

CampbellReith
consulting engineers

Confidential

Kilnwood Vale, Crawley

Ground Gas Venting Wells Specification

For

Crest Nicholson

Project No: 11950

December 2025

Campbell Reith Hill LLP
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KILNWOOD VALE, CRAWLEY

GAS VENT WELLS SPECIFICATION

Project Specification Revision Record

Date	Clause Revisions	Prepared By	Checked By
19/12/25		APP	SMB
29/01/26		APP	SMB

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Invitation to Tender

APP11950-2026-01-29-Neighbourhood Centre-Gas Vent Wells Specification-F3 Date 29 January 2026

Martin Cooper Principal Engineer
Harrison Group Environmental Ltd
Colchester: Colchester Business Centre, 1 George Williams Way, Colchester, CO1 2JS
London: Unit 12, Waterways Business Centre, Navigation Drive, Enfield, EN3 6JJ
Norwich: Kimberley Street, Norwich, NR2 2RJ
Cambridge: 1 Francis Court, High Ditch Road, Fen Ditton, Cambridge, CB5 8TE

Dear Martin

Kilnwood Vale, Crawley – Gas Vent Wells Specification

Having expressed an interest in submitting a re-measurable Tender for the site investigation to the above project, we have pleasure in enclosing, on behalf of Crest Nicholson, one set of tender documents together with a copy of the Instructions to Tenderers for your consideration.

Your attention is drawn to the following:

1. Pre-selection has been undertaken and the number of tenderers invited is one.

2. Information as to the site, the main construction works and the Employer's Requirements are detailed in the tender documents in Schedules 1 to 5.

3. The successful tenderer will be in full charge of the supervision and direction of the investigation, and he will be responsible for advising ourselves of any changes which, in his opinion, are necessary to ensure the satisfactory performance and completion of the investigation.

4. Tenderers must accept responsibility for the proper performance of the investigation and shall assume performance of the role of Principal Contractor under the CDM Regulations (2015) unless otherwise notified. If the tenderer is not prepared to accept these duties notice should be given within 3 days of tender receipt.

5. Unless noted otherwise in Schedule 1, the Employer has appointed ourselves to act as the Investigation Supervisor for the investigation contract.

6. Having regard to the constraints imposed by the Employer and our knowledge of the site, we have prepared a suggested layout for the investigation as indicated on the attached drawing. The tenderers will be responsible for advising us of any shortcomings of which they might reasonably be aware in these proposals when submitting their tender.

7. Tenders will be assessed on their technical merits as well as price. Accordingly, the Employer gives no guarantee that the lowest tender or any tender will be accepted.

8. To be considered, tenders must be submitted without qualifications in accordance with the attached Instructions to Tenderers, and must be received at the address specified on or before 16th January 2026.

   If, after reviewing the documentation, you are unable to submit a tender we will be grateful if you would advise the undersigned by telephone or email at the earliest opportunity.

Yours faithfully
for and on behalf of CAMPBELL REITH HILL LLP
Encls
Neighbourhood Centre Addendum Ground Assessment Report; Figures; Designers Risk Assessment; Historic Borehole Logs

Kilnwood Vale, Crawley
Gas Vent Wells Contract

Instructions to Tenderers

1. The Employer has endeavoured to provide (but without responsibility) desk study information as he has available to assist tenderers. Tenderers remain responsible for collecting any further information required and for evaluating all relevant information necessary to ensure the proper performance of the investigation.

2. The successful tenderer is required to indemnify the Employer against any damage caused by his activities to underground or above ground services, infrastructure or Japanese knotweed.

3. The following specification is based on the 'UK Specification for Ground Investigation', 2nd Edition, published by ICE Publishing 2012. Tenderers should note the contents and requirements of Schedules 1 to 5 and they must prepare, complete and submit with their tender Schedules 6 to 8 inclusive, as they will all form part of the Contract.

4. In preparing and completing Schedules 6 to 8 the Tenderer must take account of and comply with the requirements of Schedules 1 to 5. Any tenders, which do not contain all the information required or are divergent from the requirements of Schedules 1 to 5 may be rejected. To assist tenderers we provide the following notes for guidance in completing these schedules.

5. Schedule 6: List of Activities

   This should contain the following:-

   a) An indication of the minimum period for mobilisation from placement of order together with an estimate of the earliest start date.

   b) A detailed program indicating time periods required for the various phases of investigation including site works, monitoring periods/dates, production of testing schedules, laboratory testing draft and final report production.

   c) Details of areas of land required for investigation and for storage of investigation equipment.

   d) Proposals for accessing any confined/enclosed areas of land for investigation purposes.

   e) A description of any particular investigative procedures or equipment proposed which warrant further mention due to particular merits.

   f) The provisions proposed for Health and Safety and content of the Construction Phase Health and Safety plan for the duration of investigation where the Principal Contractor.

6. Schedule 7: Information Required

   The tenderer is to list any information concerning the investigation, which he requires the Employer to provide, and he must state when each item of information will be required.

7. Schedule 8: List of Premises and Subcontractors

   The Employer needs to know the office where the Contract will be administered from together with the address of any subcontractors (including laboratories) to be used.

   The tenderer shall also provide confirmation of professional accreditation and quality assurance schemes in which the tenderer and subcontractors participate.

8. Schedules 6 to 8 should be completed and may include additional documents, provided these are clearly incorporated in, and physically attached to, the form provided.

Bill of Quantities

9. The Tenderers are required to complete the attached Bill of Quantities for the Investigation. This Bill of Quantities is based upon that included in the 'UK Specification for Ground Investigation', 2nd Edition, published by ICE Publishing in 2012 and will be used by the Engineer to ascertain and determine by admeasurement the value of all payments to the Contractor.

In preparing the Bill of Quantities, tenderers should comply with the following:-

a) The Bill of Quantities must be prepared in accordance with the Preamble provided in the Specification.

b) All quantities (including those of sampling and testing) must be a true and accurate estimate of the anticipated final quantities and the rates must reflect the actual costs for each particular element of the investigation.

c) The Bill of Quantities is to be prepared on the basis of the investigation outlined on the attached CampbellReith drawing(s) together with the requirements of Schedules 1 to 5. Where the tenderer is of the opinion that there are other works required in addition to those described in the Schedules a supplementary Bill of Quantities is to be prepared and included in the tender for the items which the specialist feels should be carried out as a result of his review.

d) The Bill of Quantities should include an item which identifies the rate for further technical advice following completion of the investigation.

e) The Bill of Quantities should include a general contingency item equal to 10% of the Tender Sum which will only be expended in whole or in part on the instruction of the Engineer.

10. Tenderers must be prepared to enter into a Contract based on the Conditions of Contract provided after the Form of Tender. The successful tenderer shall, if requested and subject to the payment of an appropriate fee, enter into a collateral warranty (form to be agreed with the Employer) for which approval will not be unreasonably withheld.

11. The following completed documents must be submitted with the tender:

Form of Tender (and Appendix)
Form of Agreement
List of Activities (Schedule 6)
Information Required (Schedule 7)
List of Premises and Subcontractors (Schedule 8)
Bill of Quantities

12. CDM Regulations apply and the successful tenderer will be required to act as Principal Contractor except when noted in Schedule 1.8. All works shall be carried out in accordance with Construction Phase Plan to be produced by the Principal Contractor based on the Pre-construction information provided.

13. Unless stated elsewhere, tenderers are expected to have visited the site during the preparation of their tender. No additional costs to the client will be considered as a result of the tenderer not having inspected the site.

14. Tenders must be submitted by e-mail marked "SI Tender (11950)" addressed to antonyphin@campbellreith.com and simonburr@campbellreith.com addresses on or before 16th January 2026.

