not required.

6.1.84 S1.16.7 Inclinometer installations (Clause 11.6)

- See Schedule 2.
- The data shall be downloaded to a website with the website address, username and password provided in the Factual Report.

6.1.85 S1.16.8 Slip indicators (Clause 11.7)

- Not required.

6.1.86 S1.16.9 Extensometers and settlement gauges (Clause 11.8)

- Not required.

6.1.87 S1.16.10 Settlement monuments (Clause 11.9)

- Not required.

6.1.88 S1.16.11 Removal of installations (Clause 11.10)

- Installed instruments shall be removed following completion of the six month monitoring period, upon completion of which the instruments shall be removed and the equipment returned to Kier.

6.1.89 S1.16.12 Other instrumentation (Clause 11.11)

- Not required.

6.1.90 S1.17 Installation monitoring and sampling (Specification Section 12) Particular restrictions/relaxations

S1.17.1 Groundwater level readings in installations (Clause 12.2)

- For automatic installations, readings to be recorded and transmitted 4 times per day for 6 months.

S1.17.2 Groundwater sampling from installations (Clause 12.3.1)

- Not required.

S1.17.3 Purging/micro-purging (Clause 12.3.2)

- No special requirements.

S1.17.4 Ground gas monitoring (Clause 12.4)

- Not required.

S1.17.5 Sampling from ground gas installations (Clause 12.5)

- Not required.

S1.17.6 Other monitoring (Clause 12.8)

- Not required.

S1.17.7 Sampling and testing of surface water bodies (Clause 12.9)

- Not required.

6.1.91 S1.18 Daily records (Specification Section 13) Particular restrictions/relaxations

S1.18.1 Information for daily records (Clause 13.1)

- The dates and times of sampling shall be included.

S1.18.2 Special in situ tests and instrumentation records (Clause 13.4)

- Instrument installation records shall clearly include the hole diameter, installation casing and perforated screen diameter and installed depths, material descriptions and installed depths of the filter(s) and seal(s) and cover arrangements.

6.1.92 S1.19 Geotechnical laboratory testing (Specification Section 14) Particular restrictions/relaxations

S1.19.1 Investigation Supervisor or Contractor to schedule testing (Clause 14.1.1)

- Investigation Supervisor to schedule testing based on the daily records.
- The Investigation Supervisor has provided a testing philosophy and required tests in Schedule 2.
- The Contractor shall select suitable core sub samples and prepare a blank schedule of all samples recovered.

S1.19.2 Tests required (Clause 14.1.2)

- See schedule 2.

6.1.93 S1.19.3 Specifications for tests not covered by BS 1377 and options under BS 1377 (Clauses 14.2.1 and 14.4)

- Where test methods are given in BS EN 17892, those methods shall be used. Otherwise, the methods given in BS1377 shall be used.
- S1.19.4 UKAS accreditation is required (Clause 14.3)

6.1.94 S1.19.5 Rock testing requirements (Clause 14.5)

- Not required.

6.1.95 S1.19.6 Chemical testing for aggressive ground/groundwater for concrete (Clause 14.6)

- Chemical testing suites are as given in the UK Specification for Ground Investigation - Suite D Brownfield with pyrite.

- Test methods for sulfate testing shall be in accordance with the recommendations of TRL report 447.

6.1.96 S1.19.7 Laboratory testing on site (Clause 14.7)

- Not required.

6.1.97 S1.19.8 Special laboratory testing (Clause 14.8)

- Not required.

6.1.98 S1.20 Geoenvironmental laboratory testing (Specification Section 15) Particular restrictions/relaxations

S1.20.1 Investigation Supervisor or Contractor to schedule testing (Clause 15.1)

- Contractor to carry out assessment for waste characterisation.

S1.20.2 Accreditation required (Clause 15.2)

- Contractor to detail the accreditation which can be offered on a test-by-test basis.

6.1.99 S20.3 Chemical testing for contamination (Clause 15.3)

- The Contractor to provide details of the testing laboratories for review. A ten-day turnaround is required.
- The Contractor shall complete the proforma page for Modified Suite E in Schedule 1.20.3, to provide for the case of unforeseen contamination being encountered.

