**This document is executed as a deed and is delivered and takes effect at the date written at the beginning of it**

nec 4

Environment Agency

| | |
|---|---|
| **Framework:** | **Collaborative Delivery Framework** |
| **Supplier:** | **VolkerStevin Ltd** |
| **Company Number:** | **00288392** |
| **Geographical Area:** | **North West** |
| **Project Name:** | **Penketh and Whittle FRMS - Preliminary Works Contract** |
| **Project Number:** | **ENV0000148C** |
| **Contract Type:** | **Engineering Construction Contract** |
| **Option:** | [redacted] |
| **Contract Number:** | **33701** |
| **Stage:** | **Construction** |

| Revision | Status | | Originator | | Reviewer | | Date |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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**ENGINEERING AND CONSTRUCTION CONTRACT under the Collaborative Delivery Framework**
**CONTRACT DATA**

**Project Name** Penketh and Whittle FRMS - Preliminary Works Contract

**Project Number** ENV0000148C

This contract is made on Wednesday 18th August 2021
between the *Client* and the *Contractor*

- This contract is made pursuant to the Framework Agreement (the "Agreement") dated 01st day of April 2019 between the *Client* and the *Contractor* in relation to the Collaborative Delivery Framework. The entire agreement and the following Schedules are incorporated into this Contract by reference

- Schedules 1 to 21 inclusive of the Framework schedules are relied upon within this contract.

- The following documents are incorporated into this contract by reference

## Part One - Data provided by the *Client*

**Statements given in all Contracts**

**1 General**

The *conditions of contract* are the core clauses and the clauses for the following main Option, the Option for resolving and avoiding disputes and the secondary Options of the NEC4 Engineering and Construction Contract June 2017.

Main Option [redacted]

Option for resolving and avoiding disputes W2

Secondary Options

X2: Changes in the law

X5: Sectional Completion

X7: Delay damages

X9: Transfer of rights

X10: Information modelling

X11: Termination by the *Client*

X15: *Contractor's* design

X18 Limitation of Liability

X20: Key Performance Indicators

Y(UK)1: Project Bank Account

Y(UK)2: The Housing Grants, Construction and Regeneration Act 1996

Y(UK)3: The Contracts (Rights of Third Parties) Act 1999

Z: *Additional conditions of contract*

The *works* are

Preliminary works including GI, Contractor design of inverted siphon culvert, advance purchase of material and site compound establishment for Main Works

The *Client* is The Environment Agency

Address for communications

Horizon House
Deanery Road
Bristol
BS1 5AH

Address for electronic communications [redacted]

The *Project Manager* is

Address for communications

[redacted]

Address for electronic communications

The *Supervisor* is

Address for communications

Address for electronic communications

The Scope is in
ENV000148C-JAC-XX-00-SO-PM-0003 (V2.0)

The Site Information is in
ENV000148C-JAC-ZZ-00-TN-HS-0002 (P01)

The *boundaries of the site* are
Figures 1, 2 and 3 in S102 of the Scope

The *language of the contract* is English

The *law of the contract* is
*the law of England and Wales, subject to the jurisdiction of the courts of England and Wales*

The period for reply is 2 weeks

The following matters will be included in the Early Warning Register

Early warning meetings are to be held at intervals no longer than 2 weeks

**2 The *Contractor's* main responsibilities**

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

| *condition* to be met | *key date* |
|---|---|
| 'none set' | 'none set' |
| 'none set' | 'none set' |
| 'none set' | 'none set' |

The *Contractor* prepares forecasts of the total Defined Cost for the whole of the *works* at intervals no longer than 4 weeks

**3 Time**

The *starting date* is [redacted]

The *access dates* are
part of the Site
Access to FastDraft
Access to Site

The *Contractor* submits revised programmes at intervals no longer than 4 weeks

The *Completion Date* for the whole of the *works* is [redacted]

The *Client* is not willing to take over the *works* before the Completion Date

The period after the Contract Date within which the *Contractor* is to submit a first programme for acceptance is 4 weeks

**4 Quality management**

The period after the Contract Date within which the *Contractor* is to submit a quality plan is 4 weeks

The period between Completion of the whole of the *works* and the

*defects date* is 52 weeks

The *defect correction period* is 2 weeks except that
- The *defect correction period* for is
- The *defect correction period* for is

## 5 Payment

The *currency of the contract* is the £ sterling

The *assessment interval* is Monthly

The *Client* set total of the Prices is [redacted]

The *interest rate* is 2.00% per annum (not less than 2) above the Base rate of the Bank of England