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Desk Study Information

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CONDITIONS OF CONTRACT

The Terms and Conditions of appointment shall be the ICC Infrastructure Conditions of Contract - Ground Investigation Version, August 2011. The following amendments, omissions and additions apply:

- Amendments to the Infrastructure Conditions of Contract Payment Provisions. Reference: ICC/Payment/October 2011.
- Amendments to the Infrastructure Conditions of Contract CDM Provisions. Reference: ICC/CDM/May 2015.

FORM OF TENDER

To Chloe Swain, Technical Coordinator
Crest Nicholson
c/o CampbellReith
SI Tender (11950)
15 Bermondsey Square
London
SE1 3UN

Dear Chloe

Kilnwood Vale, Crawley – Gas Vent Wells Specification

Having examined the Drawings, Conditions of Contract, Specification and Schedules 1 to 5 and having completed the Bill of Quantities for the construction of the above-mentioned investigations and Schedules 6 to 8, we offer to undertake and complete the whole of the said investigations in conformity with the said Drawings, Conditions of Contract, Specification, Schedules and Bill of Quantities for such sum as may be ascertained in accordance with the said Conditions of Contract.

We warrant that all skill and care was taken in designing the Investigation and acknowledge that the Bill of Quantities includes everything that could have reasonably been foreseen for the satisfactory completion of the Investigation.

We undertake to complete and deliver the whole of the investigations comprised in the Contract with reasonable diligence within the times stated in the Contract.

Unless and until a formal agreement is prepared and executed this Tender together with your written acceptance thereof, shall constitute a binding Contract between us.

We understand that you are not bound to accept the lowest or any tender you may receive.

Yours sincerely

Signature.....

Address.....

Date.....

FORM OF TENDER (APPENDIX)

(NOTE: Relevant Clause numbers are shown in brackets)

Appendix - Part 1 (to be completed prior to the invitation to tender)

1.	Name of the Employer Address:	Crest Nicholson 500 Dashwood Lang Road, Bourne Business Park, Addlestone, Surrey, United Kingdom, KT15 2HJ
2.	Name of the Engineer Address:	Campbell Reith Hill LLP 15 Bermondsey Square London SE1 3UN
3.	Defects Correction Period	12 weeks
4.	Number and type of copies of Drawings to be provided	Figure 1 – Site Location Figure 2 – Site Layout Plan and Proposed Vent Well Locations Figure 3 – Site Cross Section Figure 4 – Proposed Development and Vent Well Locations
5.	Form of Agreement	Required
	If required	Signed
6.	Performance Bond	Not required
	Amount of Bond (if required) to be	n/a
7.	Minimum amount of third party insurance (persons and property) for each and every occurrence	£5,000,000
8.	The liability of the Contractor under his Professional Indemnity shall be	£2,000,000
9.	Commencement Date (Date of instruction)	Week 0
10.	Time for completion calculated from the Commencement Date	
	Sections of the Investigation	
	Section	
	A - Completion of site works.	Week 5
	B - Release of preliminary information (draft report) in accordance with Specification Schedule S1.21.12	Week 52
	C - The Remainder of the Investigation (Final Report)	Week 54
11.	Liquidated damages for delay	Not required

12.	Method of measurement adopted in preparation of Bills of Quantities	"Site Investigation in Construction, 'UK Specification for Ground Investigation', 2nd Edition (2012)"
13.	Rate of retention (recommended not to exceed 5%)	0%
14.	Limit of retention (% of Tender Total) (Recommended not to exceed 3%)	0%
15.	Bank whose Base Lending Rate is to be used	Bank of England
16.	Name of the Client Name of the Principal Designer Name of the Principal Contractor	Crest Nicholson Crest Nicholson TBD
17.	Period for Approval	Testing Schedule: 1 week Draft Report: 2 weeks Final Report: 1 week
18.	Maximum sum for the Contractor to make changes without an instruction	£250
19.	The arbitration procedure to be used is	a) The Institution of Civil Engineers' Arbitration Procedure (1997)

FORM OF AGREEMENT

THIS AGREEMENT made the _____ day of _____ 20 .

BETWEEN

of

in the County of (hereinafter called "the Employer")

and

of

in the County of (hereinafter called "the Contractor")

WHEREAS the Employer is desirous that certain Investigations should be carried out in connection with

_____

_____

and has accepted a Tender by the Contractor for the carrying out of the Investigation.

NOW THIS AGREEMENT WITNESSETH as follows

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement, namely

   a) the said Tender and the written acceptance thereof
   b) the Drawings
   c) the Conditions of Contract
   d) Schedules 1 to 8
   e) the Specification
   f) the priced Bill of Quantities

3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned the Contractor hereby covenants with the Employer to carry out the Investigation in conformity in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay to the Contractor in consideration of the carrying out of the Investigation the Contract Price at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed the day and year first above written.

SIGNED on behalf of the said ..... Ltd/plc (the Employer)

Signature ..... Signature .....

Position ..... Position .....

In the presence of ..... In the presence of .....

SIGNED on behalf of the said ..... Ltd/plc (the Contractor)

Signature ..... Signature .....

Position ..... Position .....

In the presence of ..... In the presence of .....

or

SIGNED AS A DEED by the said .....

..... Ltd/plc (the Employer)

In the presence of .....

SIGNED AS A DEED by the said .....

..... Ltd/plc (the Contractor)

In the presence of .....

SCHEDULES 1 - 8

Specification

The Specification shall be the '*UK Specification for ground investigation',* 2nd Edition published by ICE Publishing, with the 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

Schedule 1: Information and site-specific requirements

S1.1 Name of Contract
Kilnwood Vale, Crawley, Ground Gas Venting Wells

S1.2 Investigation Supervisor
To be determined

S1.3 Description of Site
The site is located to the east of Kilnwood Vale Primary School and accessed via Illett Way and Calvert Link, as indicated in Figures 1 & 2.

The site, including the wider area, was subject to a cut and fill exercise, to build a cohesive engineering platform, placed and compacted to an end-product earthworks specification. Beneath the engineering platform is construction waste landfill, under which lies the Weald Clay formation, as shown on the site cross section in Figure 3. A desk study is included with this specification.

The site recently comprised a compound for construction of nearby residential properties.

S1.4 Main works proposed and purpose of this contract

To install and monitor ground gas in pressure relief venting wells in areas of open space adjacent to a proposed public house and low-rise houses (see Figure 4), installed on a nominal 15m grid over a known area of trapped methane in the construction waste landfill.

Following a preliminary 12-month, monthly ground gas monitoring period, there may be a requirement for further quarterly spot monitoring for a further two years. At the end of the spot monitoring period, high frequency ground gas monitoring will be required.

If the assessment of results confirm ground gas vent wells are no longer required, wells are to be decommissioned in accordance with EA guidance.

S1.5 Scope of Investigation

- 15 cable percussion boreholes, each drilled to a nominal depth of 9 metres below ground level (bgl) into the residual landfill material;
- full-time supervision;
- in-situ testing during drilling (infrared methane gas monitor and temperature readings);
- all exploratory holes and levels to be surveyed to Ordnance Datum;
- installation of 100mm diameter gas monitoring wells within the boreholes, pipework projecting above the ground with removable spinning cowls;
- 12 no. monthly spot monitoring rounds at the borehole locations for methane and flow rates; and,
- A short-term high-frequency monitoring period with data logging (hourly for up to 2 weeks) to assess efficacy of venting and influence of water levels and atmospheric variables on borehole gauge pressure and gas flow rate.
- A rate for decommissioning boreholes at the end of the monitoring period – cut excess pipe, backfill response zone with sand and seal with bentonite to base of subsoil / topsoil layer.