6.1.100 S1.20.4 Waste characterisation (Clause 15.4)

- The Contractor is required to undertake the Hazard Assessment Screen using the HazWasteOnline Toolkit, to establish whether the sampled soils should be considered as inert, hazardous or non-hazardous waste in line with the EA guidance WM3 "Guidance on the classification and assessment of waste".

6.1.101 S1.20.5 Waste Acceptance Criteria testing (Clause 15.5)

- A programme of chemical laboratory testing is required for a range of potential contaminants to allow an initial classification of the materials for waste disposal purposes. The GI Contractor is required to undertake the Hazard Assessment Screen using the HazWasteOnline Toolkit, to establish whether the sampled soils should be considered as inert, hazardous or non-hazardous waste in line with the EA guidance WM3 "Guidance on the classification and assessment of waste", (1st Edition 2015) and WAC classification testing is then to be carried out to confirm or deny suitability for a specific type of landfill site. The contractor is required to notify the employer of the results of the initial screening before undertaking WAC testing and to discuss the suggested number of further tests and the associated costs.
- In the event contaminated ground is identified, the Investigation Supervisor will specify appropriate testing from suites H (inert waste landfill), Suite I (stable non-reactive hazardous waste in non-hazardous landfill) and J (hazardous waste landfill) of the ICE Specification for Ground Investigation. The Contractor is to detail what test methods can be offered.

S1.20.6 Laboratory testing (Clause 15.6)

- Not required.

S1.20.7 Special laboratory testing (Clause 15.7)

- Not required.

6.1.102 S1.19.5 Rock testing requirements (Clause 14.5)

- None.

6.1.103 SCHEDULE 1.20.3 CHEMICAL LABORATORY TESTING FOR CONTAMINATION

- Nominated Test Laboratory - Contractor to specify proposed laboratory
- Required Testing Turnaround Times - 10 days

MODIFIED SUITE E – Soil Samples			
Determinand	**Limit of detection required/offered[1]**	**Test method ~~required~~/offered[1]**	**Accreditation ~~required~~/offered[1]**
Antimony	2mg/kg		
Arsenic	1mg/kg		
Barium	10mg/kg		
[1]Boron			
Cadmium	0.1mg/kg		
Chromium (total)	1mg/kg		
Chromium (Trivalent)	5mg/kg		
Chromium (Hexavalent)	0.5mg/kg		
Copper	0.5mg/kg		
Lead	0.5mg/kg		
Mercury	0.1mg/kg		
[1]Molybdenum			
Nickel	0.5mg/kg		
Selenium	0.2mg/kg		
Zinc	0.5mg/kg		
pH			
[1]Water soluble sulphate (as SO4)			
[1]Organic matter			
Hydrocarbons			
Aliphatic TPH >C5-C6	1mg/kg		
Aliphatic TPH >C6-C8	1mg/kg		
Aliphatic TPH >C8-C10	1mg/kg		
Aliphatic TPH >C10-C12	1mg/kg		
Aliphatic TPH >C12-C16	1mg/kg		
Aliphatic TPH >C16-C21	1mg/kg		
Aliphatic TPH >C21-C35	1mg/kg		
Aliphatic TPH >C35-C44	1mg/kg		
Total Aliphatic Hydrocarbons	5mg/kg		
Aromatic TPH >C5-C7	1mg/kg		
Aromatic TPH >C7-C8	1mg/kg		
Aromatic TPH >C8-C10	1mg/kg		
Aromatic TPH >C10-C12	1mg/kg		

