Specification

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The specification shall be the *UK Specification for Ground Investigation 2nd Edition* (2012) published by ICE Publishing, with information, amendments and additions as described in the 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

Schedules

SCHEDULE 1: INFORMATION AND SITE SPECIFIC REQUIREMENTS

S1.1 Name of Contract

Yeo Bank Farm Bridge

S1.2 Investigation Supervisor

TBC

S1.3 Description of site

Site Location, Description and Access

Yeo Bank Farm is located on the Somerset Levels approximately 700m east north east of Icelton, Weston- super-mare. The site of the proposed bridge shall cross the River Congresbury Yeo to the south of Yeo Bank Farm at approximate National Grid Reference 338360, 165700. The postcode of the site is BS21 6XH.

Yeo Bank Farm, to the north of the bridge site, comprises a variety of farm buildings and adjacent hardstanding. The River Congresbury Yeo, located south west of the Yeo Bank Farm buildings, is flanked to the north east and south west by grassed flood bunds. No details on the construction of the flood bunds are currently known. There is a drainage ditch running along the toe of the north eastern flood bund, separating the bund from the farm structures. A compacted gravel (hoggin) access track runs along the top of this north eastern flood bund. To the south west of the River Yeo, and the proposed bridge site, is agricultural land.

It is also noted that there is a sluice control system approximately 250m downstream of the site, beyond which the river is tidal.

Access to the north eastern side of the proposed bridge shall be via Yeo Bank Lane and through Yeo Bank Farm. It should be noted that Yeo Bank Lane is in parts single track and bounded to the south by a drainage ditch.

Access to the south western side of the proposed bridge shall be as detailed above and then over the sluice gate and around the agricultural land bounding the River Congresbury Yeo flood bund. Alternatively, access can be made along the unpaved old railway track off of Wick Road, although it is understood that this access is narrow.

The Site has been classified as GREEN as per the BDA Site Designation.

Ground Cover

Ground cover across the site of the proposed bridge is grass, with the exception of the compacted gravel track along the north eastern flood bund and the River through the middle of the site.

Soft ground is likely to be encountered across the site.

Topography and Elevation

The site stradles the River Congresbury Yeo. The water level in the River is approximately 2.89m AOD (Natural Low Channel water level). The maximum recorded level between January 2017 and June 2018 was 5.1m AOD.

The crest of the flood bunds are at approximately 7.8m AOD. The river facing slope of the north eastern flood bund has a gradient of between 1:5 and 1:10 in the upper slope steepening to 1:3 in the lower slope. The river facing slope of the south western bund has a gradient of 1:3 or less. The topography of the site is shown on Drawing Number 674946-CH2-SBR-TUFA-DR-CB-0002 Rev P5 dated June 2018, attached to this Specification.

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

It is understood that the proposed works will consist of construction of a new bridge. At present agricultural vehicles and cattle are crossing the river at the sluice control system on an existing track which is also used by pedestrians and cyclists. The construction of the new bridge will separate the cattle and agricultural vehicles from the public, thus reducing risk to the public.

The current proposed general arrangement for the bridge is shown on Drawing Number 674946-CH2-SBR-TUFA-DR-CB-0002 Rev P5 dated June 2018.

The structure shall be a three span bridge, with a 40 tonne weight limit, founded on piled piers and abutments. The bridge shall comprise a 4m carriageway with 600mm width verges and 500mm width parapets. The maximum height of the approach embankments shall be 2m. The underside of the bridge deck shall be 6.8m AOD allowing for a freeboard of approximately 0.1m during the fluvial 1 in 100yr +CC (30%) event.

The purpose of this contract is to:

1. Confirm the geology and ground conditions: distribution and engineering properties of the geological formations and any artificial ground
2. Determine potential ground aggressiveness with geotechnical testing
3. Undertake in-situ and laboratory geotechnical testing of the soils/rocks to provide sufficient data to determine engineering properties of the underlying strata
4. Undertake environmental testing on selected samples to identify any potential soil or groundwater contamination, and to characterise for disposal.

S1.5 Scope of investigation

It is the Contractors responsibility to supply suitable plant, or platforms, to safely undertake the works detailed within this Specification and shown on the attached drawing.

The Contractor should be aware that the works are adjacent to a watercourse; with some proposed positions on the slopes adjacent to the watercourse.

The site is within a Category 3 Flood Zone and as such is considered to be within a functional floodplain. Tutshill Sluice, just downstream of the site, forms part of the tidal defence which stops tidal surges flowing up the river. It is the Contractors responsibility to manage this risk accordingly.

In addition, a specific method statement to cover those exploratory holes in the floodplain will be required. This method statement needs to cover the following issues:

- Prevention of pollution of the watercourse
- Method to be adopted including spill-kits if considered necessary
- Evacuation plan should flooding occur

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The investigation comprises the following works:

- 4 No. boreholes advanced using a drilling rig capable of both dynamic sampling and rotary coring that can obtain the required samples through possible made ground/fill, superficial deposits and solid geology to depths of approximately30 mbgl. Boreholes shall extend 7.5m in to competent bedrock. Collection of Piston/UT100 undisturbed samples where possible, SPT testing and collection of rock cores.
- Soils to be logged in accordance with BS EN ISO 14688-1:2002+A1:2013 and BS 5930:2015
- Rock to be logged in accordance with BS EN ISO 14689-1:2002, BS 5930:2015 and with consideration of CIRIA C570
- 10 No. Cone Penetration Tests, to refusal, using the Piezocone with 4 No. pore pressure dissipation testing (two on either side of the River)
- Geotechnical laboratory testing on selected samples
- Environmental testing on selected samples
- Provision of AGS data
- Ground Investigation Factual Report (as per 16.8.1)

Specific borehole requirements are detailed further in Schedule 1 and Schedule 2. The propsoed borehole location plan is attached to this Specification.

S1.6 Geology and ground conditions

The following general assessment of the geology of the site and ground conditions has been inferred from the available information. No assurance is given to its accuracy:

- Geology of Britain Viewer, http://mapapps.bgs.ac.uk/geologyofbritain/home.html
- Solid and Drift British Geological Survey: Map Sheet no 264 (Bristol)
- Boreholes from the British Geological Survey GeoIndex: BGS ref ST36NE1, ST36NE2, ST36NE3 and ST36NE7. In addition, ST36NE34, ST36NE35, ST36NE58, ST36NE59, ST36NE60, ST36NE188 and ST36NE189 associated with the M5 corridor approximately 1km south east of the site have also been reviewed.
- Trial pits from the British Geological Survey GeoIndex: ST36NE31.

Published geology indicates that the site is underlain by Tidal Flat Deposits comprising organic rich clay and silt, overlying the Mudstone and Halite-Stone of the Mercia Mudstone Group (MMG).

Made Ground

It is assumed that the flood bunds flanking the River Congresbury Yeo were constructed using site won material, the exact composition and construction of which is unknown.

Superficial deposits

Tidal Flat deposits comprising generally soft to firm silty clay were encountered in all of the historical boreholes in close proximity to the Site. In many of the historical records an interbedded peat stratum was identified from around 3m bgl, with over 2.5m of Peat being recorded. Traces of peat were also logged within the clay layers of the Tidal Flat deposits. Boreholes ST36NE2, ST36NE3 and ST36NE7 encountered a 1.0m thickness of firm clay overlying soft clay, considered likely to represent a desiccated upper layer, as typically seen in alluvial deposits.

Tidal Flat Deposits were encountered, along the M5 corridor, to between -5.8 and -14.8mAOD. Boreholes within 1km of the site did not extend deep enough to prove the base of the superficial deposits.

Bedrock geology

A review of the exploratory holes undertaken along the M5 corridor indicate that the MMG comprises interbedded mudstone with siltstone, generally described as very weak.

Groundwater

It is assumed that groundwater shall be in continuity with the water level within the River Congresbury Yeo.

S1.7 Schedule of drawing(s) and documents

Yeo Bank Farm Bridge General Arrangement Option 2, Drawing Number 674946-CH2-SBR-TUFA-DR-CB-0002 Rev P5, dated June 2018

Yeo Bank Farm Proposed Exploratory Hole Location Plan, Drawing Number 70061747-GEO-001, Dated July 2019

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

In addition to the British and European Standards outlined in the Specification, the work should be undertaken in accordance with the following Standards, current on the date of this specification:

- BS EN 1997-1
- BS EN 1997-2
- BS EN ISO 22475-1
- BS EN ISO 14688-1
- BS EN ISO 14688-2
- BS EN ISO 14689-1
- BS EN 24476-3
  And any associated National Appendices where applicable;
- BRE Digest 365
- BS 1377
- BS 5930
- BS 10175
- CIRIA C570

S1.8.1 Quality management system (Clause 3.3)

Quality management to BS EN ISO 9001.

Prior to commencement of work, the contractor shall submit Method Statements to the Invesitgation Supervisor for approval. These shall include, but shall not be limited to:

- Type of plan
- Sequence of Works (including setting out)
- Site access arrangements and requirements
- Proposals for accessing the site areas
- Control Measures of Water Arisings Entering the Watercourse
- Temporary works including locations of stockpiles and consumables
- Transportation of materials to, from and around the Site
- Methodology for drilling, sampling and in-situ testing
- Health and Safety requirements including appropriate monitoring
- Details of the proposed Laboratory and the relevant accreditation schedules and certificated for all tests listed in this Specification

The Contractor shall comply with the site regulations imposed by the Client and any specific land issues raised by the land owners.

The Contractor shall prepare a written Health and Safety (H & S) Plan incorporating safety and emergency procedures for the site and submit this to the Client one week prior to commencement of work. All personnel working on the site shall be given an induction on the contents of the H & S Plan and shall acknowledge receipt of a copy.

A copy of the H & S Plan shall be kept on site at all times.

S1.8.2 Professional Attendance (Clause 3.5.2)

The Contractor shall provide full-time professional attendance to perform those tasks detailed in Specification Note for Guidance 3.5.2 which are relevant to this investigation.

The Contractor shall provide a suitably qualified Geotechnical Engineer/ Engineering Geologist with a minimum of 3 years' relevant experience.

S1.8.3 Provision of ground practitioners and other personnel (Clauses 3.6.1 and 3.6.2)

No other personnel (see Specification Clause 3.6.2) are to be provided by the Contractor.

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

The proposed exploratory holes are adjacent to the River Congresbury Yeo, and as such works shall be undertaken in accordance with an EA Permit (to be provided to the Contractor in advance of the works). The Contractor shall ensure suitable methods to control water arisings entering the watercourse.

The Contractor shall ensure appropriate H&S measures are in place to protect their people and plant during the works.

The site is within a moderate unexploded bomb (UXO) risk area. A preliminary UXO risk assessment from Zetica states that 'no readily available records have been found to indicate the Site was bombed'.

Contamination is not expected to be encountered on site. Should hazardous ground be encountered during the ground investigation, the Investigation supervisor shall be informed immediately. Risk mitigation measures shall be agreed between the Contractor and Investigation Supervisor.