S1.6 Geology and Ground Conditions

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

Layer	Thickness (approx.) (m)	Description	Key Properties / Observations
Engineered Fill	2.0	Class 2c general cohesive fill	95% compaction of Maximum Dry Density- 10% Air Void Ratio- Undrained Shear Strength: 50 kPa- Permeability: < 1×10^{-7} m/s- CBR ≥ 3%- FTOC < 4%
Residual Construction Waste Landfill	8.0	Soft to firm heterogeneous clay with variable gravel	Gravel may include stiff clay, silt, sand, crushed brick, concrete, chalk, organic material (wood fragments), and ash. Occasional presence of plastic, glass, and metal. Elevated concentrations of methane and borehole flow rate to be anticipated.
Weald Clay Formation	80	Shales, mudstones, and siltstone	Normally dark grey, can weather to mottled yellow/brown firm to stiff clay

S1.7 Schedule of Drawing(s) and Documents

The client will provide any services information that he may hold to the wining tenderer. The accuracy and completeness of any such information cannot be guaranteed and would be provided without responsibility.

Figure 1 – Site Location
Figure 2 – Site Layout Plan and Proposed Vent Well Locations
Figure 3 – Site Cross Section
Figure 4 – Proposed Development and Vent Well Locations
Neighbourhood Centre Addendum Ground Gas Assessment

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

The Contractor is to act as a Contractor under the CDM 2015 Regulations. All necessary information shall be provided to the Principal Contractor who is responsible for the maintenance of the Construction Phase Plan'. In which case item A9a in the BoQ should be modified back to that in the 'Yellow Book'.

The Contractor should note there are amendments and additions to the Standard Clauses - refer to Schedules 4 and 5.

S1.8.1 Quality Management System (Clause 3.3)

- Accreditation to BS EN ISO 9001 is required.

S1.8.2 Professional Attendance (Clause 3.5.2)

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

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

The larger Kilnwood Vale site was subject to cut and fill earthworks to provide a developable platform for residential, commercial, community and public open space end use, with associated pathways, roads, car parking and hard and soft landscaping.

The site geology comprises Engineered Fill placed over residual landfill, underlain by Weald Clay. Surcharge loading to induce settlement of the residual landfill was carried out across the majority of the larger site.

Surface emission surveys and borehole monitoring detected elevated concentrations and flow rates of methane across the site. This is due to locally present biodegradable materials such as wood fragments, fibrous materials and occasional tree stumps that remain in the residual landfill, which have created a reservoir of gas, but which are not thought to be actively generating gas at any significant rate. The proportions of ground gases in the residual landfill are not that of a municipal type landfill (64% methane and 34% carbon dioxide), with methane concentrations often >80% in certain boreholes and carbon dioxide <5% at steady state in all boreholes.

Soil sampling for chemical validation was carried out on the Engineered Fill. However, the Contractor should consider asbestos in soils as a presumed risk. The Contractor shall review the information provided at tender stage and make provision for any additional assessments needed to appraise the associated risks in order to safely control the works.

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

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

S1.8.7 Protected species (Clause 3.7.4)

S1.8.8 Archaeological remains (Clause 3.7.5)

S1.8.9 Security of site (Clause 3.11)

S1.8.10 Traffic management measures (Clause 3.12)

S1.8.11 Restricted working hours (Clause 3.13)

S1.8.12 Trainee site operatives (Clause 3.14.1)

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

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)

1 hour – after which time phone the investigation supervisor.

S1.8.15 Reinstatement requirements (Clause 3.16)

As per surrounding.

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

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

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

- The as built positions of all exploratory holes shall be related to the National Grid system to an accuracy of 0.50m.
- The elevation of the ground at each exploratory hole shall be related to Ordnance Datum to the nearest 0.05m.

S1.8.19 Photography requirements (Clause 3.25)

Photographs are required. Photographs shall be supplied within the digital copy of the report.

S1.8.20 Approvals

S1.8.21 Meetings

Investigation supervisor will meet the Contractor on site on the first day.

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

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

S1.9.2 Backfilling (Clause 4.5)

S1.9.3 Dynamic sampling (Clause 4.6)

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

S1.10.1 Augering requirements and restrictions (Clauses 5.1)

S1.10.2 Particular rotary drilling techniques (Clause 5.2)

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

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

S1.10.5 Core logging (Clause 5.4.6)

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

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

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

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

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

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

S1.10.12 Backfilling (Clause 5.7)
S1.10.13 Core photographic requirements (Clause 5.8)

Photographs are required in accordance with Cl 5.8.

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

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

The Contractor shall complete a service scan of each proposed exploratory location to confirm it is free of detectable services. Where services are suspected, known or found to be in close proximity to the proposed exploratory hole, the Investigation Supervisor should be consulted so that the hole is relocated in a position, which is clear of services. The revised location should take into account statutory/required safe distances from services. If the location of the exploratory hole cannot be moved, further inspection pits are to be excavated

to confirm the services location and ensure that they will be unaffected by the investigation. This may need the approval of the utility company.

The use of inspection pits should, wherever possible, prove the positive presence of services rather than their absence. In some cases, inspection pits may need to be excavated beyond 1.20m bgl in order to be appropriate. This may include areas where land has been raised since services installation or to locate services at greater depth (e.g. foul sewer and high-voltage electricity cables). As a general reference, please consult and adhere to:

Health & Safety Executive (HSE) Publication HSG47, *Avoiding Danger from Underground Services*, Third Edition, 2014.

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

S1.11.3 Entry of personnel (Clause 6.5)

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

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

S1.11.6 Backfilling (Clause 6.10)

S1.11.7 Photographic requirements (Clause 6.12)

S1.11.8 Artificial lighting (Clause 6.12.2)

Artificial lighting shall be provided as required to obtain suitable photographs.

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

S1.11.10 Foundation Inspection Pits

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

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

This clause also refers to samples taken for contamination testing.

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

This clause also refers to samples taken for contamination testing.

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

Not required

S1.12.4 Open-tube and piston sample diameters (Clause 7.6.5)
S1.12.5 Retention of cutting shoe samples (Clause 7.6.5)

S1.12.6 Delft and Mostap sampling (Clause 7.6.12)

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

S1.12.8 Special geotechnical sampling (Clause 7.8)

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

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

S1.12.11 Frequency of sampling for contamination testing (Clause 7.9.4)

Not required

S1.12.12 Sampling method (Clause 7.9.5)

Where insufficient sample volumes are available to provide the soil samples described under S1.12.11, the Contractor shall notify the Engineer and request alternative instructions.

S1.12.13 Headspace testing (Clause 7.9.8)

S1.12.14 Sample Containers and Deviating Samples (Clause 7.9.6)

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)

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

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

S1.13.4 Seismic cone equipment requirements (Clause 8.3.1)

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

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

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

S1.14.1 Geophysical survey objectives (Clause 9.1.1)

S1.14.2 Requirement for Ground Specialist geophysicist (Clause 9.1.1)

S1.14.3 Trials of geophysical methods (Clause 9.1.1)

S1.14.4 Types of geophysics required (Clause 9.1.1)

S1.14.5 Information provided (Clause 9.2)

S1.14.6 Horizontal data density (Clause 9.3)

S1.14.7 Level datum (Clause 9.4)

S1.14.8 Geophysical survey report (Clause 9.7)

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

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

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

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

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

S1.15.5 Menard pressuremeter tests (Clause 10.5.3)

S1.15.6 Soil infiltration test (Clause 10.6)

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

S1.15.8 Interface probes (Clause 10.8)

S1.15.9 Contamination screening tests (Clause 10.9)

S1.15.10 Metal detection (Clause 10.10)