The *Contractor's share percentages* and the *share ranges* are

[redacted]

## 6 Compensation events

The place where weather is to be recorded is The nearest calibrated Met Office Weather Station to the site

The *weather measurements* to be recorder for each calendar month are
- the cumulative rainfall (mm)
- the number of days with rainfall more than 5mm
- the number of days with minimum air temperature less than 0 degrees Celsius
- the number of days with snow lying at 09:00 hours GMT

and these measurements:

1. not used
2. not used
3. not used
4. not used
5. not used

The *weather measurements* are supplied by Met Office
The *weather data* are the records of past weather measurement for each calendar month
which were recorded at t calibrated Met Office Weather Station
and which are available from The Met Office

Assumed values for the ten year weather return *weather data* for each *weather measurement* for each calendar month are

| | | | |
|---|---|---|---|
| Jan | not used | Jul | not used |
| Feb | not used | Aug | not used |
| Mar | not used | Sep | not used |
| Apr | not used | Oct | not used |
| May | not used | Nov | not used |
| Jun | not used | Dec | not used |

These are additional compensation events

1. Managing and mitigating the impact of Covid 19 and working in accordance with Public Health England guidance, as may vary from time to time, between 1st July 2021 and 31st August 2021

2. The total of the prices assumes a cost of £140k for the procurement and delivery of the pre-cast concrete box culvert sections. If at the time of placing an order for the culvert sections, in line with the Contractor's programme, the preferred supplier's cost is plus or minus 10% of the assumed value, then an instruction will be issued to adjust the total of the prices accordingly. The Contractor holds the programme risk of this particular element of the works. The additional compensation event is only to cover variations in supplier costs.

3. 'not used'
4. 'not used'
5. 'not used'

**8 Liabilities and insurance**

These are additional *Client's* liabilities

1 'not used'
2 'not used'
3 'not used'

The minimum amount of cover for insurance against loss of or damage to property (except the *works*, Plant and Materials and Equipment) and liability for bodily injury to or death of a person (not an employee of the *Contractor)* arising from or in connection with the *Contractor* Providing the Works for any one event is

[redacted]

The minimum amount of cover for insurance against death of or bodily injury to employees of the *Contractor* arising out of and in the course of their employment in connection with the contract for any one event is

not less than the amount required by law

The insurance against loss of or damage to the *works*, Plant and Materials is to include cover for Plant and Materials provided by the *Client* for an amount of

not used

**Resolving and avoiding disputes**

The *tribunal* is litigation in the courts

The *Senior Representatives* of the *Client* are

Address for communications

Address for electronic communications

[redacted]

Name

Address for communications

Address for electronic communications

[redacted]

The *Adjudicator* is 'to be confirmed'

Address for communications 'to be confirmed'

Address for electronic communications 'to be confirmed'

The *Adjudicator nominating body* is The Institution of Civil Engineers

**Z Clauses**

**Z1 Correctness of Site Information and other documents**
Z1.1 Site Information about the ground, subsoil, ducts, cables, pipes and structures is provided in good faith by the *Client*, but is not warranted correct. Clause 60.3 does not apply to such Site Information and the *Contractor* is responsible for checking the correctness of any such Site Information they rely on for the purpose of pricing for or providing the *works*.
Z1.2 Information regarding construction methods or processes referred to in pre contract health and safety plans are provided in good faith by the *Client* but are not warranted correct (except for the purpose of promoting high standards of health and safety) and the *Contractor* is responsible for checking the correctness of any such information they rely on for the purpose of pricing for, or providing the *works*.

**Z 2B: Water levels: *Contractor's* risk**
Clause 60.1 (12) second bullet point is amended to: "are not weather conditions or floods and"

**Z3 Prevention: No change to prices**
Delete first sentence of clause 62.2 and replace with:
"Quotations for compensation events except for the compensation event described in 60.1(19) comprise proposed changes to the Prices and any delay to the Completion Date and Key Dates assessed by the *Contractor*. Quotations for the compensation event described in 60.1(19) comprise any delay to the Completion Date and Key Dates assessed by the *Contractor*.
Delete 'The' At start of clause 63.1 and replace with:
"For the compensation event described in 60.1(19) the Prices are not changed. For other compensation events the..."

**Z 4 The Schedule of Cost Components**

The Schedule of Cost Components is as detailed in the Framework Schedule 9.

**Z 6 Payment for Work**

Delete existing clause 11.2 (31) and replace with:
"11.2 (31) The Price for Work Done to Date is the total Defined Cost which the *Project Manager* forecasts will have been paid by the *Contractor* before the next assessment date plus the Fee, not exceeding the forecast provided under clause 20.4 and accepted by the *Client*."