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

Available services information will be provided to the Contractor by the Client in advance of the works. The Contractor shall examine these drawings and take such steps as are considered necessary to ensure avoidance of damage to services. This shall include, but not be limited to "sweeping" the site of each exploratory point using a Cable Avoidance Tool ("CAT") or similar scanning instrument for the detection of services. The technique used shall be appropriate for the sources being detected and shall only be carried out by suitably trained operatives.

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

None anticipated.

S1.8.7 Protected species (Clause 3.7.4)

The Site is within the River Congresbury Yeo Local Wildlife Site.

No protected species are anticipated however, the potential presence of Great Crested Newts should be included in the Contractors RAMs and included in the site induction.

If Great Crested Newts are found at any time within the working area, all works must stop immediately and advice sought from a suitably qualified ecologist

S1.8.8 Archaeological remains (Clause 3.7.5)

None anticipated.

S1.8.9 Security of site (Clause 3.11)

Security and safety of all plant and equipment is the responsibility of the Contractor. If plant and equipment remains on site overnight, these must be securely fenced and locked before leaving site, or other secure measures employed.

All plant should be fenced off using herras fencing or solid panel fencing where the Contractor sees fit; during operational and non-operational times. This should include each individual exloratory hole location where activities last greater than a single working day.

All plant should have anti-vandal mechanisms and/or covers to working parts and operational control panels.

The Contractor is to ensure that the compound area is secure at all times.

S1.8.10 Traffic management measures (Clause 3.12)

Not required.

S1.8.11 Restricted working hours (Clause 3.13)

Working hours are generally restricted to daylight hours; Monday to Friday 8am to 6pm.

S1.8.12 Trainee site operatives (Clause 3.14.1)

Trainee operatives are permitted on-site provided they are escorted/mentored on a one to one basis.

Site operatives shall hold a National Vocational Qualification (NVQ), or equivalent European Union Qualification (where available), appropriate to their status and to the type of work being undertaken.

All site operatives employed on the contract shall also hold a valid and current CSCS card for their occupation as issued by Construction Skills Certification Scheme Ltd or an equivalent body in a State of the European Union. In the case of boring and drilling operatives, this should be a CSCS blue skilled (Land Drilling) card but Clause 3.14.3 also applies.

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

An Environment Agency Permit will be obtained, by the Investigation Supervisor, to cover the work adjacent to Congresbury Yeo River. Any requirements of the permit must be met by the Contractor.

A specific method statement to cover those exploratory holes in the floodplain will be required. This method statement needs to cover the following issues:

- Prevention of pollution of the watercourse
- Method to be adopted including spillkits if considered necessary
- Evacuation plan should flooding occur

The requirements of this method statement should be allowed for.

The Contractor is to ensure all drilling techniques and flush medium used do not contaminate the ground surrounding the drilling activities and that no indiscriminate soak away of flush medium occurs.

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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)

For all exploratory hole locations that are to be extended by rotary core drilling, the Contractor is to inform the Investigation Supervisor immediately on encountering bedrock.

The agreement of the Investigation Supervisor shall be obtained before pitting through hard materials or obstructions for periods > 1hr.

S1.8.15 Reinstatement requirements (Clause 3.16)

Where installations are not required, the Contractor is to return the exploratory hole location back to its original condition. Photographs shall be taken at each location prior to, and on completion.

On completion of all exploratory locations, any arising created during the drilling and excavation processes must be removed from the exploratory hole location and site at the Contractors time and cost. He shall be responsible for undertaking all Waste Acceptance Testing and ensuring the waste is disposed of in accordance with Waste Management Legislation.

Site reinstatement shall be to the approvial of the Investigation Supervisor.

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

The welfare facilities provided by the Contractor are to be compliant with the regulations stated under CDM Regulations (2015); Schedule 2.

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

All unavoidable damage is to be rectified by the Contractor at his cost.

Due to the likely soft ground across the site, trackway or matting may be required to facilitate access and minimise surface damage of the working areas.

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

The actual locations will be agreed on site with the Investigation Supervisor prior to commencement of works, in order to accommodate for access and working space restrictions.

Setting out shall be to the accuracy defined in the Specification.

If obstructions, ecological issues, services or traffic management prevent establishment of the agreed exploratory hole locations, then holes may be moved laterally by the Contractor by +/- 1m to avoid that obstruction. A larger relocation may be permitted by the Investigation Supervisor upon reasonable request.

The as-dug location of exploratory holes shall be referenced to +/-0.5m laterally and +/-0.01m vertically.

S1.8.19 Photography requirements (Clause 3.25)

The contractor shall record the following in photographs at each exploratory hole location:

- Site where plant is to be tracked through before and after the site works
- Ground cover before excavation
- Reinstatement after excavation

- Arisings including those from hand dug pits
- Any relevant geotechnical feature found in the exploratory hole to assist the description of the features found
- Any rock cores retrieved

Photographs shall be in digital “JPEG” format and the file names shall be in the format: -“Yeo Farm Bridge_BH[X]_[Y].jpg” where X is the exploratory hole reference number and Y is the sequential number of the photographs.

S1.8.20 Standing time

With the exception of progressing through hard strata or obstructions, the standing of any crew, plant, or other item supplied by the Contractor shall be communicated immediately to the Investigation Supervisor or his representative. Such standing shall be recorded on daily logs and agreed and countersigned by the Investigation Supervisor or his representative within one working day. Any standing time that has not been subject to this process shall not be paid.

S1.8.21 Programme requirements

The contractor is to provide a programme at the point of tender.

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

Contract specific restrictions/relaxations, if any, are inserted below.

S1.9.1 Permitted methods and restrictions (Clauses 4.1 to 4.4)

Not required

S1.9.2 Backfilling (Clause 4.5)

See S1.10.12

S1.9.3 Dynamic sampling (Clause 4.6)

It is the Contractors responsibility to ensure suitable plant, or platforms, are used to safely access the proposed locations as shown on the attached plan. This may include, but is not limited to: slope climbing rigs, excavator boom mounted rigs, or scaffold platforms.

Dynamic sampling shall be undertaken in locations specified within Schedule 2 using a rig capable of dynamic sampling and rotary coring.

Dynamic methods shall be used to progress the borehole until the base of the superficial deposits is reached or the strata is too stiff to progress as defined in Clauses 2.8, 4.3, 6.4 and S1.8.14. Upon which an SPT test will be undertaken before continuing with rotary drilling.

Dynamic sampling shall be carried out using hollow steel tubes incorporating a removable liner and cutting shoe in order to recover a nominally continuous sample for retention. The method and diameter of advancing the boreholes shall facilitate the recovery, inter alia, of 102mm diameter thin wall undisturbed samples, the performance of Standard Penetration Tests, over the full depth range of specified boreholes, as required. Care shall be taken at all times to avoid disturbing or loosening the soil, or causing loss of ground around the holes.

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

Contract specific restrictions/relaxations, if any, are inserted below.

S1.10.1 Augering requirements and restrictions (Clauses 5.1)

Not required.

S1.10.2 Particular rotary drilling techniques (Clause 5.2)

Rotary follow on drilling will be required on completion of dynamic sampling, as specified in Schedule 2. Rotary drilling shall progress 7.5m into competent bedrock, beyond any weathered horizon.

It is the Contractors responsibility to ensure suitable plant, or platforms, are used to safely access the proposed locations as shown on the attached plan. This may include, but is not limited to: slope climbing rigs, excavator boom mounted rigs, or scaffold platforms.

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The Contractor shall endeavour to achieve as close as it is practicable to 100% core recovery, taking into consideration the requirements of in-situ testing. If such core recovery is not being achieved, the Contractor shall take measures to improve core recovery.

Where 90% recovery or less is achieved the Contractor is to reduce subsequent core runs by half (subject to a minimum core run length of 0.5m), replacing worn or damaged equipment. If continued core recovery is below 90%, the Investigation Supervisor reserves the right to increase the core diameter and subsequent barrel size.

If core recovery of less than 50% is achieved during any run a Standard Penetration Test (SPT) shall be performed immediately afterwards and subsequent core runs reduced as above.

The Contractor is to be made aware of the composition, nature and hardness of the solid geology indicated in Schedule S1.6.

Core is required from all rotary drilling operations, unless explicitly stated as not being required in Schedule 2 or instructed by the Investigation Supervisor.

Where a combined rotary drilling rig is used dynamic sampling shall only be carried out where ground conditions are suitable and with the approval of the Investigation Supervisor.

The approval of the Investigation Supervisor shall be sought, either in person or by telephone, before terminating any borehole. The GI Contractor shall start all exploratory holes by means of a hand excavated inspection pit up to 1.2m deep. Exploratory holes shall not begin until the presence of all underground services has been established.

Special precautions shall be taken to control and contain all drilling fluids, water, slurry, arisings, spoil, dust and run-off in order that they do not reach drainage channels, watercourses and the like.

A borehole remaining open overnight shall be made safe and measures taken to prevent objects being inserted into the exploratory hole.

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

All drilling activities must be completed using a water flush medium.

The Contractor is permitted to use foams, polymers or additives where he sees suitable and fit to achieve the core recovery detailed in S1.10.2. It is the Contractors responsibility to ensure that these pose no risk of contamination to controlled waters.

Re-circulated water flush to be used. The Contractor is required to responsibly dispose of the drill flush water and sediment.

Any additional requirements of the Environment Agency Permit, will need to be met.

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

The equipment shall be capable of providing 100mm diameter core of Class 1 standard in accordance with BS EN 22475 and BS 5930.

The Contractor shall bring to site a range of drill bits and core catchers/springs appropriate for the geology, such that the required core recovery detailed within Section S1.10.2 is achievable.

S1.10.5 Core logging (Clause 5.4.6)

All core logging shall be in accordance with Clause 5.4.6 and in accordance with BS EN ISO 14689-1:2002, BS 5930:2015, with consideration to CIRIA C570 .

Core must be photographed (prior to examination), logged and sub sampled, where required, on site to ensure the natural moisture content is retained. All examination shall be undertaken on site within 48 hours to ensure the moisture from the core samples is not lost.

The contractor is to ensure that core and sub samples are transported securely to ensure core integrity.

Mechanical logging, e.g.; TCR, SCR, RQD and fracture index is to be undertaken.

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

The following suitable samples are required per metre run of solid core: 1 sample for UCS testing, 3 samples for point load testing.

The core preparation, preservation and storage of samples from rotary cores for laboratory testing will be as follows, and conducted on site:

(1) The following equipment is needed on site to conform to the requirements of this Specification:

- a thermostatically controlled wax bath capable of maintaining the wax at a temperature of approximately 65°C
- low melting point wax, comprising 50% petrolatum and 50% paraffin wax (or similar approved)
- heavy-duty cling film and aluminium foil to the approval of the Engineer
- two counter-rotating saws capable of cutting the plastic liner into two halves along its long axis
- soil lathe for trimming the samples.

(2) Each core run shall be handled with extreme care at all times.

(3) As soon as possible after recovery of the core run from the drill hole, the inner liner containing the core shall be taken to the saw for cutting. The saw shall be set such that only the liner is cut, leaving the sample unscored. If necessary a sharp safety knife may be used for final separation of the two halves of the liner, if the saw has not already penetrated the full thickness of the liner.