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

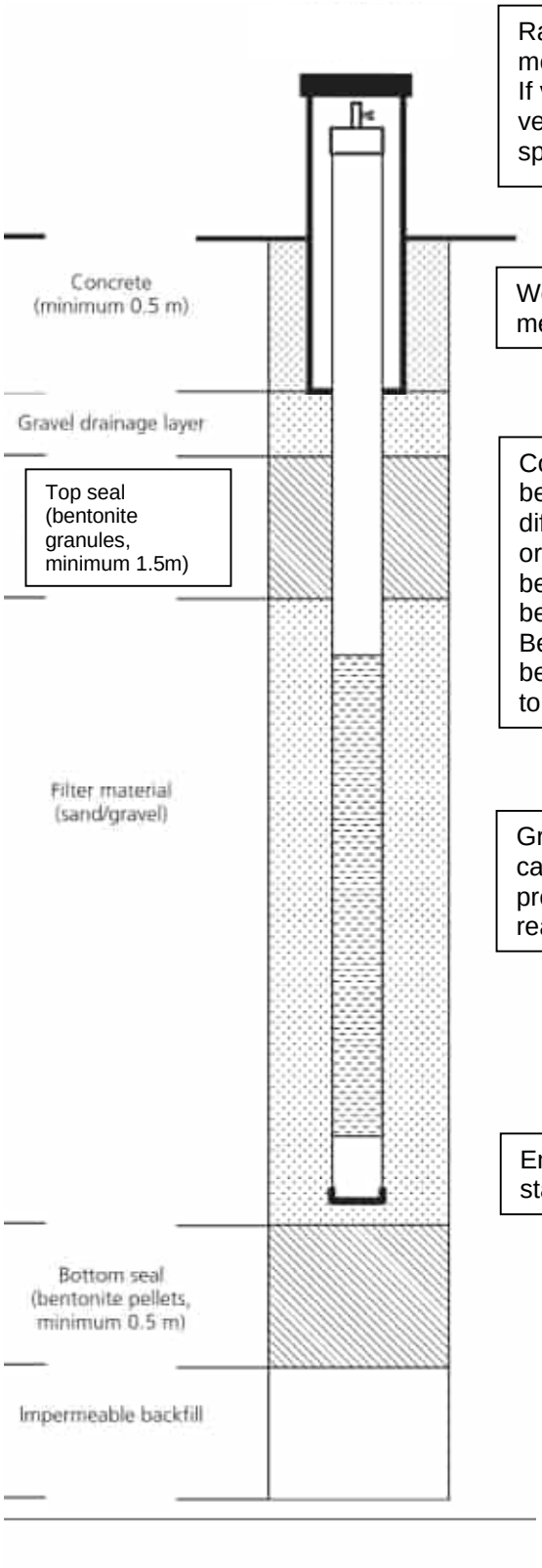
S1.16.1 Protective covers for installations (Clause 11.2)

Raised cover and rubber bung to be used unless noted otherwise in Schedule 2.

S1.16.2 Protective fencing (Clause 11.3)

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

Standpipes shall be constructed as indicated on Drawing AII.1 of the specification, noting the increase in top seal thickness in order to avoid creating a pathway to surface. Additional detail on standpipe construction is taken from Industry Code of Practice for the Management of Landfill Gas, Section 7[1].



Raised pipe fitted with rotating cowl that can be removed for monitoring.
If vent wells remain into the final development detailed design for vent boxes is to be determined – currently outside scope of this specification.

Well casing to be 100mm, HDPE, SDR11 for sufficient mechanical strength

Correct hydration of the bentonite seal is essential. The bentonite should be granules rather than pellets, as pellets are difficult to hydrate properly. The bentonite should be pre-mixed or tipped directly into standing water. Regular rehydration may be required, especially in the drier months. Bentonite slurry can be pumped in under pressure using special equipment. Bentonite is best poured one dry bag at a time and the poured bentonite fully hydrated before the next bag is used. This helps to prevent bridging.

Gravel size to be large enough not to fall through holes in casing. Gravel should be rounded rather than angular to prevent tight packing, and free of calcerous stone as this can react with the ground gas and blind the gravel pack.

End cap fitted prior to installation to prevent debris entering standpipe.

[1] https://esauk.org/document/industry-code-of-practice-for-the-management-of-landfill-gas/

S1.16.4 Other piezometer installations (Clause 11.4.3)

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

S1.16.6 Ground gas standpipes (Clause 11.5)

The Contractor should note there are amendments to the Clause to which this Schedule relates - refer to Schedule 4. In particular, installations should conform to BS8576:2013.

S1.16.7 Inclinometer installations (Clause 11.6)

S1.16.8 Slip indicators (Clause 11.7)

S1.16.9 Extensometers and settlement gauges (Clause 11.8)

S1.16.10 Settlement monuments (Clause 11.9)

S1.16.11 Removal of installations (Clause 11.10)

S1.16.12 Other instrumentation (Clause 11.11)

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

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

The Contractor should note there are amendments to the Clause to which this Schedule relates - refer to Schedule 4.

S1.17.2 Groundwater sampling from installations (Clause 12.3.1)

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

S1.17.4 Ground gas monitoring (Clause 12.4)

The Contractor should note there are amendments to the Clause to which this Schedule relates - refer to Schedule 4.

Spot monitoring rounds

1. The Contractor is to make monthly (12 no.) return visits to site for spot monitoring. Samples containers shall be compliant with S1.12.14.

2. For the initial rounds, gas taps and bungs are to be left off of the standpipes between monitoring rounds to allow the wells to vent to atmosphere.

3. Samples containers (as required) shall be compliant with S1.13.7 The following parameters shall be monitored and recorded on each visit to the site. Items b) to e) shall proceed in the order stated and the gas tap shall be closed between the flow and gas concentration stages.

    a. Weather conditions on the day of and 24 hours prior to the visit.
    b. Downhole temperature.
    c. Downhole pressure and the flow rate should be recorded every minute over a 10 minute period.
    d. Concentrations (% vol) of CH4, CO2 and O2 (ppm) over a 10-minute period with concentrations recorded every minute.
    e. Water level

4. If water is encountered the Investigation Supervisor may instruct removal.

5. Investigation Supervisor approval shall be obtained prior to commencement of any laboratory analysis of gas samples.

6. The Investigation Supervisor may instruct that prolonged pumping gas monitoring is undertaken over a period of up to 2 hours on selected wells.

7. Monitoring on-site shall generally be undertaken using portable handheld equipment. The performance specification and accuracy of the equipment employed shall meet the requirements of Table 2 in BS8576: 2013 and be stated in the final report.

8. Any damage to the monitoring installation or incidents of open gas taps upon arrival shall be Recorded.

9. The name of the person monitoring shall be stated and wherever possible the same person shall be used on each monitoring visit to maximise consistency. Monitoring visits shall be coordinated so as to include ‘worst case’ events comprising periods of rapidly falling barometric pressure.

Continuous Gas monitoring period

10. At the end of the 12 month spot monitoring period – or sooner if the results and assessment of the spot monitoring allow – continuous ground gas flow and concentration monitoring for a period of 2 weeks to be provided on 5no. of the monitoring well installations.

11. 2 weekly visits over 2 weeks will be made to spot monitor the continuous monitored installations and the remaining 10 installations and obtain samples as per S1.17.5

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

If concentrations of CH_4 exceed 50.0% vol., concentrations of CO_2 exceed 30.0% vol, concentrations of Volatile Organic Compounds (VOCs) exceed 20ppm or concentrations of oxygen are less than 5% vol, collect gas samples – contact investigation supervisor to confirm requirement.