### Z7 *Contractor's* share

After cl54.2 and before cl54.3, insert the following additional clause:
54.2A If, prior to Completion of the whole of the works, the Price for Work Done to Date exceeds 111% of the total of the Prices, the amount in excess of 111% of the total of the Prices is retained from the Contractor.

### Z10 Payments to subcontractors, sub consultants and

Subcontractors
The *Contractor* will use the NEC4 contract on all subcontracts for works. Payment to subcontractors will be 28 days from the assessment date.
If the *Contractor* does not achieve payments within these time scales then the *Client* reserves the right to delay payments to the *Contractor* in respect of subcontracted work, services and supplies.
Failure to pay subcontractors and suppliers within contracted times scales will also adversely affect the *Contractor's* opportunities to work on framework contracts.

### Z11Y(UK) 3 The Contracts (Rights of Third Parties) Act

The design consultant employed by the *Contractor* is required to fulfil the obligations of the warrantor under the primary contract for design works that they complete. This includes:
Transfer of rights clause Z11
Professional indemnity insurance cover to same cover as that specified for the *Contractor*
Z11.1 The *Client* ('the third party') may in its own right enforce the provisions of this clause, subject to and in accordance with the provisions of the Contracts (Right of Third Parties) Act 1999 and the following provisions:
Z11.1.1 the parties may not rescind or vary any provision(s) of this agreement, including this clause, at any time without the consent of the third party; and
Z11.1.2 each third party's rights against party A under this agreement shall be subject to the same conditions, limitations and exclusions as apply to party B's rights against party A under this agreement.
Z11.2 Except as provided in clause Z11.1, this agreement does not create any right enforceable by any person who is not a party to it (Other Party') under the Contracts (Rights of Third Parties) Act 1999, but this clause does not affect any right or remedy of a other party which exists or is available apart from that Act.

### Z16 Disallowed Costs

Add the following bullets to clause 11.2 (26) Disallowed costs
- was incurred due to a breach of safety requirements, or due to additional work to comply with safety requirements.
- was incurred as a result of the client issuing a Yellow or Red Card to prepare a Performance Improvement Plan.
- was incurred as a result of rectifying a non-compliance with the Framework Agreement and/or any call off contracts following an audit.

### Z19 Linked contracts

Delays and additional cost on this contract resulting from the *Contractor's* fault or error on a previous contract on this project or programme will be a Disallowable cost under this contract and not be a Compensation event under this contract.

### Z20 Defect Dates for Sections

Where a section of the *works* is defined and is located in a separate area of the Site, the time to the *defects date* for that section is the defined period after the Completion of that *section*, and is defined in the Contract Data.

### Z21 Requirement for Invoice

Add the following sentence to the end of clause 51.1:
The Party to which payment is due submits an invoice to the other Party for the amount to be paid within one week of the *Project Manager's* certificate.
Delete existing clause 51.2:
51.2 Each certified payment is made by the later of
- one week after the paying Party receives an invoice from the other Party and
- three weeks after the assessment date, or, if a different period is stated in the Contract Data, within the period stated.

If a certified payment is late, or if a payment is late because the *Project Manager* has not issued a certificate which should be issued, interest is paid on the late payment. Interest is assessed from the date by which the late payment should have been made until the date when the late payment is made, and is included in the first assessment after the late payment is made

### Z22 Resolving Disputes

Delete W2.1

### Z23 Risks and insurance

Replace clause 84.1 with the following
Insurance certificates are to be submitted to the *Client* on an annual basis.

## Secondary Options

### OPTION X2: Changes in the law

The *law of the project* is the law of England and Wales, subject to the jurisdiction of the courts of England and Wales

### OPTION X5: Sectional Completion

The *completion date* for each [redacted]*ction* of the *works* is

[redacted]

***X7 plus X5***

Delay damages for [redacted]

### OPTION X10: Information modelling

The period after the Contract Date within which the *Contractor* is to submit a first Information Execution Plan for acceptance is 2 weeks

The minimum amount of insurance cover for claims made against the *Contractor* arising out of its failure to use skill and care normally used by professional providing information similar to the Project Information is, in respect of each claim

[redacted]

The period following Completion of the whole of the *works* or earlier termination for which the *Contractor* maintains insurance for claims made against it arising out of its failure to use the skill and care is

6 years

### OPTION X15: The *Contractor's* design

The *period for retention* following Completion of the whole of the *works* or earlier termination is 6 years