(4) The sample, still in the two halves of the liner, shall be placed on a clean flat work surface. The top half of the liner shall be removed carefully and any excess drilling fluid gently removed from the surface of the sample, using a clean dry cloth or absorbent paper towel. Gentle axial tapping at one end of the top half of the liner is permissible to ease removal. The sample shall then be rotated through 180 degrees, so that the other half of the liner can be removed and the remainder of the sample surface cleaned of drilling fluid.

(5) The preservation technique for samples is as follows. The entire sample shall be fully wrapped carefully in a single layer of aluminium foil with the shiny surface of the foil on the outside to dissipate the heat from the molten wax. The foil shall be carefully smoothed to remove any air pockets that may form between the sample and the aluminium foil. Care should be taken to avoid excess foil on the ends of the sample or the formation of air pockets. The sample shall be carefully covered (including its ends) with a smooth layer of low melting point wax. It may be necessary to coat the ends of the sample in wax as a

separate action. The sample shall then be stood on its end on a flat clean surface to cool, maintaining its correct orientation.

(6) When the wax has solidified, the sample shall be wrapped tightly in heavy-duty cling-film under tension, overlapping at least 30mm on to both ends of the sample. Before using the cling film, it shall be dipped into the wax bath so that it is coated with a thin film of wax. Care should be taken to avoid the formation of air pockets. Each end of the sample shall then be wrapped tightly in heavy-duty cling-film. The cling film shall overlap at least 30mm onto the curved surface of the sample. Before using the cling film, it shall be dipped into the wax bath so that it is coated with a thin film of wax.

(7) The sample should then be dipped into the bath of low melting point wax and rotated until all the cling film (including that at the ends of the sample) is entirely covered in a second coat of wax. It may be necessary to dip the ends of the sample in wax as a separate action. The wax should then be allowed to cool.

(8) When the wax on the surface of the sample has solidified, the sample shall be wrapped in a second layer of cling film dipped in wax, as described above. The cling film shall cover the curved surface and both ends of the sample. Any joins in the cling film shall overlap by at least 30mm. Heavy duty adhesive tape shall then be wrapped around the bottom edges of both ends to protect the cling film from becoming damaged at these locations.

(9) The sample shall be clearly identified on its outside with the following information: contract number, borehole number, sample number and depth and with an arrow pointing to the top of the sample (and labelled as such). If a label is attached to the sample, it shall be secured beneath a further layer of tightly wrapped cling film. All marking shall be in indelible ink.

(10) When the sample has been sealed as described above, it shall be protected from damage by laying it inside a protective ‘sleeve’ made from split drain pipe, guttering, or rigid liner. The sample shall be secured inside its protective sleeve by binding the package with adhesive tape. The sample shall be stored on site in a temperature controlled environment that is free of vibrations. The Contractor shall take all reasonable measures to maintain the temperature of the samples between 10° and 15°C. Under no circumstances shall the temperature of the sample be allowed to drop below 5°C.

(11) When transporting samples to the laboratory, the samples shall be handled with great care and shall be protected during the journey from vibration, sudden movement and excessive changes in temperature or humidity. They shall not be transported in the core boxes but in a separate padded box to minimise sudden movement, vibration etc.

(12) Samples shall be stored in the laboratory in a temperature and humidity controlled environment that is free of vibrations. The temperature shall be maintained between 10°C and 12°C and the relative humidity between 90 and 95%. Under no circumstances shall the temperature of the samples be allowed to drop below 5°C.

(13) The Contractor may also be required to take small disturbed samples from the rotary cores, as instructed by the Engineer. These shall be taken in accordance with Clause 7.6 and stored in accordance with Clause 7.5. S1.10.7 Address for delivery of selected cores (Clauses 5.4.8 and 5.4.9)

The core shall be transported with extreme care and with minimal changes to environmental conditions as possible. The location of delivery will be specified accordingly for laboratory samples as well as the rest of the core samples which do not require laboratory testing, this will be done in agreement with the Investigation Supervisor.

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

Not required.

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

Rotary open hole drilling is not scheduled, however the Investigation Supervisor reserves the right to use open hole drilling methods should they see fit. If rotary open hole techniques are being utilised in superficial materials, the contractor is to terminate drilling and notify the investigation supervisor immediately when solid geology is encountered. The Investigation Supervisor will subsequently advise on any further requirements of the exploratory position.

In-situ SPT testing may be requested by the Investigation Supervisor where the depth to solid geology has not been clearly identified.

Any open hole progressed location is required to be of sufficient diameter to enable core recovery as stated in S1.10.4. Core recovery at an open hole progressed location may be requested by the Investigation Supervisor.

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

Not required.

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

Not required.

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

Not required.

S1.10.12 Backfilling (Clause 5.7)

The Contractor is to return the exploratory hole location back to its original condition, backfilled with bentonite pellets. Backfilling of boreholes with soil arisings is not permitted. Any arising created during the drilling process must be removed from site at the Contractors time and cost. He shall be responsible for undertaking all Waste Acceptance Testing and ensuring the waste is disposed of in accordance with Waste Management Legislation.

Where backfilling of boreholes takes up to two times the borehole volume without attaining the instructed backfill level, the Contractor is to ‘dip’ the borehole to establish the level of back fill achieved and then contact the Investigation Supervisor immediately for further instruction.

The Contractor should use the Environment Agencies following guidelines: ‘Good practice for decommissioning redundant boreholes and wells, where applicable and/or instructed by the Investigation Supervisor.

S1.10.13 Core photographic requirements (Clause 5.8)

As per the Specification

S1.10.14 Recording groundwater levels

Groundwater levels shall be recorded at the beginning and at the end of each working shift or other rest periods greater than 30 minutes.

Where a ‘groundwater strike’ occurs, drilling activity is to be stopped, the groundwater level recorded, and then left to stabilise for no less than 20 minutes before another level reading is recorded before drilling re-commences.

On each occasion when groundwater is recorded by the Contractor, the depth of the exploratory hole, the depth of any casing and the time on a 24 hour clock should also be recorded.

The groundwater monitoring methodology for groundwater strikes above is to undertaken as part of the drillers day work activities and shall not be included as 'standing time'.

Where artesian conditions are encountered, the Contractor shall immediately inform the Investigation Supervisor and agree a method for dealing with the conditions.

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

Contract specific restrictions/relaxations, if any, are inserted below

S1.11.1 Indirect detection of buried services and inspection pits (Clauses 3.8.3 and 6.1)

Notwithstanding the apparent absence of any below- ground services, all exploratory hole locations shall be scanned using CAT, genny or other type of detection device, prior to any excavation. The technique used shall be appropriate for the sources being detected and shall only be carried out by suitably trained operatives.

Safe digging practices, in accordance with HSE publication HSG 47 "Avoiding Danger from Underground Services", must be used to verify and establish the actual positions of any mains, pipes, services and other apparatus on site before any mechanical plant is used.

Existing services drawings are for indicative purposes only. The position of existing PUBLIC MAINS, SERVICES and SEWERS shown on the drawings have been extracted from plans provided by the Statutory Undertakers and/or Public Authority and the accuracy of the positions is not guaranteed in any way. Privately owned services and connections are not shown but should be anticipated.

In addition, inspection pits to a depth of 1.2m below ground level are required at borehole positions. All inspection pits shall be logged and sampled by a competent Engineer.

If scanning indicates the presence of an underground service, then the Contractor is required to identify an alternative location in close proximity to the scheduled position that is not affected by services. This position is to be agreed with the Investigation Supervisor.

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

Not required.

S1.11.3 Entry of personnel (Clause 6.5)

Not required.

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

Not required.

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

Not required.

S1.11.6 Backfilling (Clause 6.10)

Not required.

S1.11.7 Photographic requirements (Clause 6.12)

See S1.8.19.

S1.11.8 Artificial lighting (Clause 6.12.2)

Not required.

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

Not required.

S1.11.10 Recording groundwater levels

Not required.

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

Contract specific restrictions/relaxations, if any, shall be inserted below.

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

Not required.

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

Samples shall be retained until all geotechnical testing is complete and only after agreement with the Investigation Supervisor.

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

See S1.12.11 for details on geo-environmental samples.

Initial UT100 sample/Piston Sample/SPT to be taken from 0.5m below the base of the inspection pit, as appropriate to the ground conditions.

Stratum	SPT	UT100/Piston Sampler	Disturbed	Bulk	Core sub samples
Made Ground	1.0m intervals	Alternating with SPT	Any topsoil, at each change in strata or consistency and midway between successive UT100/Pistons/ SPTs. In addition, where the split barrel sampler is used this shall be retained as a small disturbed sample.	At 0.5m and 1.0m within inspection pit and of any deeper granular material	N/A
Tidal Flat Deposits	1.0m intervals to 5.0m depth	Alternating with SPT	At each change in strata or consistency and midway between successive	Of any granular material and where no sample is	

	1.5m intervals beyond 5.0m depth		UT100/Pistons/ SPTs. In addition, where the split barrel sampler is used this shall be retained as a small disturbed sample.	recovered with an SPT or UT100.	
Mercia Mudstone	1.5m intervals	N/A	At location of SPTs in weathered stratum	N/A	The following suitable samples are required per metre run of solid core: 1 sample for UCS testing, 3 samples for point load testing

General

Samples should be of sufficient volume to provide sufficient sample material for a wide range of geotechnical analysis, specifically those listed in Bills K.

All samples should be stored in appropriate sealed containers.

All samples shall be removed from the site of the boreholes at the end of each day's work and shall be protected from frost damage or excessive heat by being stored on or near the site in a structure which is under cover and secure from interference. All samples shall be removed from the site so as to reach the laboratory within a maximum five days of being taken.

A description of all samples scheduled for testing shall be included on the testing record.

The frequency of sampling and in situ testing is dependent on the ground conditions. In the absence of particular requirements or instructions from the Investigation Supervisor sampling shall be as follows;

a) Cohesive Soils - First undisturbed tube sample (UT100) in all boreholes 0.5m below the base of the hand dug pit, thereafter at alternate 1.0 m intervals to 5.0m and 1.5m intervals below. Piston samples should be used in soft ground. Sampling should alternate with SPTs. If a sample is not obtained, this should be followed immediately by an SPT. Small disturbed samples should be taken at each change in soil type or consistency and from every SPT.

b) Granular Soils - Small disturbed samples shall be taken at each change in soil type or consistency, and at every SPT depth. Samples shall be taken from the liners or from the SPTs if split spoon samplers are used, at the time of logging. Bulk samples should be taken midway between each successive SPT.

c) Extremely weak Rock – SPT's every 1.5m until refusal (100 blows)

d) Inspection pits - Small disturbed and bulk samples shall be taken of the topsoil and at each change in soil type or consistency.

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

Where practicable, open tube samplers of the OT/T/W (thin walled) type shall be adopted for undisturbed samples. If this is not practicable due to stiffness of stone content of soils, then samples of the OT-TK/W (thick walled) type shall be used with the prior agreement of the Investigation Supervisor.

Open tube samplers shall be of nominal diameter 100 mm.

Piston samples shall be used in soft ground.

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

Material from cutting shoes should be retained as a small disturbed sample.

S1.12.6 Delft and Mostap sampling (Clause 7.6.12)

Not required.

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

Where a 'groundwater strike' occurs, drilling activity is to be stopped, the groundwater level recorded, and then left to stabilise for no less than 20 minutes before another level reading is recorded before drilling re-commences.