S1.17.6 Other monitoring (Clause 12.8)

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

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

S1.18.1 Information for daily records (Clause 13.1)

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

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

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

The Investigation Supervisor will schedule the geotechnical, contamination and waste testing.

S1.19.2 Tests required (Clause 14.1.2)

- Refer to Section K of the Bill of Quantities.
- The Contractor shall inform the Investigation Supervisor at tender stage if testing procedures are to vary from those specified.

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

All geotechnical testing to be undertaken in accordance with BS 1377 unless separately detailed in the Schedules 1.19.6 and 1.19.8 or as described below.

Moisture Content (Water Content) tests are to be undertaken in accordance with the current version of BS EN ISO 17892-1.

Bulk Density tests are to be undertaken in accordance with the current version of BS EN ISO 17892-2.

Particle Density tests are to be undertaken in accordance with the current version of BS EN ISO 17892-3.

Particle size distribution tests are to be undertaken in accordance with the current version of BS EN ISO 17892-4.

Incremental loading oedometer tests are to be undertaken in accordance with the current version of BS EN ISO 17892-5.

Fall cone tests are to be undertaken in accordance with the current version of BS EN ISO 17892-6.

Unconfined compression tests are to be undertaken in accordance with the current version of BS EN ISO 17892-7.

Unconsolidated undrained triaxial tests are to be undertaken in accordance with the current version of BS EN ISO 17892-8.

Consolidated triaxial compression tests on water saturated soils are to be undertaken in accordance with the current version of BS EN ISO 17892-9.

Direct shear tests are to be undertaken in accordance with the current version of BS EN ISO 17892-10.

Permeability tests are to be undertaken in accordance with the current version of BS EN ISO 17892-11.

Determination of liquid and plastic limits are to be undertaken in accordance with the current version of BS EN ISO 17892-12.

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

UKAS accreditation is required for all geotechnical tests.

S1.19.5 Rock testing requirements (Clause 14.5)

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

S1.19.7 Laboratory testing on site (Clause 14.7)

S1.19.8 Special laboratory testing (Clause 14.8)

SCHEDULE 1.19.6 (Derived from BRE Special Digest SD1)

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

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

S1.20.2 Accreditation Required (Clause 15.2)

The Contractor should note CampbellReith have made an amendment to the Clause to which this Schedule relates. The Contractor should refer to Schedule 4 for these requirements.

The Contractor shall notify the Investigation Supervisor where any accreditation cannot be achieved or when any sample deviates prior to reporting (refer to UKAS 'Guidance on Deviating Samples').

S1.20.3 Chemical testing for contamination (Clause 15.3)

The chemical analytical laboratory shall be Contractor selected. The Contractor shall refer to following tables indicating the contamination test suites for soil, water and gas which may be required as part of the works. All analytical tests are required on a maximum 10 day turnaround.

The Contractor shall notify the Investigation Supervisor where any Limit of Detection (LOD) cannot be achieved. The Contractor shall state in his tender return where any test method inserted in Schedule 1.20.3 cannot be achieved.

pH tests on soils and groundwater and sulphate tests on groundwater are to comply with methods prescribed S1.19.6

SCHEDULE 1.20.3

PRIMARY SOIL ANALYSIS SUITES (CONTRACTOR TO COMPLETE METHOD AND LAB)

		LOD
s1.1	As, Be, B, Cd, Cr, Cu, Ni, Pb, Hg, Se, V, Zn	1mg/kg
	Cyanide (total)	1mg/kg
	pH	Unit 0.1%
	TPH screen (C6-C40)	10mg/kg
	PAH (16 speciated)	0.01mg/kg
	Phenol (total)	0.01mg/kg

		LOD
s1.2	Phenol (total)	0.01mg/kg
s1.3	Asbestos in Soil using stereo microscopy	Detected
s1.4	Total Organic Carbon	%
s1.5	Sulphate (total)	50 mg/kg

		LOD
s1.6	As, Be, B, Cd, Cr, Ni, Pb, Hg, Se, Cu, V, Zn,	1mg/kg
	Hexavalent Chromium	0.3mg/kg
	Moisture Content	0.1 %
	PAHs USEPA 16	0.01mg/kg
	EPH Banded (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, >C21)	0.01mg/kg
	Sulphate (total)	50 mg/kg
	Sulphide	15 mg/kg
	Phenols Monohydric (Total of Phenol+Cresol+Xylenol)	0.025mg/kg
	Cyanide (total)	1mg/kg
	pH	pH

		LOD
s1.7	TPH – CWG (C5-40) Aliphatic/Aromatic Split (with CWG banding) Ali C5-6,>6-8,>8-10,>10-12,>12-16,>16-35,>35-44 Aro - >C6-7,>7-8,>8-10,>C10-12,>12-16,>16-21,>21-35, >35-44	0.1mg/kg

		LOD	Method / Lab
s1.8	(As S1.3 above) Asbestos in Soil using stereo microscopy	Detected	Asbestos in Soil using stereo microscopy
s1.9	Identification of Asbestos in a Bulk material by PLM (e.g. identification of asbestos in a product such as a cement).	Present / Absent	HSG 248
s1.10	Gravimetric Quantification of Bulk Asbestos Products and Fibre Bundles in soils by PLM/PCOM	0.1%	HSG 248/HSG 264
s1.11	Detailed Gravimetric Quantification and Free Fibre Dispersion and Collection by PLM/COM	0.001%	HSG 248/HSG 264/HSE Report NO. 83/19964

		LOD
s1.12	Soil Leachate Preparation (specific determinants specified as water)	NA
s1.13	Fraction Organic Carbon (for NC/99/11)	Fraction

OTHER SOIL ANALYSIS

		LOD
	CLEA Metals (specify after CLR 8)	
	Barium	1mg/kg
	Water Soluble Boron	1mg/kg
	CLEA Inorganic Chemicals (specify after CLR 8)	
	Cyanide (Free)	1mg/kg
	Nitrate (soluble) as NO3	1mg/kg
	Nitrite (soluble) as NO2	0.01 mg/kg
	Water Soluble Sulphate as SO4 2:1 Extract	0.003g/l
	Sulphate (Total)	50mg/kg
	Non CLEA Inorganic Chemicals	
	Ammoniacal Nitrogen – as N	0.3mg/kg
	Fluoride	0.25mg/kg
	Nitrite	0.3mg/kg
	Phosphate	1mg/kg
	Sulphur (Elemental)	50mg/kg
	Sulphur (Total)	0.01%
	Thiocyanate	1mg/kg
	Non CLEA Miscellaneous	
	Leachate Prep – TCLP	NA
	Loss on ignition	0.10%
	Calorific Value	MJ/kg
	CLEA Organic chemicals	
	PAH (16 speciated) (Modified EPA 8100)	0.001mg/kg
	Benzo(K)fluoranthene	0.001mg/kg
	TPH – Risk Based Evaluation Package (C6-C40)	10mg/kg
	TPH – CWG (C5-35)	0.1mg/kg
	TPH – UK CWG (EC5 – EC70) for EA report P5-08/TR3	0.1mg/kg
	BTEX by GC-MS (	0.001mg/kg
	Phenols (speciated)	10mg/kg
	TLC (mineral oils, aromatics, NSO resins)	10mg/kg
	PCBs (7 congeners)	0.001mg/kg
	PCBs (total aroclors)	0.001mg/kg
	Acetone	0.001mg/kg
	CLEA Semi Volatile Organic Compounds (SVOCs)	
	SVOCs target list (Modified US EPA 8270)	0.1mg/kg
	SVOC scan (up to 10 peaks, >80% fit)	1mg/kg
	CLEA Volatile Organic Compounds (VOCs)	
	VOCs target list only (Modified US EPA 8260)	0.1mg/kg
	CLEA Organics	
	Glycol Suite: Monoethylene glycol, propylene glycol, diethylene glycol, triethyleneglycol	0.1mg/kg
	Alcohol suite: methanol, ethanol, i-oropanol, methyl acetate, n-propanol, ethyl acetate, i-propyl acetate, n-butanol, n-propyl acetate, n-oentanol, n-butyl acetate, n-hexanol, n-heptanol (both 1mg/kg)	0.1mg/kg
	Pesticides – Combined suite	0.001mg/kg
	Pesticides – Organochlorine suite	0.001mg/kg
	Pesticides – Organophosphorous suite	0.001mg/kg
	Total Organic Carbon (TOC)	0.01%
	Atrazine and simazine	0.01mg/kg
	Dioxins and furans	0.001mg/kg
	Organolead compounds	0.01mg/kg
	Organotin compounds	0.01mg/kg