The minimum amount of insurance cover for claims made against the *Contractor* arising out of its failure to use skill and care normally used by professionals designing works similar to the *works* is, in respect of each claim

[redacted]

The period following Completion of the whole of the *works* or earlier termination for which the *Contractor* maintains insurance for claims made against it arising out of its failure to use the skill and care is

6 years

### OPTION X18: Limitation of liability

The *Contractor's* liability to the *Client* for indirect or consequential loss is limited to

[redacted]

For any one event, the *Contractor's* liability to the *Client* for loss or damage to the *Client's* property is limited to

[redacted]

The *Contractor's* liability for Defects due to its design which are not listed on the Defects Certificate is limited to

[redacted]

The *Contractor's* total liability to the *Client* for all matters arising under or in connection with the contract, other than excluded matters, is limited to [redacted]

The *end of liability date is* 6 years after the Completion of the whole of the *works*

**OPTION X20: Key Performance Indicators (not used with Option X12)**

The *incentive schedule* for Key Performance Indicators is in Schedule 17.

A report of performance against each Key Performance Indicator is provided at intervals of 3 months.

**Y(UK)1:Project Bank Account**

Project bank account is not required

**Y(UK2): The Housing Grants, Construction and Regeneration Act 1996**

The period for payment is 14 days after the date on which payment becomes due

**Y(UK3): The Contracts ( Rights of Third Parties Act) 1999**

| term | *beneficiary* |
|---|---|
| not used | not used |

| term | *beneficiary* |
|---|---|
| The provisions of Y(UK)1 | |

## Part Two - Data provided by the *Contractor*

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

### 1 General

**The *Contractor* is**

Name: VolkerStevin Ltd

Address for communications: [redacted]

Address for electronic communications

The *fee percentage* is: [redacted]

The *working areas* are

The *key persons* are

Name (1)
Job
Responsibilities
Qualifications
Experience

[redacted]

The *key persons* are

Name (2)
Job
Responsibilities
Qualifications
Experience

The *key persons* are

Name (3)
Job
Responsibilities
Qualifications
Experience

[redacted]

The *key persons* are

Name (4)
Job
Responsibilities
Qualifications
Experience

The following matters will be included in the Early Warning Register

### 2 The Contractor's main responsibilities

The Scope provided by the *Contractor* for its design is in

**3 Time**

The programme identified in the Contract Data is

**5 Payment**

The *activity schedule* is

**Resolving and avoiding disputes**

The *Senior Representatives* of the *Contractor* are

Name (1)
Address for

Address for

Name (2)
Address for

Address for electronic communications

**X10: Information Modelling**

The *information execution plan* identified in the Contract Data is

**Y(UK)1: Project Bank Account**

The *project bank* is

*named suppliers* are

# Contract Execution

***Client* execution**

Signed under hand by [redacted] for and on behalf of the Environment Agency

Signature [redacted] Role [redacted]

***Consultant* execution**

***Consultant* execution**

Signed under hand by [redacted] for and on behalf of VolkerStevin Ltd

Signatur [redacted]

# Environment Agency
# NEC4 Engineering and Construction Contract (ECC)
# SCOPE

## Project / contract information

| | |
|---|---|
| Project name | Penketh & Whittle FRMS<br>Preliminary Works Contract |
| Project SOP reference | [redacted] |
| Contract reference | 33701 |
| Document Reference | ENV000148C-JAC-XX-00-S0-PM-0003 |
| Date | 5/08/2021 |
| Version number | V2.0 |
| Author | [redacted] |

## Revision history

| Revision date | Summary of changes | Version number |
|---|---|---|
| 24/06/2021 | First DRAFT | DRAFT – D1 |
| 26/07/2021 | Second DRAFT | DRAFT – D2 |
| 29/07/2021 | Final | V1.0 |
| 5/08/2021 | Final | V2.0 |

This Scope should be read in conjunction with the version of the *Client's* Minimum Technical Requirements (MTRs) current at the Contract Date.

In the event of any conflict between this Scope and the MTRs, this Scope shall prevail.

| Environment Agency | NEC4 – ECC | Scope |
|---|---|---|

## Contents List

## S 100 Description of the *works*

### S 101 General Description of the *works*

The contract covers enabling works required by the *Contractor* for the Penketh & Whittle FRMS. This preliminary works contact covers works that are required in advance of the main works contract. The main works contract will cover the construction of the scheme. The Preliminary works contract (this contract) covers:

- Ground investigation works
- Pre ordering of materials
- Compound Set up
- Design of Siphon culvert under the railway and canal
- Surveys

The *Contractor* is to undertake Ground Investigation (GI) works to help inform the characterisation of the existing ground conditions and obtain geotechnical and geoenvironmental information to facilitate the completion of the detailed design of the Penketh & Whittle Flood Risk Management Scheme (FRMS).