MODIFIED SUITE E – Soil Samples			
Determinand	**Limit of detection required/offered[1]**	**Test method ~~required~~/offered[1]**	**Accreditation ~~required~~/offered[1]**
Aromatic TPH >C12-C16	1mg/kg		
Aromatic TPH >C16-C21	1mg/kg		
Aromatic TPH >C21-C35	1mg/kg		
Aromatic TPH >C35-C44	1mg/kg		
Total Aromatic Hydrocarbons	5mg/kg		
Total Petroleum Hydrocarbons	10mg/kg		
Speciated PAH			
Naphthalene	0.1mg/kg		
Acenaphthylene	0.1mg/kg		
Acenaphthene	0.1mg/kg		
Fluorene	0.1mg/kg		
Phenanthrene	0.1mg/kg		
Anthracene	0.1mg/kg		
Fluoranthene	0.1mg/kg		
Pyrene	0.1mg/kg		
Benzo[a]anthracene	0.1mg/kg		
Chrysene	0.1mg/kg		
Benzo[b]fluoranthene	0.1mg/kg		
Benzo[k]fluoranthene	0.1mg/kg		
Benzo[a]pyrene	0.1mg/kg		
Indeno(1,2,3-c,d)Pyrene	0.1mg/kg		
Dibenz(a,h)Anthracene	0.1mg/kg		
Benzo[g,h,i]perylene	0.1mg/kg		
Total of 16 PAH's	2mg/kg		
Phenols (BTEX)			
Benzene	1µg/kg		
Toluene	1µg/kg		
Ethylbenzene	1µg/kg		
m & p-Xylene	1µg/kg		
o-Xylene	1µg/kg		
Total Phenols	0.3mg/kg		
[1]Cyanide (total)			
Asbestos Type			
Asbestos identification	0.001%		

[1]Contractor to detail what can be offered under each of these categories.

6.2.1 SCHEDULE 2

The actual scope of works is dependent on Traffic Management constraints and the locations below are provisional and subject to access and services.

Exploratory hole reference	Position relative to slope	BH Type	Provisional Depths (m bgl)	Coordinates	Approximate Ground Level (m OD)	Provisional Instrument Types & Depths (m bgl)	Remarks
BH01/19	Crest	Percussion	10.00	E: 389887 N: 221329	39	Remotely read vibrating wire piezometer with tip at 4.00	Located in the eastbound verge of the A40 at embankment crest.
IT01A/19	Crest	Hand dug inspection trench	1.2	E: 389887 N: 221329	39	None	To positively identify underground services and NRTS cables within the verge
DP02/19	Crest	Dynamic Probe	6.00	E: 389882 N: 221328	39	None	Located in the eastbound verge of the A40 at embankment crest.
WLS03/19	Mid	Dynamic (Windowless) Sampler	4.00	E: 389885 N: 221335	37	Remotely read vibrating wire piezometer with tip at 3.00	Located on the mid slope of the embankment in line with the defect.
DP04/19	Mid	Dynamic Probe	4.00	E: 389880 N: 221333	37	None	Located on the mid slope of the embankment in line with the defect.
WLS05/19	Toe	Dynamic (Windowless) Sampler	4.00	E: 389883 N: 221340	35	Remotely read vibrating wire piezometer with tip at 3.00	Located at the toe of the embankment within the verge of the A40 eastbound on slip.
DP06/19	Toe	Dynamic probe	4.00	E: 389878 N: 221339	35	None	Located at the toe of the embankment within the verge of the A40 eastbound on slip.
BH07/19	Crest	Percussion	10.00	E: 389825 N: 221343	39	Remotely read inclinometer to 6.00	Located in the eastbound verge of the A40 at embankment crest.
IT07A/19	Crest	Hand dug inspection trench	1.2	E: 389825 N: 221343	39	None	To positively identify underground services and NRTS cables within the verge
DP08/19	Crest	Dynamic Probe	6.00	E: 389829 N: 221346	39	None	Located in the eastbound verge of the A40 at embankment crest.
WLS09/19	Mid	Dynamic (Windowless) Sampler	4.00	E: 389923 N: 221348	37	None	Located on the mid slope of the embankment
At the crest, the percussion boreholes should prove a minimum 5m of natural ground and be positioned as close to the crest as possible							

A pre start meeting will be held in Brunel House, 930 Hempton Court, Aztec West, Almondsbury, BS32 4SR at least 2 weeks prior to mobilisation to site.