DC - Distillation/colourmetric. IC - Ion Chromatography

PRIMARY WATER ANALYSIS SUITES (CONTRACTOR TO COMPLETE METHOD AND LAB)

		LOD
w1.1	As, Cd, Cr, Cu, Ni, Zn, Pb, Hg, B, Se, hex Cr	0.001mg/l
	Total cyanide, free cyanide, thiocyanate	1.0ug/l
	PAH (total), TPH (total), phenol (total)	0.1ug/l
	Sol sulphate, sulphide, free sulphur	0.1mg/l
	pH	0.01 units

		LOD
w1.2	PAH (total)	1mg/l
w1.3	PAH (total of USEPA 16)	0.01mg/l
w1.4	PAH (16 speciated) (Modified EPA 8100)	0.01ug/l
w1.5	TPH – CWG (C5-35) based on TNRCC method 1006	0.01mg/l
w1.6	Petrol Range Organics/BTEX/MTBE	0.01mg/l
w1.7	BTEX by GC-MS (Modified US EPA 8150)	0.001mg/1
w1.8	SVOCs target list (one extraction only) (Modified US EPA 8270)	0.001mg/l
w1.9	SVOC scan (up to 10 peaks, >80% fit)	0.01mg/l
w1.10	VOCs target list only (Modified US EPA 8260)	0.001mg/l
w1.11	VOCs target list plus TICs (top 10 peaks to 0.01mg/1 only) (Modified US EPA 8260)	0.001mg/l
w1.12	Phenols (total) by HPLC	0.01mg/l
w1.13	Phenols (speciated)	0.01mg/l

OTHER WATER ANALYSIS

		LOD
	Glycol Suite:	
	Monoethylene glycol, propylene glycol, diethylene glycol, triethylene glycol	1mg/l
	Alcohol suite	
	Methanol, ethanol, i-opropanol, methyl acetate, n-propanol, ethyl acetate, i-propyl acetate, n-butanol, n-propyl acetate, n-pentanol, n-butyle acetate, n-hexanol, n-heptanol.	1mg/l
	PCBs (7 congeners)	0.01µg/l
	PCBs (total aroclors)	0.001mg/l
	Pesticides - Combined suite	0.01µg/l
	Pesticides - Organochlorine suite	0.01µg/l
	Pesticides - Organophosphorous suite	0.01µg/l
	Total Organic Carbon (TOC)	1mg/l
	Tributyl-tin/triphenyl-tin/dibutyl tin	0.05ug/l
	Atrazine and simazine	0.01mg
	Inorganics	
	Ammoniacal Nitrogen	0.2mg/l
	BOD	1mg/l
	COD	10mg/l
	Chloride	1mg/l
	Complex Cyanide	0.05 mg/l
	Easily Lib Cyanide	0.05 mg/l
	Dissolved Oxygen	0.1mg/l
	Electrical Conductivity	0.01 mS/cm
	Nitrate	0.3mg/l

	Nitrite	0.05mg/l
	pH	0.01 units
	Sulphide	0.05mg/l
	Magnesium	0.001mg

PRIMARY GAS ANALYSIS SUITES (CONTRACTOR TO COMPLETE METHOD AND LAB)

		LOD
g1.1	Bulk Gas - Methane (0.05%), Carbon Dioxide (0.05%), Oxygen (0.5%), Nitrogen (0.5%), Hydrogen (0.5%), Carbon Monoxide (1ppm), Hydrogen Sulphide (1ppm)	0.05%
g1.2	C1-C7 (Methane, Ethane, Ethene, Butane, Propane, Pentane, Hexane, Heptane)	1ppm
g1.3	VOCs inc BTEX.	10ppm

S1.20.4 Waste characterisation (Clause 15.4)

The Contractor should note an addition to Clause 3.26 - refer to Schedule 5.

The Contractor shall be responsible for the disposal and waste classification of soils from the site investigation in line with Environment Agency requirements and shall make appropriate provision for this at tender stage.

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

All analytical tests for waste are required on a 10 day turnaround. The Contractor shall notify the Investigation Supervisor where any Limit of Detection (LOD) cannot be achieved.

WAC Leachate	LOD (mg/kg)
Eluates for compliance using BS EN 12457 - 2 at L/S 10 l/kg (mg/kg) (single stage)	
As	0.5
Ba	20
Cd	0.04
Cr	0.5
Cu	2
Hg	0.01
Mo	0.5
Ni	0.4
Pb	0.5
Sb	0.06
Se	0.1
Zn	4
Cl	800
F	10
SO_4	1000 [1]
Total dissolved Solids (TDS) [2]	4000
Phenol Index	1
Dissolved organic Carbon at own pH or pH7.5-8.0 [3]	500

[1] This limit value for sulphate may be increased by 6,000, provided that the value of Co from a percolation test does not exceed 1,500 mg/l at L/S=0.1 l/kg. It will be necessary to use a percolation test to determine the limit value at L/S – 0.1 l/k.

[2] The values for TDS can be used instead of the values for Cl and SO4.

[3] DOC at pH 7.5-8.0 and L/S 10 can be determined on eluate derived from a modified version of the pH dependence test, prEN 14429, if the limit value at own pH (BS EN 12457 eluate) is not met.

		LOD
Full WAC Soil Suite	TOC, LOI, BTEX, PCBs, Mineral Oil C10-C40 Acid Neutralisation Capacity, PAHs-total (17 GC-MS)	1% or mg/kg
Inert WAC Soil Suite	TOC,BTEX, PCBs, Mineral Oil C10-C40, PAHs-total (17 GC-MS) 1% or mg/kg	1% or mg/kg
Hazardous WAC Soil Suite	TOC, LOI	1%

S1.20.6 Laboratory testing (Clause 15.6)

S1.20.7 Special laboratory testing (Clause 15.7)

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

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

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

- Preliminary logs, Chain of Custody forms and blank test schedules shall be submitted to the Investigation Supervisor within 48hrs of exploratory hole completion.

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

- As required by Cl16.2.2 and additionally:
  (i) The results of any in situ tests associated with the location.
  (ii) Any visual or olfactory evidence of contamination and reference to/detail of any suspected asbestos containing materials (matrix and proportion).
  (iii) In all granular soils (including Made Ground) the state of density shall be classified in accordance with BS EN ISO 14688-2.
  (iv) In addition to natural fine soils, the consistency term shall be given for any Made Ground that would behave as a fine soil.
  (v) Made Ground descriptions shall be made in accordance with BS 5930:2015 supplemented by the 'Description of Anthropogenic Materials – A Practitioners' Guide', issued by the Association of Geotechnical and Geoenvironmental Specialists (AGS, 2018).
  (vi) For trial pits the ease/difficulty of excavation shall be recorded.
  (vii) For cores or excavations into rock the Fracture Index (FI) shall be recorded.
  (viii) The % recovery is to be recorded for dynamic sampling techniques.