The GI work requirements have been designed by the *Client's* designer ([redacted]), who are also the designer for the Penketh & Whittle FRMS. The aims of the GI *works* are to:

- Characterise the different strata and define the boundaries between them;
- Obtain material parameters to assess the suitability of the material for the proposed Penketh & Whittle FRMS;
- Understand the local groundwater depth and seasonal variability;
- ensure compliance with agreed Network Rail (NR) requirements for Under Track Crossings (UTX) and other third-party assets concerned.

A key component of the Penketh & Whittle FRMS is the Penketh Brook overflow culvert. A siphon is required to enable the overflow culvert to pass underneath the canal and railway. The Contractor is required to undertake the design of the siphon section of the works including the inception and reception pits.

The Contractor is also required to order and purchase a number of long lead time materials required and establish the site compound for the subsequent and future Penketh & Whittle Main Works Contract.

### S 102 Description of the Working Areas

Site is located approximately 3km west of Warrington town centre (Figure 1).

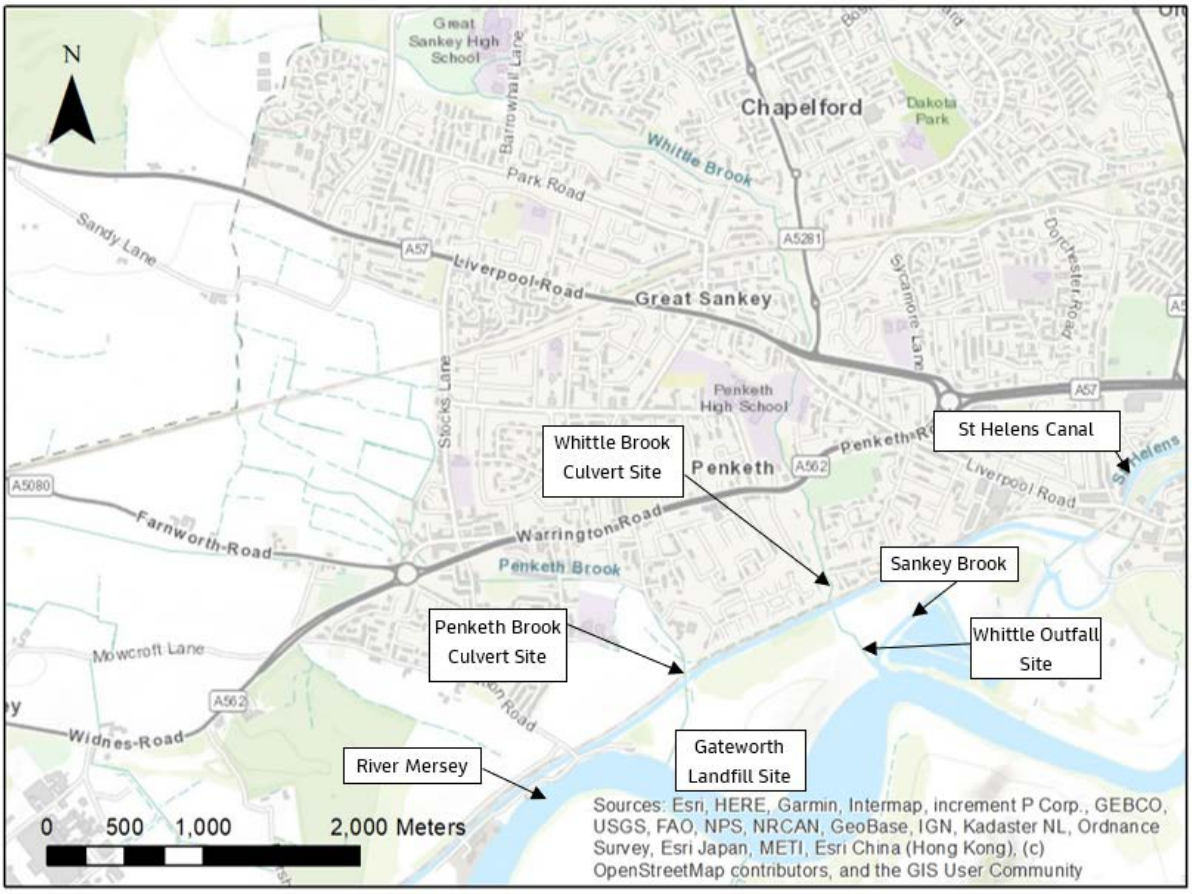



Figure 1: Location of the works

The working area consists of four areas:-

- Area 1: Penketh Culvert Site
- Area 2: Whittle Outfall Site
- Area 3: Whittle Culvert Site
- Area 4: Field adjacent to Gatewarth Landfill Site