On each occasion when groundwater is recorded by the Contractor, the depth of the borehole and the time on a 24 hour clock should also be recorded.

The groundwater monitoring methodology for groundwater strikes above is to undertaken as part the excavation activities and shall not be included as 'standing time'.

Samples of any encountered groundwater shall be taken.

S1.12.8 Special geotechnical sampling (Clause 7.8)

Not required.

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

Not required.

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

Disposal of contamination samples is the responsibility of the Contractor.

All untested/contaminated samples shall be kept for a period of 28 days after submission of the approved final report. After this time the Investigation Supervisor's permission shall be sought for their disposal. The Contractor shall dispose of all samples in accordance with the Waste Disposal Regulations. Samples submitted to the chemical testing laboratory for analysis shall be disposed of 28 days after submission unless otherwise instructed

S1.12.11 Frequency of sampling (Clause 7.9.4)

As specified in S1.12.3 for geotechnical samples.

Additionally, soil samples for environmental assessment should be taken from each exploratory location based on the following criteria:

- The first contamination sample shall be taken in topsoil where present, or beneath any hard standing or sub-base materials, within 0.5m of ground level;
- Samples through Made Ground shall be taken every 1.0m or at changes in the nature of the Made Ground. In natural soils, contamination samples shall be taken within 500mm of penetrating the stratum. In the event that visual or olfactory evidence of

contamination is noted below this depth, then further samples shall be taken as directed by the Investigation Supervisor.

- Targeted samples if any visual or olfactory evidence of contamination is observed should also be collected.

The quantity of material and containers used will depend on specific laboratory requirements for the specified analysis. The Contractor is to ensure that sufficient sample material is taken at each sample point for the tests specified in Suite E and F. In addition, it is the Contractors responsibility to ensure that Suite E is appropriate to the likely contaminants on site and should be amended if necessary. The samples are to be collected and sent to the laboratory on the same day as sampling. Chain of custody schedules are to be provided to the Investigation Supervisor within 24hrs of sampling. Any samples which are received by the laboratory outside of their holding time and are classified as non-compliant shall be re-sampled at the Contractors own cost.

It is recommended that a waste characterisation is undertaken on the results of the chemical analyses and it is assumed that these should be representative of any material to be removed from site. Full WAC samples and analysis will be required on the specific material requiring disposal at the time of construction.

S1.12.12 Sampling method (Clause 7.9.5)

Samples are to be taken in accordance with *BS10175:2011 +A2:2017 Investigation of Potentially Contaminated Sites – Code of Practice*.

S1.12.13 Headspace testing (Clause 7.9.8)

Not required.

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

S1.13.1 Type(s) and reporting of dynamic probing (Clauses 8.1.1 and 8.1.2)

Not required.

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

It is the Contractors responsibility to ensure the CPT rig used shall be capable of safely accessing the proposed locations as shown on the attached plan.

The CPT shall be calibrated in accordance with the manufacturers recommendations.

Continuous static cone penetration testing with pore water pressure measurement (CPTu) is required using a piezocone. The CPTu shall be carried out in accordance with BS1377 Part 9 Section 3.1 with the exception that under paragraph 3.1.4.8, the frequency of reading shall be 50mm instead of 200mm.

Two dissipation tests shall be undertaken, one on either side of the River, depth to be confirmed by the Investigation Supervisor on site. At least one test should be undertaken within a Peat horizon.

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

Reporting shall be in accordance with BS1377-9 to include settlement and permeability parameters.

On completion an interpretative CPT log shall be provided on which the following is recorded, as a minimum:

- Soil type

- Profile of undrained shear strength with depth
- Cone resistance and pore pressure with depth
- Cone resistance and friction ratio with depth

Full scale cone resistance plots shall be provided with additional expanded plots showing cone resistance in clay layers to full scale if necessary. On one or both of these plots, a legend shall be included describing the soils interpreted from the data.

S1.13.4 Seismic cone equipment requirements (Clause 8.3.1)

Not required.

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

Not required.

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

Not Required.

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

Contract specific restrictions/relaxations, if any, shall be inserted below.

S1.15.1 Tests in accordance with British Standards (Clause 10.3)

Standard Penetration Testing in accordance with BS EN ISO 22476-3. Calibration/energy certificates to be provided for all SPT hammers used on site.

Below the solid geology interface SPT failure threshold is required to be raised from 50 blows to 100.

SPTs to be continued until refusal. Should any weaker strata be encountered below, SPTs should be re-commenced.

S1.15.2 Hand penetrometer and hand vane for shear strength (Clause 10.4.1)

Hand shear vane or hand penetrometer tests, as appropriate, shall be carried out on suitable samples of cohesive materials from rotary core samples. Both peak and remoulded strength is required for hand vane tests when undertaken.

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

Not required.

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

Not required.

S1.15.5 Menard pressuremeter tests (Clause 10.5.3)

Not required

S1.15.6 Soil infiltration test (Clause 10.6)

Not required.

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

Not required.

S1.15.8 Interface probes (Clause 10.8)

Not required.

S1.15.9 Contamination screening tests (Clause 10.9)

Not required.

S1.15.10 Metal detection (Clause 10.10)

Not required.

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

Not required.

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

Not required.

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

Contract specific restrictions/relaxations, if any, shall be inserted below.

S1.18.1 Information for daily records (Clause 13.1)

Daily information recorded should be as specified in Clause 13.2.

Exploratory hole records shall be submitted to the Investigation Supervisor within 24 hours of completion of each exploratory hole, with drillers' logs and draft preliminary engineer's logs, including details of in situ testing, and the sample schedule submitted within 48 hours of the completion of each exploratory hole.

The sample schedule should include a comment column on the sample sufficiency to different tests i.e. should the sample be damaged, undersized for PSD testing, unsuitable for triaxial testing etc.

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

Not required.

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

Contract specific restrictions/relaxations, if any, shall be inserted below.

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

The Contractor shall provide blank laboratory schedules completed with all samples recovered for the use of the Investigation Supervisor on completion of the investigation or weekly, whichever is the shortest.

S1.19.2 Tests required (Clause 14.1.2)

Laboratory testing shall be scheduled by the Investigation Supervisor following completion on the ground investigation. The testing shall be appropriate to the ground conditions encountered and the works proposed on the site.

The Bill of Quantities has been populated with likely laboratory tests however this may require amendment once the ground conditions are known.

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

Where rock testing is required, this shall be completed to the standard laid out by the International Society for Rock Mechanics (ISRM).

S1.19.4 UKAS accreditation to be adopted (Clause 14.3)

All laboratories shall be UKAS accredited.

S1.19.5 Rock testing requirements (Clause 14.5)

The list as follows is not exhaustive and only lists those tests likely to be used in this contract; natural moisture content, uniaxial compressive strength and point load strength.

S1.19.6 Chemical testing for aggressive ground/groundwater for concrete (Clause 14.6) (Test suites A-D are overleaf)

Testing suites Suite B (Greenfield pyrite present) is required.

S1.19.7 Laboratory testing on site (Clause 14.7)

Not required.

S1.19.8 Special laboratory testing (Clause 14.8)

Not required.

S1.20 Geo-environmental laboratory testing (Specification Section 15) Particular restrictions/relaxations

Contract specific restrictions/relaxations, if any, shall be inserted below.

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

Sufficient chemical testing for soils shall be undertaken to define the contamination status of the site.

All geo-environmental and contaminative testing will be scheduled by the Investigation Supervisor. The chain of custody schedule and preliminary engineering logs are to be provided within 24hours of sampling to the Investigation Supervisor.

S1.20.2 Accreditation required (Clause 15.2)

All laboratories should be UKAS and MCERTS accredited.

S1.20.3 Chemical testing for contamination (Clause 15.3) (Test suites E-F are overleaf)

Indicative suites of testing, Suite E (soil samples), Suite F (leachate samples) and Suite G (water samples) are provided in the bill of quantities for costing purposes. However the schedule of geoenvironmental analysis will be determined based on visual and olfactory

observations as well as headspace tests. All testing must be MCERTS accredited unless unavailable for a specific determinant.

It is the Contractors responsibility to ensure that Suites, E,F & G are appropriate to the likely contaminants on site and should be amended if necessary. Contractor will detail limits of detection, test methods and accreditation which can be offered for each individual determinand.

Before the ground investigation commences the Contractor must notify the Investigation Supervisor detailing the laboratory to be used for the testing and the testing results turnaround.

Testing will be undertaken on the laboratories standard turnaround which should be no longer that 10 working days.

SCHEDULE 1.19.6 (Derived from BRE Special Digest SD1) **Sheet 1 of 1**

CHEMICAL TESTS ON POTENTIALLY AGGRESSIVE GROUND/GROUNDWATER

SUITE A Greenfield site (pyrite absent)			
Sample type	**Determinand**	**Recommended test methods**	**Test method specified/offered[1]**
Soil	pH in 2.5 : 1 water/soil extract	BR 279 Electrometric	
		BS 1377 Part 3, Method 9	
	SO_4 in 2 : 1 water/soil extract	BR 279 Gravimetric method, cation exchange or ion chromatography	
		BS 1377 Part 3 Method 5.3 + 5.5	
		TRL 447 Test 1	
Groundwater	pH	BR 279 Electrometric	
		BS 1377 Part 3, Method 9	
	SO_4	BR 279 Gravimetric method, cation exchange or ion chromatography	
		BS 1377 Part 3 Method 5.4 + 5.5	
		Commercial lab in-house procedure – determination of sulphur by ICP-AES[2]	
SUITE B Greenfield site (pyrite present)			
Soil	pH in 2.5 : 1 water/soil extract	BR 279 Electrometric	
		BS 1377 Part 3, Method 9	
	SO_4 in 2 : 1 water/soil extract	BR 279 Gravimetric method, cation exchange or ion chromatography	
		BS 1377 Part 3 Method 5.3 + 5.5	
		TRL 447 Test 1	
	Acid soluble SO_4	BR 279 Gravimetric method	
		BS 1377 Part 3, Method 5.2 + 5.5	
		TRL 447 Test 2	
	Total sulphur	BR 279 Ignition in oxygen	
		TRL 447 Test 4A	
		TRL 447 Test 4B	
Groundwater	pH	BR 279 Electrometric	
		BS 1377 Part 3, Method 9	
	SO_4	BR 279 Gravimetric method, cation exchange or ion chromatography	
		BS 1377 Part 3 Method 5.4 + 5.5	
		Commercial lab in-house procedure – determination of sulphur by ICP-AES	

[1] **Either** Investigation Supervisor to specify method required **or** Contractor to detail method(s) offered

[2] AAS: atomic absorption spectrometry

[3]ICP-AES: inductively coupled plasma atomic emission spectroscopy

SCHEDULE 1.20.3 **Sheet 1 of 3**

CHEMICAL LABORATORY TESTING FOR CONTAMINATION

Nominated Test Laboratory: ***Contractor to specify proposed laboratory***

Required Testing Turnaround Times: ***10 days***

NB 1. This proforma Schedule MUST be reviewed in the light of site-specific desk study results and amended accordingly to include any additional determinands likely to be required.