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

AGS data is required in full incorporating both the main phase of fieldwork and all subsequent gas and water monitoring visits and iterative phases of chemical analysis. The data shall be checked by the Contractor prior to issue and be accompanied by the error log.

The environmental soils data should be provided in .hwol format if available from the testing laboratory.

S1.21.4 Preliminary digital data (Clause 16.5.3)

- Preliminary AGS digital data is to be issued as part of the draft report as follows:
  - Exploratory hole records and laboratory soils data (geotechnical, contamination and waste) upon completion of all scheduled testing and data from any completed monitoring. Files must include legend codes and all other relevant exploratory hole log data. Multiple files may be provided for gas and groundwater results provided they are uniquely identified.
- The environmental soils data should be provided in .hwol format if available from the testing laboratory.

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

A factual site investigation report as described in Schedule S1.21.8 is required.

S1.21.6 Electronic report requirements (Clause 16.6.3)

- PDF versions of the report shall make use of bookmarks in accordance with the guidance notes to Cl 16.6.3.
- For draft and final reports, drawings are to be additionally provided in DWG or DXF formats and must include: north arrow, scale and paper size, a key and title indicating the subject of the drawings.
- Draft and final reports are to include AGS data as detailed in S1.21.3 and S1.21.4, although the latter should be updated to include the completed monitoring programme.
- In addition the draft and final reports are to include the following information in relation to contamination and waste testing:
  - i) 'CrossTab' collated Microsoft Excel electronic copy of results;
  - ii) Laboratory formatted data and MCERTS supporting data; and,
  - iii) .hwol data (if available).
- Chemical analysis spread sheets shall be provided in:
  1. Excel spread sheet format that shall follow a consistent order and format for rows and columns to allow direct referencing across a given row/column for either a single determinant across all exploratory samples or vice versa.
  2. Separate sheets shall be provided for the analysis results for soil, water, leachate and gas.
  3. Each of the spread sheet fields shall be populated free of hidden data, spaces, or other insertions (other than explained symbols) that inhibit interpretation of data.
  4. The detection limit applicable to each chemical analysis, agreed at appointment, shall remain consistent throughout the works.
  5. The units of expression shall be consistent (e.g micrograms or milligrams) and shall remain consistent throughout the works for a given medium and parameter.
- Sample data shall be submitted to the Engineer electronically as soon as the complete data (eg. Schedule requested) becomes available and within 12 working days of receiving the applicable testing schedule from the Engineer

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

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

- A factual report as described in Cl 16.8.1, Cl 16.8.2 and Cl 16.8.3 is required, with the following additions:
  Cl 16.8.1 items (c) and (h): key sheets are to be additionally provided;
  Cl 16.8.1 Item (c): Chain of Custody records are to be additionally provided for all contamination and waste samples;
  Cl 16.8.1 Item (d): Calibration certificates are to be additionally provided where calibration is required by the testing standard adopted.
- In addition, the contractor is to provide a section of the report detailing any known limitations to the in situ, ex situ or monitoring test results provided.

S1.21.11 Times for supply of electronic information (Clause 16.10.1)

- Preliminary AGS data is required as discussed in S1.21.4 and AGS data is required upon issue of the draft and final reports. Drawings to be additionally provided in DWG or DXF formats at the time of issue of draft and final reports.
- If available, .hwol data shall be provided as given in S1.21.4 and is required upon issue of the draft and final reports.

S1.21.12 Electronic information transmission media (Clause 16.10.2)

- Preliminary data to be issued via e-mail.
- Draft and Final reports and associated data to be issued via e-mail and on CD or DVD ROM.

S1.21.12 Report approval (Clause 16.11)

- One electronic copy of the report is required for draft issue. This is the 'Preliminary Information' referred to in the Appendix to the Form of Tender.
- One electronic copy of the report is required for final issue. This must be a signed copy.
- The period of approval will be that given in the Appendix to the Form of Tender.

S1.21.13 Contents of an Interpretative Phase 2 Report for Contamination

Schedule 2: Exploratory Holes

S2.1 Hole number

See table

S2.2 Type

See table

S2.3 Scheduled depth

See table

S2.4 National grid reference

See table and Figure 2

S2.5 Approximate ground level

Approx. 85.5m AOD

S2.6 Remarks

See table

Hole number	Type	Scheduled depth (m)	Standpipe installation details	Sampling and in situ testing	Remarks
VW01	Cable percussion	9	100mm diameter standpipe with slotted section in residual landfill; Raised covers, rotating cowl. Gas bung and tap only fitted during spot monitoring. A minimum 1.5m Top Seal of bentonite granules.	IR gas monitor reading and temperature to be recorded every 1m during drilling	Elevated methane concentrations and flow rates are anticipated during drilling. Personal monitors / alarms will be required during drilling.
VW02					
VW03					
VW04					
VW05					
VW06					
VW07					
VW08					
VW09					
VW10					
VW11					
VW12					
VW13					
VW14					
VW15					

Before pulling off any borehole the Investigation Supervisor is to be contacted to confirm installation instructions.

The Investigation Supervisor is to be contacted at the end of each shift so as to be provided with an update of each day's progress.

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
2	2.3	Delete second sentence.	Replace with 'They shall be competent to undertake the work required which shall include site reconnaissance, supervision of trial pitting, boring and drilling, logging soils to BS5930:2015, making observations of potential contamination, sampling appropriately and liaison with site owners / occupiers'.
3	3.7.2	CDM (2007)	CDM (2015)
3	3.8.2	..to the CDM Coordinator	...to the Principal Designer
3	3.9	... at least one working days' notice...	...at least two working days' notice...
10	10.6	...BRE Digest 365 (2007)...	... BRE Digest 365 (2016)...
11	11.5	Delete the second sentence and the box reference to CIRIA C665	Installations shall be in accordance with Section 9.2.3 of BS 8576:2013
12.2	12.2	Add	On each occasion of groundwater monitoring, sample collection shall be accompanied by records of: i. Groundwater levels in standpipes; ii. Depth of installation (base of tip or base of pipe), to check any silting up in progress; iii. Thickness and depth of any hydrocarbon free product (LNAPL or DNAPL); iv. Description of water condition including water colour, odour, turbidity and any hydrocarbon free product.
12.4	12.4.1	Add	1. The following parameters shall be monitored and recorded on each visit to the site. Items iv to viii shall proceed in the order stated and the gas tap shall be closed between the flow and gas concentration stages. i) Weather conditions on the day of and 24 hours prior to the visit. ii) Air temperature. iii) Barometric Pressure on day of visit and preceding 3 days. iv) Downhole temperature. v) Downhole pressure and equilibrium flow rate. vi) Timed initial, peak and steady state equilibrium concentrations (% vol) of CH_4, CO_2 and O_2 (ppm) concentrations of Volatile Organic Compounds (VOCs) and flow rates up to 3 minutes. If equilibrium is not achieved after 3 minutes the rate and direction of concentration change shall be recorded.

			vii) If concentrations of CH_4 exceed 5.0% vol., concentrations of CO_2 exceed 10.0% vol, concentrations of Volatile Organic Compounds (VOCs) exceed 20ppm or concentrations of oxygen are less than 5% vol, collect gas samples for laboratory analysis then fully purge borehole with nitrogen, close valve and remeasure 60 minutes after purging. viii) If post purge concentrations of CH_4 exceed 5.0% vol., concentrations of CO_2 exceed 10.0% vol, concentrations of Volatile Organic Compounds (VOCs) exceed 20ppm or concentrations of oxygen are less than 5% vol, collect a second set of gas samples for laboratory analysis. Engineer approval shall be obtained prior to commencement of any laboratory analysis. 2. Monitoring on-site shall generally be undertaken using portable handheld equipment. The performance specification and accuracy of the equipment employed shall be stated in the final report. 3. Any damage to the monitoring installation or incidents of open gas taps upon arrival shall be recorded. 4. The name of the person monitoring shall be stated and wherever possible the same person should be used on each monitoring visit to maximise consistency. It is desirable monitoring visits are coordinated so as to include 'worst case' events comprising periods of rapidly falling barometric pressure. Where stated in Schedule S1.17.5 continuous gas monitors shall be deployed in the indicated wells and monitored over a minimum duration of 7 days unless stated otherwise. Gas sampling and flow rate shall be recorded. Further guidance is presented in BS 8576:2013.
15.2	15.2	Add	1. Where additional testing outside the original scope of works is required, the analytical methods shall be agreed between the Engineer and Contractor. 2. Only laboratories and analytical methods accredited to and compliant with the 'MCERTS all Performance Standard for Laboratories Undertaking Chemical Testing of Soil' shall be used. Laboratories shall be BS EN ISO/IEC 17025:2000 accredited.