The River Mersey is located immediately to the south of the Whittle Outfall Site and Penketh Culvert Site. The boundary for the *works* are shown in Figure 2, Figure 3 and Figure 4 below

Area 1 - Penketh Culvert Site:

This Site is centred at an approximate national grid reference (NGR) of SJ 56785 87004.

The proposed FRMS development at this location includes the construction of a new culvert running adjacent to and then under the Garston and Warrington Railway and St Helens Canal to increase culvert capacity and prevent overtopping of the Penketh Brook banks. The proposed culvert will be constructed to the west of the existing culvert and will include trench excavation alongside the railway and a trenchless crossing beneath the railway and canal, with an associated inception pit (to the north) and reception pit (to the south). The proposed development includes also the construction of a new channel to connect the south shaft with the existing course of the Penketh Brook.

Penketh Brook flows in a general south-easterly direction prior to discharging into the River Mersey. It flows from a rural area upstream of Widnes Road, passes beneath St Helens Canal and the Garston

and Warrington Railway via a culvert before reaching the River Mersey. [redacted]

Pasture fields are located north of the railway and south of the canal. The strip of land between the canal and railway is heavily vegetated. On the south side of the canal is a section of the Trans Pennine Trail, which is a heavily used footpath. The topography of the site is generally flat. The southern section of the proposed culvert passes through a field west of the Penketh Brook that is within the boundary of the historical Gatewarth Landfill.

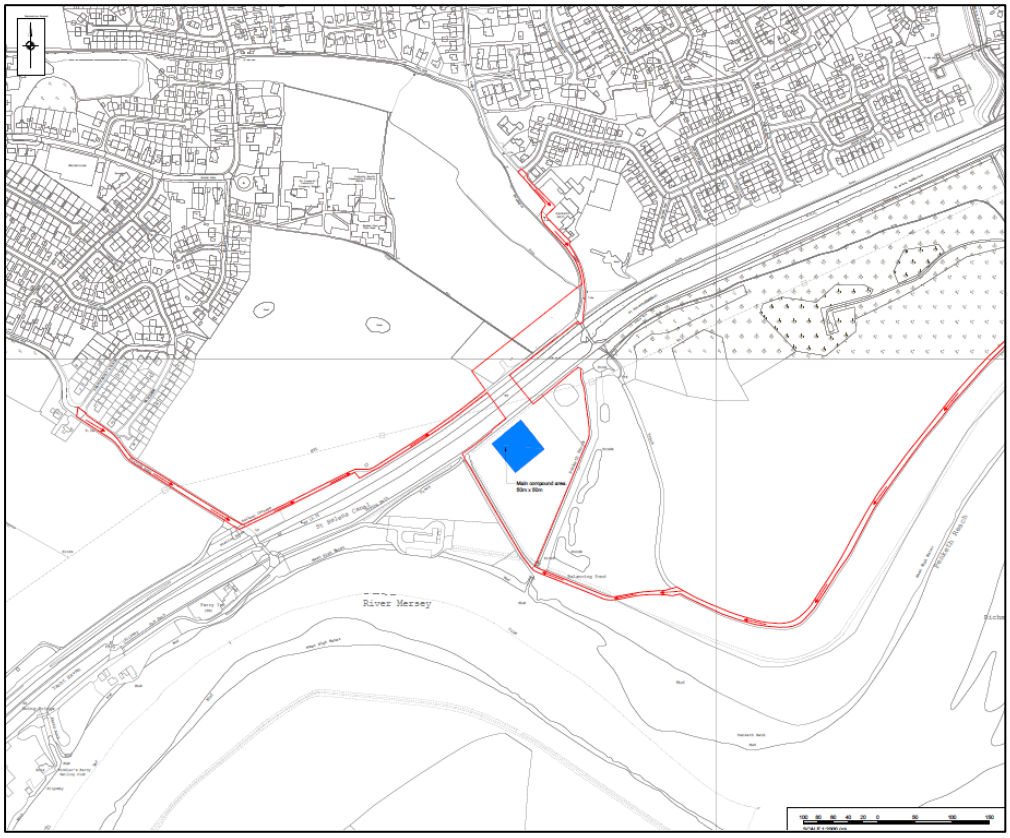



Figure 1: Working Area for Area 1 and Area 4

Area 2 - Whittle Outfall Site:

This site is centred at an approximate NGR of SJ 57514 87109.