2. Limits of detection should reflect the guideline/threshold values against which the test results will be compared.

Suite E – Soil samples			
Determinand (Procurer to list required determinands)	**Limit of detection offered [1]**	**Test method offered [1]**	**Accrediation offered [1]**
Arsenic			
Boron			
Cadmium			
Hexavalent chromium			
Total chromium			
Copper			
Lead			
Mercury			
Selenium			
Nickel			
Zinc			
pH			
Water soluble sulphate (So_4)			
Soil Organic Matter			
Speciated Total Petroleum Hydrocarbons (TPH CWG)			
BTEX			
Speciated polyaromatic hydrocarbons (USEPA 16)			
Polychlorinated Biphenyls (PCBs)			
Phenol			
Cyanide (free and total)			
Asbestos screen (Quantifiication as required)			
VOC			
SVOC			

[1]Contractor to detail what can be offered under each of these categories. See also Specification Note for Guidance 15.5.

SCHEDULE 1.20.3 **Sheet 2 of 3**

CHEMICAL LABORATORY TESTING FOR CONTAMINATION

Nominated Test Laboratory: ***Contractor to specify proposed laboratory***

Required Testing Turnaround Times: ***10 days***

NB 1. This proforma Schedule MUST be reviewed in the light of site-specific desk study results and amended accordingly to include any additional determinands likely to be required.

2. Limits of detection should reflect the guideline/threshold values against which the test results will be compared.

Suite F – (Soil derived) Leachate samples			
Determinand (Procurer to list required determinands)	**Limit of detection offered [1]**	**Test method offered [1]**	**Accrediation offered [1]**
Arsenic			
Boron			
Cadmium			
Hexavalent chromium			
Total chromium			
Copper			
Lead			
Mercury			
Selenium			
Nickel			
Zinc			
pH			
Water soluble sulphate (So_4)			
Speciated Total Petroleum Hydrocarbons (TPH CWG)			
BTEX			
Speciated polyaromatic hydrocarbons (USEPA 16)			
Phenol			
Cyanide (free and total)			
VOC			
SVOC			

[1]Contractor to detail what can be offered under each of these categories. See also Specification Note for Guidance 15.5.

SCHEDULE 1.20.3 **Sheet 3 of 3**
CHEMICAL LABORATORY TESTING FOR CONTAMINATION

Nominated Test Laboratory: ***Contractor to specify proposed laboratory***

Required Testing Turnaround Times: ***10 days***

NB 1. This proforma Schedule MUST be reviewed in the light of site specific desk study results and amended accordingly to include any additional determinands likely to be required.

2. Limits of detection should reflect the guideline/threshold values against which the test results will be compared.

Suite G – Water samples			
Determinand (Procurer to list required determinands)	**Limit of detection offered [1]**	**Test method offered [1]**	**Accrediation offered [1]**
Arsenic (dissolved)			
Boron (dissolved)			
Cadmium (dissolved)			
Hexavalent chromium (dissolved)			
Total chromium (dissolved)			
Copper (dissolved)			
Lead (dissolved)			
Mercury (dissolved)			
Nickel (dissolved)			
Selenium (dissolved)			
Zinc (dissolved)			
Calcium (dissolved)			
pH			
Water soluble sulphate (So_4)			
Dissolved Organic Carbon (DOC)			
Spediated Total Petroleum Hydrocarbons (TPH CWG)			
BTEX			
Speciated polyaromatic hydrocarbons (USEPA 16)			
Polychlorinated Biphenyls (PCBs)			
Phenol			
Cyanide (free and total)			
VOC			
SVOC			

[1]Contractor to detail what can be offered under each of these categories. See also Specification Note for Guidance 15.5.

S1.20.4 Waste characterisation (Clause 15.4)

Contractor to carry out assessments.

S1.20.5 Waste Acceptance Criteria testing (Clause 15.5) (Test suites H-J are overleaf)

Not required.

S1.20.6 Laboratory testing on site (Clause 15.6)

Not required.

S1.20.7 Special laboratory testing (Clause 15.7)

Not required.

S1.21 Reporting (Specification Section 16) Particular restrictions/relaxations

Contract specific restrictions/relaxations, if any, shall be inserted below. All test (geotechnical and chemical) results to be reported in PDF, AGS and Excel format.

S1.21.1 Form of exploratory hole logs (Clauses 16.1 and 16.2.1)

Contractor to submit a blank set of proformas or example records to the Investigation Supervisor for approval.

S1.21.2 Information on exploratory hole logs (Clause 16.2.2)

As per the Specification.

S1.21.3 Variations to final digital data supply requirements (Clause 16.5.1)

Data to be provided in AGS.

Digital data must be received as a single file.

All data shall be checked for errors/integrity prior to issue.

Contractor to detail the data in AGS version 4or higher.

The following project information will be used:

- PROJ_ID: TBC
- PROJ_NAME: Yeo Bank Farm Bridge

- PROJ_LOC: TBC
- PROJ_CLNT: North Somerset Council

All disks, or other agreed transmission media, shall be securely labelled and clearly marked with:

- The title 'AGS Format Data'
- The project identification (PROJ_ID)
- The project location (PROJ_LOC)
- The date of issue to the Investigation Supervisor (PROJ_DATE)
- The name of the Contractor (PROJ_CONT)
- The name of the investigation Supervisor (PROJ_ENG)
- The unique issue sequence number

No specialised or additional groups, fields or codes are to be used.

The standard legend codes; GEOL_LEG, will be used and included in the ABBR group.

The contractor shall interpret the geological strata encountered in the ground investigation and include geology codes GEOL_GEOL.

The GEOL_GEO2 fields shall be defined by the main constituents; any abbreviations shall be included in the ABBR group.

When full penetration of 450mm has been achieved, the N value shall be reported in the ISPT_NVAL field as a whole number. When full penetration has not been achieved, this field shall remain empty.

The ISPT_REP field shall be used to present incomplete tests, i.e. 50/160mm.

The WETH group shall be used to define the weathering grade.

S1.21.4 Preliminary digital data (Clause 16.5.3)

Final digital data only is required.

S1.21.5 Type(s) of report required (Clause 16.6)

Full factual Ground Investigation Report; Clause 16.8.

S1.21.6 Electronic report requirements (Clause 16.6.3)

All reports to be provided in a single unprotected digital file that can be read by PDF software.

All images and photographs must be provided in JPEG data file uncompressed and no larger than 5mb per image or photograph.

S1.21.7 Format and contents of Desk Study Report (Clause 16.7)

Not required.

S1.21.8 Contents of Ground Investigation Report (or specified part thereof) (Clause 16.8)

Not required.

S1.21.9 Contents of Geotechnical Design Report (or specified part thereof) (Clause 16.9)

Not required.

S1.21.10 Times for supply of electronic information (Clause 16.10.1)

A full PDF set of logs, a spreadsheet schedule of samples and an AGS data file shall be supplied 1 week following the completion of the site works. (Interim issues may be by electronic medium at the Contractor's discretion).

Upon completion of the works, a final AGS data file shall be supplied. It is desirable that AGS files are updated and version controlled, to contain all the information available to date, rather than individual packets of data.

S1.21.11 Electronic information transmission media (Clause 16.10.2)

The Contractor is to choose one of the following data transfer methods: electronic mail, file transfer server (ftp server), USB Drive or CD/DVD ROM.

S1.21.12 Report approval (Clause 16.11)

One electronic copy of the draft Factual Investigation Report must be submitted to the Investigation Supervisor no later than 4 weeks after completion of the ground investigation fieldworks.

The draft report must clearly be marked with a 'DRAFT' watermark.

Investigation Supervisor's comments on the draft Ground Investigation Report and associated digital data to be issued within 2 weeks from receipt of the draft report.

No later than 1 week from approval of the draft report the Contractor is to submit a final copy to the Investigation Supervisor.

SCHEDULE 2: EXPLORATORY HOLES

Hole No	Scheduled depth (m)	Approximate NGR*		Approximate GL* (m AOD)	Instrumentation	Remarks
		E (m)	N (m)			
BH01	30m (minimum of 7.5m in to competent bedrock)	338367	165696	5.84	None	Dynamic sampling until refusal through made ground, tidal flat deposits and heavily weathered rock with rotary core follow on for 5m into competent ground **to the agreement of the Investigation Supervisor** with appropriate in-situ testing and sampling throughout for geotechnical and geo-chemical laboratory testing.
BH02		338377	165695	4.00		
BH03		338392	165711	4.64		
BH04		338402	165711	6.56		
CPT01	To refusal, approx. 20m	338349	165690	7.57	None	Piezocone CPTu testing. One dissipation test per bank, at least one to be within a peat horizon
CPT02		338356	165680	7.84		
CPT03		338358	165687	7.11		
CPT04		338362	165689	6.27		
CPT05		338366	165692	6.19		
CPT06		338402	165714	6.62		
CPT07		338406	165717	6.72		
CPT08		338410	165720	7.34		
CPT09		338412	165727	8.00		

Hole No	Scheduled depth (m)	Approximate NGR*		Approximate GL* (m AOD)	Instrumentation	Remarks
		E (m)	N (m)			
CPT10		338418	165718	7.92		

Notes:

It is recommended that the chosen GI contractor undertake a walkover survey of the site to ascertain access/egress and safe working area for each location.

It is the Contractors responsibiliy to supply suitable plant, or platforms, to safely undertake the works detailed within this Specification and shown on the attached drawing.

The Contractor should be aware that the works are adjacent to a watercourse; with some proposed positions on the slopes adjacent to the watercourse.

The site is within a Category 3 Flood Zone and as such is considered to be within a functional floodplain. Tutshill Sluice, just downstream of the site, forms part of the tidal defence which stops tidal surges flowing up the river. It is the Contractors responsibility to manage this risk accordingly.

*Borehole locations are presented on the attached exploratory hole location plan, however the actual locations will be agreed on site with the Investigation Supervisor prior to commencement of works, in order to accommodate for access and working space restrictions

SCHEDULE 3: INVESTIGATION SUPERVISOR'S FACILITIES

S3.1 Accommodation

Not required.

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.