			3. All analytical data presented shall be reported in accordance with the MCERTS Standard.

SCHEDULE 5: Specification additions

The following clauses are amended		
Section number	Clause number	Clause wording
3	3.15.1	Additional sentence: *'The Contractor shall take every reasonable precaution to ensure the safety of all persons entitled to be on the site and shall keep the site and site operations in an orderly state. He shall provide and maintain at his own expense all lights, guards, fencing and warning signs as may be required. Fencing shall be suitably robust. The Contractor shall reinstate surfaces/services in such a manner as to ensure that the Employer is safeguarded from any public liability associated with damage on accident.*
3	3.26	Additional sentence: 'The Contractor shall be fully responsible for the proper classification and disposal of all waste arisings that require removal from the site as part of the site investigation/and reinstatement works. The soil results produced as part of the works can be used, as appropriate, in this regard. Soils classification shall be in accordance with EA guidance document 'Guidance on the classification and assessment of waste' 1st Edition, Version 1.1, 2015; WM3 (as amended) and all subsequent best practice guidance amendments for waste.
3	3.27 (New Clause)	CDM 2015 The current site investigation is not considered to be notifiable under the Construction (Design and Management) Regulations 2015. The Contractor is required to act as the Principal Contractor unless an alternative party is stated in the Appendix to the Form of Tender. The Principal Designer is identified in the Appendix to the Form of Tender. The Contractor shall consider the preconstruction information referred to in S1.7 and hence develop the Construction Phase Plan.
3	3.28 (New Clause)	Sub Contracting Sub-contracting of any part of the works is not permitted unless the proposed sub-contractors are included in the tender or the written approval of the Engineer is obtained. All sub-contractors should have in place appropriate written quality control and quality assurance procedures. Evidence of UKAS accreditation for the specified testing and testing laboratory shall be provided to the Engineer in the tender.
3	3.29 (New Clause)	Asbestos It should be presumed that there is potential for asbestos containing materials to occur in the ground and structures at any site. Health and safety provisions shall be made by the Contractor to consider such an eventuality and to ensure the safety of workers. Particular care is to be taken during the site works to establish if bulk asbestos is present on the site. If asbestos is encountered which is either 'notifiable' or requires additional Health and Safety controls, all work of a disruptive nature is to cease and appropriate measures are to be agreed with the Engineer and the provisions of the Health and Safety Executive to render the asbestos safe in these circumstances. Work to be carried out in accordance with Control of Asbestos Regulations 2012.
12	12.19	Continuous Gas Monitoring. Continuous gas monitors shall be deployed in the indicated wells and monitored over a minimum duration of 7 days. Gas sampling and flow rate shall be recorded. Further guidance is presented in BS 8576:2013.

SCHEDULE 6: List of activities

(To be completed by the tenderer)

SCHEDULE 7: Information required

(To be completed by the tenderer)

SCHEDULE 8: List of premises and subcontractors

(To be completed by the tenderer)

BILL OF QUANTITIES FOR GROUND INVESTIGATION

PLEASE REFER TO SPREADSHEET

Appendix A. Rates for Geotechnical and Other Personnel

Rates shall be entered for the various grades of staff listed, who will be employed by agreement with the Engineer for advisory work for the Engineer on site on the conduct of the investigation, in accordance with Specification Clause 3.13 and Schedule 1 or subsequent to the preparation of the Site Investigation Report. This excludes the superintendence and technical direction required under the Conditions of Contract and the requirements of Clauses 3.12, 4.4.2, 5.3.6, 5.4.2, 6.5 and 7.11 which must be covered by the rates and prices entered in the main Bill of Quantities (see clause 1 of the preamble to the Bill of Quantities), and the preparation of the report which must be covered by the items in Section A of the Bill of Quantities.

Item	Item Description	Unit	Rate £
1	Technician	h	
2	Incorporated Engineer	h	
3	Graduate Engineer/Geologist/Environmental Scientist	h	
4	Graduate Engineer/Geologist/Environmental Contractor with at least 3 years of relevant experience since graduation	h	
5	Chartered Engineer/Geologist/Environmental Contractor with at least 5 years of relevant experience	h	
6	Principal chartered Engineer/Geologist/ Environmental Contractor with at least 10 years of relevant experience	h	
	Expenses incurred by staff on site visits or who are resident by agreement with the Engineer	h	
7	Fare per kilometre from Contractor's premises and return for Items 1, 2 and 3	km*	
8	As above but for Items 4, 5 and 6	km*	
9	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	
10	As above but for Items 4, 5 and 6	visit	
11	All other expenses incurred in connection with visit where an overnight stay is necessary for Items 1, 2, and 3	night	
12	As above but for Items 4, 5 and 6.	night	

* Where considered more appropriate, 'mile' may be used.

DESK STUDY INFORMATION

See enclosed information

DESIGNER'S RISK ASSESSMENT

See enclosed information

DRAWINGS

See enclosed information

REVISION HISTORY RECORD SHEET

Version No	Amendments Made	Date Approved
1	Update of CRH standard specification to NBS format	1985
2	General revision incorporating more extensive requirements for establishing the presence of contaminants and to better define near surface soils	1992
3	Reformatted SI specification in accordance with 'Recommendations for the procurement of ground investigation' by CIRIA 1986	1992
4	Instructions to tenderers and contract year amended	1994
5	General revisions, update and reformatting	1998
6	Revised to incorporate Thomas Telford Specification for Ground Investigation with revisions	Sept 2005
7	General revisions and update	Oct 2005
8	General revisions and update	Nov 2006
9	Amendments to require AGS data 3.1 format data and complete ground gas measurement in accord with CIRIA C659. Also instructions to tenderers emphasise responsibility for services is with the contractor.	Jan 2007
9.1	Accommodate the role of CDM coordinator Clarify analysis for asbestos in soils TPH testing that relates to GAC	August 2007
9.2	Update to Schedule 4: Appendix 4, Ref 1.1	July 2008
9.3	Update to Schedule 4 with (1.1B) Waste Suites	January 2009
10	Updated to MS word format	August 2009
10.1	Updated with minor amendments to chemical suites and notes on asbestos	May 2010
10.2	Change BS 10175: 2001 to BS 10175: 2011	April 2011
11	Comprehensive review to provide an update for ICE UK Specification for Ground Investigation SISG 2012. Particular additional controls also added for Asbestos in Soils.	May 2011
12	General revisions and update	March 2014
13	Amendment for CDM 2015	April 2015
14	Soil suites amended with S4UL metals	June 2017
15	General revisions and update. Collateral warranty reference amended. Continuous gas monitoring included. Gas concentration thresholds for gas samples increased	January 2020