The proposed FRMS development at this location includes the construction of a tidal outfall structure in the channel of the Whittle Brook to minimise tidal ingress and silt accumulation from the River Mersey. It will be located ~30m before the confluence of Whittle Brook and Sankey Brook. The design includes replacement of the existing barrier, installation of two side hung gates fixed to a concrete capping beam and an eel pass. This site is situated on the southern boundary of Gatewarth Landfill, approximately 25m south east of the recorded waste deposits.

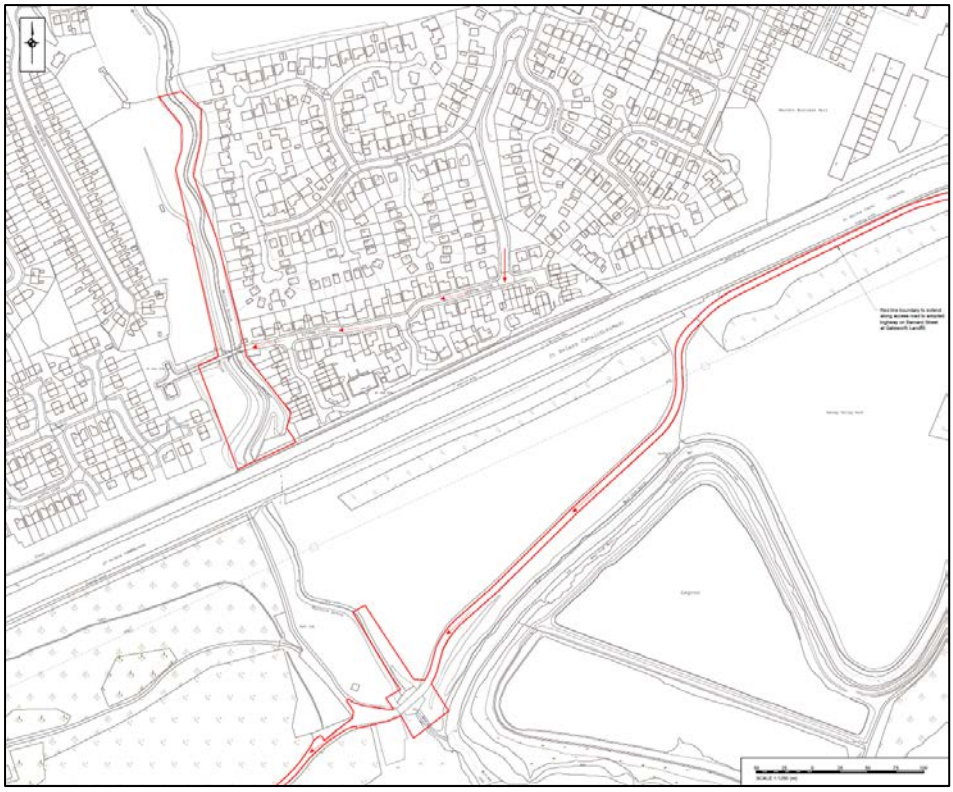


Figure 2: Working Area for Area 2 and Area 3 Sheet 1

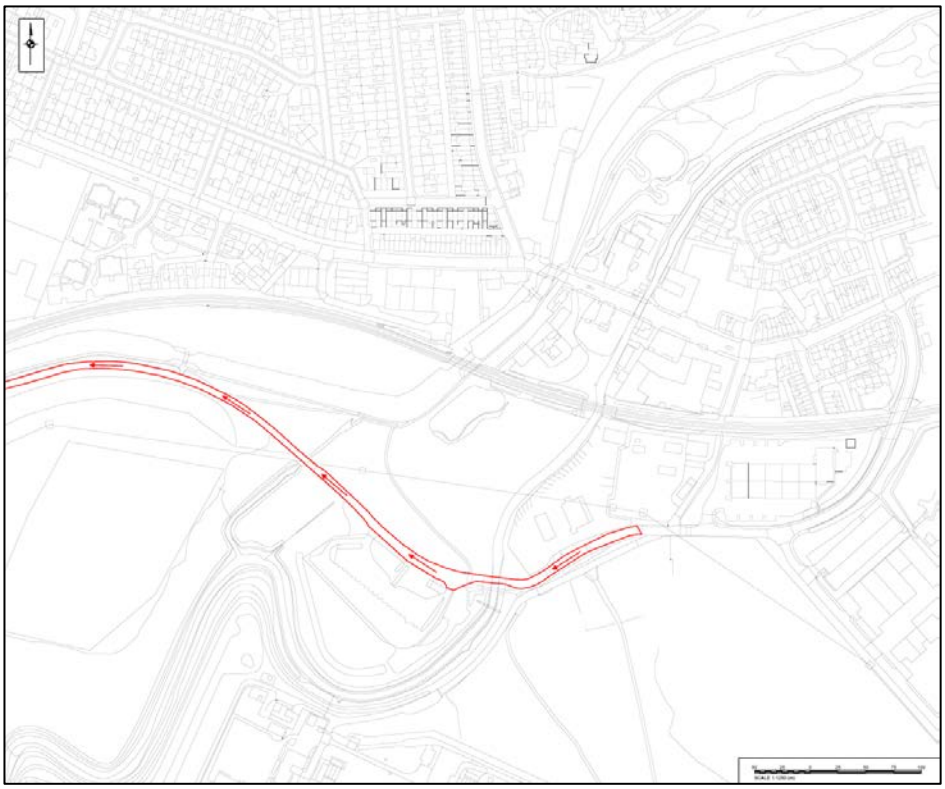


Figure 3: Working Area for Area 2 and Area 3 Sheet 2

Area 3 - Whittle Culvert Site:

This site is centred at an approximate NGR of SJ 57339 87420.

The proposed FRMS development at this location includes clearing the existing Garston and Warrington Railway and St Helen's Canal culvert of silt/debris build up. The FRMS development will also include channel dredging upstream of the culvert in the vicinity of Lytham Close to improve conveyance along Whittle Brook.

For working area see Figure 2.

Area 4 – Field adjacent to Gatewarth Landfill Site

This Site is centred at an approximate NGR of SJ 56803 86940. For working area see Figure 1.

**S 103 Requirements of the *works***

The works can be divided into four elements:

- Ground investigation works
- Pre ordering of materials
- Compound Set up
- Design of Siphon culvert under the railway and canal.
- Surveys

**Ground Investigation Works**

The *Contractor* shall undertake the GI / investigation works detailed below:

Area 1 - Penketh Culvert Site

- 2 no. cable percussive boreholes with rotary core option to 15m depth (at shafts locations);
- 1 no. cable percussive boreholes with rotary core option to 15m depth (at reinforced concrete headwall structure location);