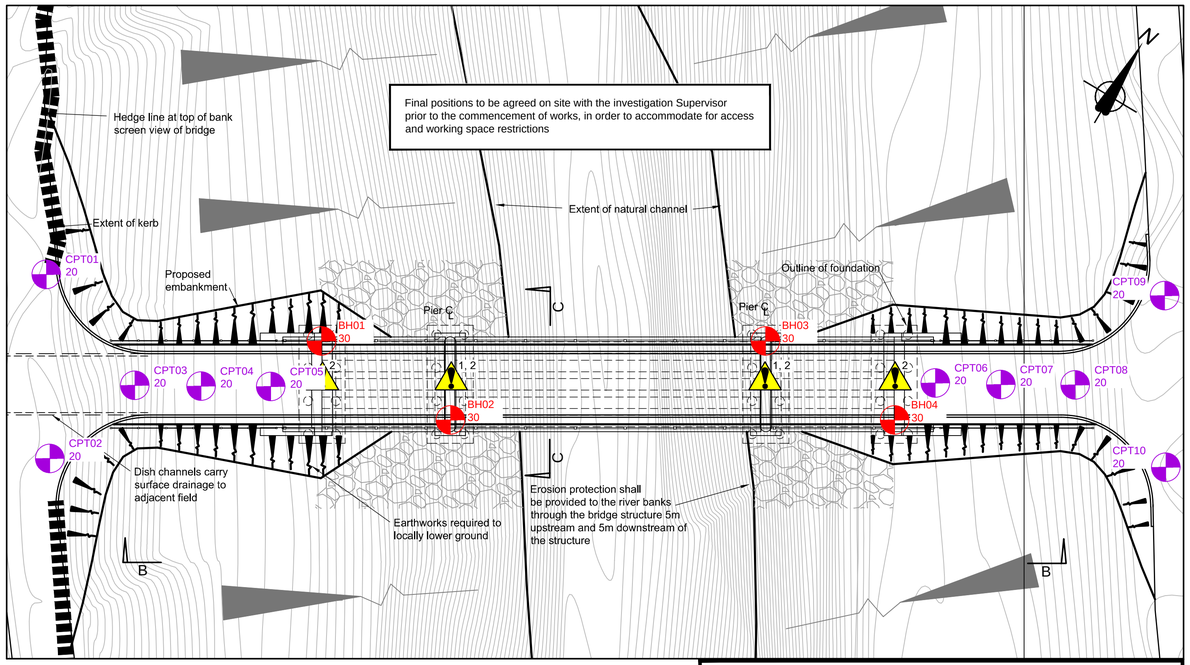
SCHEDULE 4: SPECIFICATION AMENDMENTS

The following clauses are amended			
Section number	**Clause number**	**Delete the following**	**Substitute the following**

SCHEDULE 5: SPECIFICATION ADDITIONS

The following clauses are added to the Specification		
Section number	**Clause number**	**Clause wording**

(Drawings & Documents)



PLAN
Scale 1:200

REF DEPTH — PROPOSED BOREHOLE LOCATION - DYNAMIC SAMPLING WITH ROTARY CORE FOLLOW ON

BH08 DEPTH — PROPOSED CONE PENETRATION TEST LOCATION - PIEZOCONE

BORE HOLE LOCATION COORDINATES

BH & CPT	EASTINGS	NORTHINGS	ELEVATION IN METRES
BH01 30	338367	165696	5.8400
BH02 30	338377	165695	4.0000
BH03 30	338392	165711	4.6400
BH04 30	338402	165711	6.5600
CPT01 20	338349	165690	7.5700
CPT02 20	338356	165680	7.8400
CPT03 20	338358	165687	7.1100
CPT04 20	338362	165689	6.2700
CPT05 20	338366	165692	6.1900
CPT06 20	338402	165714	6.6200
CPT07 20	338406	165717	6.7200
CPT08 20	338410	165720	7.3400
CPT09 20	338412	165727	8.0000
CPT10 20	338418	165718	7.9200

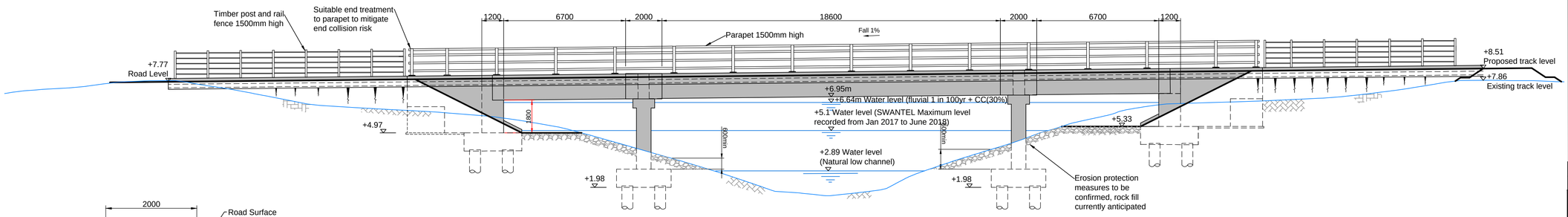
RISK WARNING.

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RISKS:

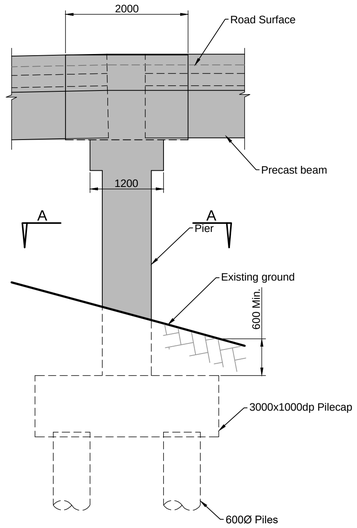
1. WORK ADJACENT TO WATER
2. WORK ON A SLOPE

LOCATION PLAN
NTS

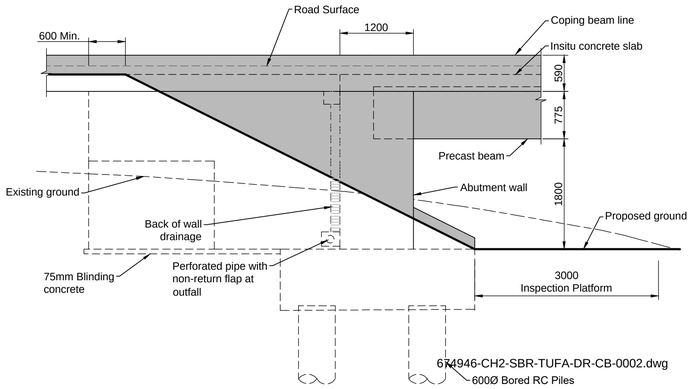
LOCATION PLAN
NTS



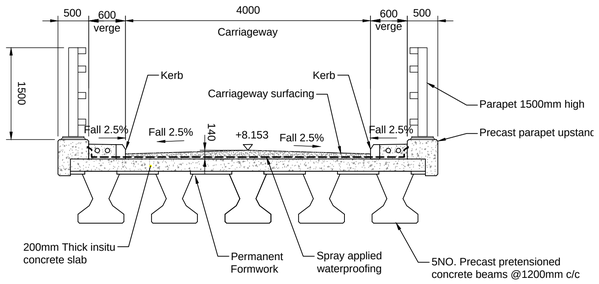
ELEVATION B-B
Scale 1:125



TYPICAL PIER ELEVATION
Scale 1:50



TYPICAL ABUTMENT ELEVATION
Scale 1:50



SECTION C-C
Scale 1:50

SECTION A-A
Scale 1:50

DO NOT SCALE

ORDINANCE SURVEY

NOTES

1. BASED ON ch2m DRAWING NUMBER 674946-CH2-SBR-TUFA-DR-CB-0002 P6 DATED JUNE 2018
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. LEVELS ARE IN METRES ABOVE ORDINANCE DATUM (A.O.D)
4. THIS DRAWING SHOULD NOT BE SCALED AND ONLY WRITTEN DIMENSIONS SHOULD BE USED.

0 1000 2000 3000 4000 5000
SCALE 1:50 (A1) MILLIMETRES
SCALE 1:100 (A3)

0 1 2 3 4 5 10
SCALE 1:125 (A1) METRES
SCALE 1:250 (A3)

0 5 10 20
SCALE 1:200 (A1) METRES
SCALE 1:400 (A3)

P2	05/07/2018	IM	NEW CPT POSITIONS ADDED AND 4 BH REMOVED	KM	KS
P1	04/07/2018	IM	FIRST ISSUE	KM	KS

DRAWING STATUS: S2 - FOR INFORMATION

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wsp.com

CLIENT: North Somerset Council

ARCHITECT:

SITE/PROJECT: YEO BANK FARM BRIDGE

TITLE: PROPOSED EXPLORATORY HOLE LOCATION PLAN

SCALE @ A1:	CHECKED:		APPROVED:
AS SHOWN AT A1	KM		KS
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70061747	KM	IM	July 19

DRAWING No: 70061747-GEO-001 REV: P2

ANNEX 1 Bill of Quantities for Ground Investigation

Preamble amendments and additions
The following clauses are amended or added to the Preamble:

None

Bill A General items, provisional services and additional items

Number	Item description	Unit	Quantity	Rate	Amount £
A	**General items, provisional sums and additional items**				
A1	Offices and stores for the Contractor	sum	Not required		
A2	Establish on site all plant, equipment and services for a Green Category site	sum	1		
A3	Extra over Item A2 for a Yellow Category site	sum	Not required		
A4	Maintain on site all site safety equipment for a Yellow Category site	week	Not required		
A5	Decontamination of equipment during and at end of intrusive investigation for a Yellow Category site	sum	Not required		
A6	Appropriate storage, transport and off-site disposal of contaminated arisings and any PPE equipment, excluding laboratory testing	provisional sum			
A7	Provide professional attendance in accordance with Clause 3.5.2				
A7.1	Provide Technician	p.day	Not required		
A7.2	Provide Graduate Ground Engineer	p.day	Not required		
A7.3	Provide Experienced Ground Engineer	p.day	8		
A7.4	Provide Registered Ground Engineering Professional	p.day	Not required		
A7.5	Provide Registered Ground Engineering Specialist	p.day	Not required		
A7.6	Provide Registered Ground Engineering Advisor	p.day	Not required		
A8	Establish the location and elevation of the ground at each exploratory hole	sum	1		
A9	Preparation of Health and Safety documentation and Safety Risk Assessment	sum	1		
A10	Facilities for the Investigation Supervisor	sum	Not required		
A11	Vehicle(s) for the Investigation Supervisor	v.wk	Not required		
A12	Fuel for vehicle for the Investigation Supervisor	provisional sum	Not required		
A13	Investigation Supervisor's telephone and facsimile charges	provisional sum	Not required		
A14	Deliver selected cores and samples to the specified address	provisional sum	Not required		
Number	**Item description**	**Unit**	**Quantity**	**Rate**	**Amount £**

A15	Special testing and sampling required by Investigation Supervisor	provisional sum	Not required		
A16	Traffic safety and management	provisional sum	Not required		
A17	One master copy of the Desk Study Report	sum	Not required		
A18	Additional copies of the Desk Study Report	nr	Not required		
A19	One master copy of the Ground Investigation Report (or specified part thereof)	sum	1		
A20	Additional copies of the Ground Investigation Report (or specified part thereof)	nr	Not required		
A21	Electronic copy of Ground Investigation Report (or specified part thereof)	sum	1		
A22	One master copy of the Geotechnical Design Report (or specified part thereof)	sum	Not required		
A23	Additional copies of the Geotechnical Design Report (or specified part thereof)	nr	Not required		
A24	Electronic copy of Geotechnical Design Report in (or specified part thereof)	sum	Not required		
A25	Digital data in AGS transfer format	sum	1		
A26	Hard-copy photographs	nr	Not required		
A27	Photographic volume	nr	Not required		
A28	Long term storage of geotechnical samples (Appendix B)	provisional sum	Not required		
A29	Long term storage of geoenvironmental samples (Appendix B)	provisional sum	Not required		
	Contract specific additional bill items None				
Total section A carried to summary					