Notes to accompany schedule 2

The following guidance is given regarding the objectives of the investigation and the types and frequency of laboratory testing:

- The percussion boreholes are to be located as close to the crest as possible and are to extend a minimum depth of 5m into natural ground to provide data for design of retaining walls
- Access to the mid slope and toe of the earthwork is required for the dynamic (windowless) sample holes and dynamic probes, hence the

equipment shall either have the ability to climb slopes or be winched up and down the earthwork

- The dynamic probes are required to provide a continuous relative density profile through the earthwork and natural ground
- The inspection trenches will extend from the earthwork crest to the back of the pavement and are required to positively identify underground services and NRTS cables (horizontal and vertical positions) within the crest
- The remotely read instrumentation will be purchased and will include vibrating wire piezometers, in-place biaxial inclinometers, a wireless central gateway and wireless nodes, powered by a solar panel. At the end of the monitoring period the instrumentation will be removed and returned to Kier
- Within fine grained soils, undisturbed UT100 samples to be obtained at provisional 1m centres, if a sample cannot be retrieved an SPT test will be undertaken
- Standard Penetration Tests (SPT) within the percussion and dynamic (windowless) sample boreholes at provisional 1m centres within coarse grained soils
- To support the repair of the pavement (CBR and/or stiffness)
- Design of embankment repair (water content, classification, undrained shear strength [UUT]) consolidated undrained shear strength [CUT])
- Environmental tests are required in accordance with 'WM3 - Guidance on the classification and assessment of waste' - chemical testing

The aspired types and frequency of testing is as follows:

Fine Embankment Fill / Cohesive Superficial Deposits / Weathered Mudstone:

- Water Content - at 1m intervals
- Classification - at 1m intervals
- UUT - at 1m intervals
- CUT - 2 from the embankment fill and 2 from the natural ground
- CBR (soaked with 10kPa surcharge) - 1 per hole at approx. 1-1.5m below carriageway level
- Environmental tests - Modified Suite E - 3 per cluster of boreholes within Engineered Embankment, additional samples to be taken in the event contamination is encountered or suspected - chemical testing suites are based on the UK Specification for Ground Investigation
- pH, Sulphates/ Sulphur (suite D Brownfield with pyrite) - 2 per hole - test methods for sulfate testing shall be in accordance with the recommendations of TRL report 447

Coarse Embankment Fill / Cohesive Superficial Deposits / Weathered Mudstone:

- Water Content - at 1m intervals (only where the driller has not added water)
- Classification - at 1m intervals
- CBR (soaked with 10kPa surcharge) - 1 per hole at approx. 1-1.5m below carriageway level
- Environmental tests - Modified Suite E - 3 per cluster of boreholes within Engineered Embankment, additional samples to be taken in the event contamination is encountered or suspected - chemical testing suites are based on the UK Specification for Ground Investigation
- pH, Sulphates/ Sulphur (suite D Brownfield with pyrite) - 2 per hole - test methods for sulfate testing shall be in accordance with the recommendations of TRL report 447

In producing borehole logs, the ground investigation contractor will be expected to comply with the following:

- All boreholes shall be given the reason for termination. If boreholes terminate on impenetrable bedrock, then a 100mm section, suitably described, shall be added to the borehole log
- Engineered fills shall be described, labelled and given a legend as such and differentiated from uncontrolled made ground
- The British Geological Survey Lexicon strata code shall be applied to each layer, for which the following codes are in use:
    - MBU: Engineered Embankment
    - MGR: Uncontrolled made ground or fill
    - RLS: Rugby Limestone Member

6.3.1 Schedule 3. Investigation Supervisor's Facilities

S3.1 Accommodation

The Contractor’s welfare facilities shall be extended to include for use by the Investigation Supervisor and site visitors.

One of the Contractors staff shall hold a first aid qualification and first aid shall be extended to the Investigation Supervisor and site visitors.

S3.2 Furnishings

Not required.

S3.3 Services

Not required.

S3.4 Equipment

Not required.

S3.5 Transport

Not required.

S3.6 Personal Protective Equipment for Investigation Supervisor

Not required.

6.4.1 Schedule 4. Specification amendments

None.

6.5.1 Schedule 5. Specification additions

None.