Bill B Percussion Boring

Number	Item description	Unit	Quantity	Rate	Amount £
B	**Percussion Boring**				
B1	Move boring plant and equipment to the site of each exploratory hole and set up	nr	Not required		
B2	Extra over Item BI for setting up on a slope of gradient greater than 20%	nr	Not required		
B3	Break out surface obstruction where present at exploratory borehole	h	Not required		
B4	Advance borehole between existing ground level and 10 m depth	m	Not required		
B5	As Item B4 but between 10 m and 20 m depth	m	Not required		
B6	As Item B4 but between 20 m and 30 m depth	m	Not required		
B7	As Item B4 but between 30 m and 40 m depth	m	Not required		
B8	As Item B4 but between 40 m and 50 m depth	m	Not required		
B9	Advance borehole through hard stratum or obstruction	h	Not required		
B10	Provide aquifer protection measures at a single aquiclude/aquifer boundary or cross contamination control measures at a single soil boundary in a borehole	nr	Not required		
B11	Backfill borehole with cement/bentonite grout or bentonite pellets	m	Not required		
B12	Standing time for borehole plant, equipment and crew	h	Not required		
	<u>Dynamic sampling</u>				
B13	Move dynamic sampling equipment to the site of each exploratory hole and set up	nr	4		
B14	Extra over Item BI3 for setting up on a slope of gradient greater than 20%	nr	2		
B15	Advance dynamic sample hole between existing ground level and 5 m depth	m	20		
B16	As Item B15 but between 5 m and 10 m depth	m	20		
B17	As Item B15 but between 10 m and **30 m** depth	m	50		
B18	Standing time for dynamic sampling equipment and crew	hr	Rate only		
B19	Provision of dynamic sampling equipment and crew for sampling as directed by the Investigation Supervisor; maximum depth 15 m	day	Not required		
B20	Backfill dynamic sampling hole with cement/bentonite grout or bentonite pellets	m	90		

Number	Item description	Unit	Quantity	Rate	Amount £
	Contract specific additional bill items None				
				Total section B carried to summary	

Bill C Rotary Drilling

Number	Item description	Unit	Quantity	Rate	Amount £
C	**Rotary drilling**				
	Hand augering		Not required		
	Continuous flight and hollow stem flight augering		Not required		
	Rotary drilling with and without core recovery				
C15	Move rotary drilling plant and equipment to the site of each exploratory drillhole and set up	nr	Included in B13		
C16	Extra over Item C15 for setting up on a slope of gradient greater than 20%	nr	Included in B13		
C17	Extra over Item C15 for setting up drilling plant for inclined drillhole	nr	Not required		
C18	Break out surface obstructions where present at exploratory drillhole	h	Not required		
C19	Standing time for rotary drilling plant, equipment and crew	h	Rate only		
C20	Provide aquifer protection measures at a single aquiclude/aquifer boundary in a drillhole	nr	Not required		
	Drilling without cores				
	Drilling to obtain cores				
C34	Rotary drill in materials other than hard strata to obtain cores of the specified diameter between existing ground level and 10 m depth	m	Not required		
C35	As Item C34 but between 10 m and 20 m depth	m	Rate only		
C36	As Item C34 but between 20 m and 30 m depth	m	Rate only		
C37	As Item C34 but between 30 m and 40 m depth	m	Not required		
C38	As Item C34 but between 40 m and 50 m depth	m	Not required		
C39	Extra over Items C34 to C38 for use of semi-rigid core liner	m	Rate only		
C40	Extra over Items C34 to C38 for coring inclined rotary drillhole	m	Not required		
C41	Rotary drill in hard strata to obtain cores of the specified diameter between existing ground level and 10 m depth	m	Not required		
C42	As Item C41 but between 10 m and 20 m depth	m	Rate only		
C43	As Item C41 but between 20 m and 30 m depth	m	30		

Number	Item description	Unit	Quantity	Rate	Amount £
C44	As Item C41 but between 30 m and 40 m depth	m	Rate only		
C45	As Item C41 but between 40 m and 50 m depth	m	Not required		
C46	Extra over items C41 to C45 for use of semi-rigid liner	m	Not required		
C47	Extra over items C41 to C45 for coring inclined rotary drillhole	m	Not required		
C48	Backfill rotary drillhole with cement/bentonite grout or bentonite pellets	m	30		
C49	Core box to be retained by client	nr	Not required		
	Rotary percussive drilling		Not required		
	Resonance (sonic) drilling		Not required		
	Sonic drilling without cores		Not required		
	Sonic drilling to obtain cores		Not required		
	Contract specific additional bill items				
	None				
				Total section C carried to summary	

Bill D Pitting and Trenching

Number	Item description	Unit	Quantity	Rate	Amount £
D	**Pitting and trenching**				
	Inspection pits				
D1	Excavate inspection pit by hand to 1.2 m depth	nr	14		
D2	Extra over Item D1 for breaking out surface obstructions	h	Not required		
	Trial pits and trenches		Not required		
	Observation pits and trenches		Not required		
	Daily provision of pitting crew and equipment		Not required		
	General		Not required		
	Contract specific additional bill items				
	None				
				Total section D carried to summary	

Bill E Sampling and monitoring during intrusive investigation

Number	Item description	Unit	Quantity	Rate	Amount £
E	**Sampling and monitoring during intrusive investigation**				
	Samples for geotechnical purposes				
E1	Small disturbed sample	nr	128		
E2	Bulk disturbed sample	nr	28		
E3	Large bulk disturbed sample	nr	Rate only		
E4.1	Open tube sample using thick-walled (OS-TK/W) sampler	nr	Rate only		
E4.2	Open tube sample using thin-walled (OS-T/W) sampler	nr	20		
E5	Piston sample	nr	10		
E6	Groundwater sample	nr	4		
E7	Ground gas sample	nr	Not required		
E8	Cut, prepare and protect core sub sample	nr	28		
	Continuous or semi-continuous sampling		Not required		
	Containers for contamination assessment and WAC testing				
E14.1	Provision of containers and collection of samples for contamination Suite E (S1.20.3)	nr	52		
E14.2	Provision of containers and collection of samples for contamination Suite F (S1.20.3)	nr	Rate only		
E14.3	Provision of containers and collection of samples for contamination Suite G (S1.20.3)	nr	Rate only		
E15.1	Provision of containers and collection of samples for WAC Suite H (S1.20.5)	nr	Not required		
E15.2	Provision of containers and collection of samples for WAC Suite I (S1.20.5)	nr	Not required		
E15.3	Provision of containers and collection of samples for WAC Suite J (S1.20.5)	nr	Not required		
	Contract specific additional bill items				
	None				
				Total section E carried to summary	

Bill F Probing and cone penetration testing

Number	Item description	Unit	Quantity	Rate	Amount £
F	**Probing and cone penetration testing**				
	Dynamic probing		Not required		
	Cone penetration testing				
F8	Bring static cone penetration test equipment to the site of each test location	nr	10		
F9	Extra over Item F8 for setting up on a slope of gradient greater than 20%	nr	Rate only		
F10	Carry out static cone penetration test measuring both cone and sleeve resistance from existing ground level to 10 m depth	m	100		
F11	As Item F10 but between 10 m and 20 m depth	m	100		
F12	As Item F10 but between 20 m and 30 m depth	m	Rate only		
F13	As Item F10 but between 30 m and 40 m depth	m	Not required		
F14	Extra over Items F10 to F13 for use of piezocone	m	200		
F15	Extra over Items F10 to F13 for interpretation of CPT/CPTU data	m	200		
F16	Carry out dissipation test up to 1 hour duration	nr	4		
F17	Extra over Item F16 for test duration exceeding 1 hour	h	Rate only		
F18	Standing time for static cone penetration test equipment and crew	h	Rate only		
F19	Extra over Items F10 to F13 for use of seismic cone	m	Not required		
F20	Carry out seismic cone test	nr	Not required		
F21	Extra over Item F20 for interpretation of seismic cone data	nr	Not required		
F22	Standing time for seismic cone test equipment and crew	h	Not required		
	Contract specific additional bill items				
	None				
				Total section F carried to summary	

Bill G Geophysical testing

Number	Item description	Unit	Quantity	Rate	Amount £
G	**Geophysical testing**				
	Land based mapping techniques		Not required		
	Land based profiling techniques		Not required		
	Land based borehole techniques		Not required		
	Overwater		Not required		
	Contract specific additional bill items				
	None				
				Total section G carried to summary	

Bill H In situ testing

Number	Item description	Unit	Quantity	Rate	Amount £
H	**In situ testing**				
H1	Standard penetration test in borehole	nr	30		
H2	Standard penetration test in rotary drillhole	nr	24		
H3	In situ density testing				
H3.1	Small pouring cylinder method	nr	Not required		
H3.2	Large pouring cylinder method	nr	Not required		
H3.3	Water replacement method	nr	Not required		
H3.4	Core cutter method	nr	Not required		
H3.5	Nuclear method	day	Not required		
H4	California Bearing Ratio test	nr	Not required		
H5	Vane shear strength test in borehole	nr	Not required		
H6	Penetration vane test, penetration from ground level	nr	Not required		
H7	Hand penetrometer test (set of 3 readings)	nr	Not required		
H8	Hand vane test (set of 3 readings)	nr	Rate only		
	Other tests		Not required		
	Permeability testing		Not required		
	Self-boring pressuremeter		Not required		
	High pressure dilatometer		Not required		
	Driven or push-in pressuremeter		Not required		
	Menard pressuremeter		Not required		
	Soil infiltration test		Not required		
	Miscellaneous site testing		Not required		
	Contract specific additional bill items				
	None				
				Total section H carried to summary	

Bill I Instrumentation

Number	Item description	Unit	Quantity	Rate	Amount £
I	**Instrumentation**				
	Standpipes and piezometers		Not required		
I15	Standpipe and piezometer development		Not required		
	Slip indicators		Not required		
	Contract specific additional bill items				
	None				
				Total section I carried to summary	

Bill J Installation monitoring and sampling

Number	Item description	Unit	Quantity	Rate	Amount £
J	**Installation monitoring and sampling** (during Fieldwork Period)		Not required		
	Installation monitoring and sampling (post Fieldwork Period)		Not required		
	Contract specific additional bill items None				
				Total section J carried to summary	

Bill K Geotechnical laboratory testing

Number	Item description	Unit	Quantity	Rate	Amount £
K	**Geotechnical laboratory testing**				
K1	Classification				
K1.1	Moisture content	nr	40		
K1.2	Liquid limit, plastic limit and plasticity index	nr	20		
K1.3	Volumetric shrinkage	nr	Not required		
K1.4	Linear shrinkage	nr	Not required		
K1.5	Density by linear measurement	nr	Not required		
K1.6	Density by immersion in water or water displacement	nr	Not required		
K1.7	Dry density and saturation moisture content for chalk	nr	Not required		
K1.8	Particle density by gas jar or pyknometer	nr	Not required		
K1.9	Particle size distribution by wet sieving	nr	8		
K1.10	Particle size distribution by dry sieving	nr	Rate only		
K1.11	Sedimentation by pipette	nr	8		
K1.12	Sedimentation by hydrometer	nr	Rate only		
K2	Chemical and electrochemical				
K2.1	Organic matter content	nr	8		
K2.2	Mass loss on ignition	nr	Not required		
K2.3	Sulphate content of acid extract from soil	nr	Not required		
K2.4	Sulphate content of water extract from soil	nr	Not required		
K2.5	Sulphate content of groundwater	nr	Not required		
K2.6	Carbonate content by rapid titration	nr	Not required		
K2.7	Carbonate content by gravimetric method	nr	Not required		
K2.8	Water soluble chloride content	nr	Not required		
K2.9	Acid soluble chloride content	nr	Not required		
K2.10	Total Sulphur content	nr	Not required		
K2.11	Total dissolved solids	nr	Not required		
K2.12	pH value	nr	Not required		
K2.13	Resistivity	nr	Not required		

Number	Item description	Unit	Quantity	Rate	Amount £
K2.14	Redox potential	nr	Not required		
K3	Compaction related				
K3.1	Dry density/moisture content relationship using 2.5 kg rammer	nr	4		
K3.2	Dry density/moisture content relationship using 4.5 kg rammer	nr	Not required		
K3.3	Dry density/moisture content relationship using vibrating rammer	nr	Not required		
K3.4	Extra over Items K3.1, K3.2 and K3.3 for use of CBR mould	nr	Not required		
K.3.5	Maximum and minimum dry density for granular soils	nr	Not required		
K3.6	Moisture Condition Value at natural moisture content	nr	Not required		
K3.7	Moisture Condition Value/moisture content relationship	nr	Not required		
K3.8	Chalk crushing value	nr	Not required		
K3.9	California Bearing Ratio on recompacted disturbed sample	nr	Not required		
K3.10	Extra over Item K3.9 for soaking	day	Not required		
K4	Compressibility, permeability, durability				
K4.1	One-dimensional consolidation properties, test period 5 days	nr	6		
K4.2	Extra over Item K4.1 for test period in excess of 5 days	day	12		
K4.3	Measurements of swelling pressure, test period 2 days	nr	Not required		
K4.4	Measurement of swelling, test period 2 days	nr	Not required		
K4.5	Measurement of settlement on saturation, test period 1 day	nr	Not required		
K4.6	Extra over Items K4.3 to K4.5 for test period in excess of 2 or 1 day (s)	day	Not required		
K4.7	Permeability by constant head method	nr	Not required		
K4.8	Dispersibility by pinhole method	nr	Not required		
K4.9	Dispersibility by crumb method	nr	Not required		
K4.10	Dispersibility by dispersion method	nr	Not required		
K4.11	Frost heave of soil	nr	Not required		
K5	Consolidation and permeability in hydraulic cells		Not required		
K6	Shear strength (total stress)				
K6.1	Shear strength by the laboratory vane method (set of 3)	nr	Not required		

Number	Item description	Unit	Quantity	Rate	Amount £
K6.2	Shear strength by hand vane (set of 3)	nr	Not required		
K6.3	Shear strength by hand penetrometer (set of 3)	nr	Not required		
K6.4	Shear strength of a set of three 60 mm × 60 mm square specimens by direct shear, test duration not exceeding 1 day per specimen	nr	Not required		
K6.5	Extra over Item K6.4 for test durations in excess of 1 day per specimen	sp.day	Not required		
K6.6	Shear strength of a single 300 mm × 300 mm square specimen by direct shear, test duration not exceeding 1 day	nr	Rate only		
K6.7	Extra over Item K6.6 for test durations in excess of 1 day	day	Rate only		
K6.8	Residual shear strength of a set of three 60 mm × 60 mm square specimens by direct shear, test duration not exceeding 4 days per specimen	nr	Not required		
K6.9	Extra over Item K6.8 for test durations in excess of 4 days per specimen	sp.day	Not required		
K6.10	Residual shear strength of a 300 mm square specimen by direct shear, test duration not exceeding 4 days	nr	Not required		
K6.11	Extra over Item K6. 10 for test duration in excess day of 4 days	day	Not required		
K6.12	Residual shear strength using the small ring shear apparatus at three normal pressures, test duration not exceeding 4 days	nr	Not required		
K6.13	Extra over Item K6.12 for test duration in excess of 4 days	day	Not required		
K6.14	Unconfined compressive strength of 38 mm diameter specimen	nr	Not required		
K6.15	Undrained shear strength of a set of three 38 mm diameter specimens in triaxial compression without the measurement of pore pressure	nr	10		
K6.16	Undrained strength of a single 100 mm diameter specimen in triaxial compression without the measurement of pore pressure	nr	10		
K6.17	Undrained shear strength of single 100 mm diameter specimen in triaxial compression with multistage loading and without measurement of pore pressure	nr	Not required		
K7	Shear strength (effective stress)				
K7.1	Consolidated undrained triaxial compression test with measurement of pore pressure (set of three 38 mm specimens), test duration not exceeding 4 days per specimen	nr	Not required		

Number	Item description	Unit	Quantity	Rate	Amount £
K7.2	As K7.1 but single-stage or multi-stage test using 100 mm diameter specimen	nr	Not required		
K7.3	Consolidated drained triaxial compression test with measurement of volume change (set of three 38 mm specimens), test duration not exceeding 4 days per specimen	nr	Not required		
K7.4	As Item K7.3 but single stage or multi stage test using 100 mm diameter specimen, test duration not exceeding 4 day	nr	6		
K7.5	Extra over Items K7.1 and K7.3 for test duration in excess of 4 days per specimen	sp.day	Not required		
K7.6	Extra over Items K7.2 and K7.4 for test duration in excess of 4 days	day	12		
K8	Rock testing				
K8.1	Natural water content of rock sample	nr	10		
K8.2	Porosity/density using saturation and calliper techniques	nr	Not required		
K8.3	Porosity/density using saturation and buoyancy	nr	Not required		
K8.4	Slake durability index	nr	Not required		
K8.5	Soundness by magnesium sulphate	nr	Not required		
K8.6	Magnesium sulphate test	nr	Not required		
K8.7	Shore scleroscope	nr	Not required		
K8.8	Schmidt rebound hardness	nr	Not required		
K8.9	Resistance to fragmentation	nr	Not required		
K8.10	Aggregate abrasion value	nr	Not required		
K8.11	Polished stone value	nr	Not required		
K8.12	Aggregate frost heave	nr	Not required		
K8.13	Resistance to freezing and thawing	nr	Not required		
K8.14	Uniaxial compressive strength	nr	25		
K8.15	Deformability in uniaxial compression	nr	Not required		
K8.16	Indirect tensile strength by Brazilian test	nr	Not required		
K8.17	Undrained triaxial compression without measurements of porewater pressure	nr	Not required		
K8.18	Undrained triaxial compression with measurement of porewater pressure	nr	Not required		
K8.19	Direct shear strength of a single specimen	nr	Not required		

Number	Item description	Unit	Quantity	Rate	Amount £
K8.20	Swelling pressure test	nr	Not required		
K8.21	Measurement of point load strength index of rock specimen (set of ten individual determinations)	nr	Not required		
K8.22	Single measurement of point load strength on core sample (either axial or diametral test	nr	50		
	Ground/groundwater aggressivity				
K9.1	Suite A (Greenfield site – pyrite absent), Schedule 1.19.6	nr	Not required		
K9.2	Suite B (Greenfield site – pyrite present) , Schedule 1.19.6	nr	20		
K9.3	Suite C (Brownfield site – pyrite absent) , Schedule 1.19.6	nr	Not required		
K9.4	Suite D (Brownfield site – pyrite present), Schedule 1.19.6	nr			
	Contract specific additional bill items				
	None				
				Total section K carried to summary	

Bill L Geoenvironmental laboratory testing

Number	Item description	Unit	Quantity	Rate	Amount £
L	**Geoenvironmental laboratory testing**				
	Contamination testing				
L1.1	Suite E (Soil samples Schedule S1.20.3)	nr	32		
L1.2	Suite F (Water samples Schedule S1.20.3)	nr	Rate only		
L1.3	Suite G (Gas samples Schedule S1.20.3)	nr	Not required		
	Waste acceptance criteria testing				
L2.1	Suite H (Inert waste landfill Schedule S1.20.5)	nr	Not required		
L2.2	Suite I (Stable non-reactive hazardous waste in non-hazardous waste landfill Schedule S1.20.5)	nr	Not required		
L2.3	Suite J (Hazardous waste landfill Schedule S1.20.5)	nr	Not required		
	Contract specific additional bill items				
	None				
				Total section L carried to summary	

Summary of Bill of Quantities

		£
A.	General items and provisional sums	
B.	Percussion boring	
C.	Rotary drilling	
D.	Pitting and trenching	
E.	Sampling during intrusive investigation	
F.	Probing and cone penetration testing	
G.	Geophysical testing	
H.	In situ testing	
I.	Instrumentation	
J.	Installation monitoring and sampling	
K.	Geotechnical laboratory testing	
L.	Geoenvironmental laboratory testing	
	Total tender	

CV of Supervising Engineer enclosed **Yes/No**
Method Statements enclosed **Yes/No**

Signature……...

Signed By……..

On Behalf of (Company)……

Date…….

Appendix A. Rates for Ground Practitioners and other Personnel

Item	Item Description	Unit	Rate
1	Technician	h	
2	Graduate ground engineer	h	
3	Experienced ground engineer	h	
4	Registered Ground Engineering Professional	h	
5	Registered Ground Engineering Specialist	h	
6	Registered Ground Engineering Advisor	h	
7	Expenses incurred by staff on site visits who are resident by agreement with the Investigation Supervisor	day	
8	Rate per kilometer[1] from Contractor's premises and return for Items 1, 2 and 3	km[1]	
9	As above but for Items 4, 5 and 6	km[1]	
10	All other expenses incurred in conjunction with a site visit where a return journey is made on the same day for Items 1, 2 and 3	visit	
11	As above but for Items 4, 5 and 6	visit	
12	All other expenses incurred in connection with a visit where an overnight stay is necessary for Items 1, 2 and 3	overnight	
13	As above but for Items 4, 5 and 6	overnight	
[1] where considered more appropriate, 'mile' may be used			

Estimate of costs under Appendix A to the Bill of Quantities where the provision of the Contractor's staff for work in accordance with Specification Clauses 3.5.2, 3.6.1 and 3.6.2 cannot be adequately specified at tender. **(To be assessed by the Investigation Supervisor)**

Appendix B. Long-term sample storage

Item	Item Description	Unit	Rate
Geotechnical Samples			
1	Dynamic (windowless) samples	nr	
2	Rotary drilling core in core box	nr	
3	Rotary drilling core sub-samples	nr	
4	Bulk samples	nr	
5	Large bulk samples	nr	
6	Open-tube samples (thick-wall sampler)	nr	
7	Open-tube samples (thin-wall sampler)	nr	
8	Disturbed samples	nr	
9	Groundwater samples	nr	
10	Delft samples	nr	
11	Mostap samples	nr	
12	Piston Samples	nr	
Contamination Samples		nr	
13	Soil samples in plastic tubs	nr	
14	Soil samples in glass containers	nr	
15	Groundwater samples	nr	
16	Gas samples	nr	
Where samples comprise more than one container, the rate entered shall be per container			

Estimate of costs under Appendix B to the Bill of Quantities for long-term storage of samples where required in S1.12.2 and S1.12.10. **(To be assessed by the Investigation Supervisor)**