- 5 no. machine excavated trial pits to 3.5m depth, along the south channel;
- 3 no. machine excavated trial pits to 3.5m depth, along the north culvert.

Area 2 - Whittle Outfall Site

- 4 no. dynamic sample boreholes to 8m depth;
- 4 no. machine excavated trial pits to 3.5m depth;
- 2 no. sediment sample; and
- 2 no. surface water samples.

Area 3 - Whittle Culvert Site

- 5 no. sediment; and
- 5 no. surface water samples.

Location Plans reference for the *works* are presented in Table 1.

| Drawing Title | Reference | Revision | Location |
|---|---|---|---|
| Penketh Culvert Exploratory Hole Location Plan | ENV000148C-JAC-ZZ-3PB-DR-GT-0001 | P02 | Appendix A |
| Whittle Outfall Exploratory Hole Location Plan | ENV000148C-JAC-ZZ-3WB-DR-GT-0001 | P02 | Appendix A |
| Whittle Channel Dredging Exploratory Hole Location Plan | ENV000148C-JAC-ZZ-3WB-DR-GT-0002 | P02 | Appendix A |
| Compound set up arrangement | n/a | n/a | Appendix A |

**Table 1: Location Plans**

Further details of exploratory hole locations and requirements are detailed in Schedule 2 of S 1700 (Appendix C).

In addition to the above, the *Contractor* shall undertake and complete the following activities:

- General site clearance and vegetation removal to facilitate the works within the boundaries of the site;
- Check on the possible presence of underground services prior to commencement of any exploratory holes in accordance with "Specification for underground utility detection, verification and location", PAS 128:2014. All borehole positions shall be commenced from hand dug inspection pits excavated prior to drill rig setup to allow potential relocation of holes in the event of buried services being encountered or suspected. Any relocation to be agreed with the *Project Manager*.
- Retrieval of representative soil samples from exploratory hole locations;
- In-situ testing including Hand Vane Shear Tests and Standard Penetration Tests (SPT) from exploratory hole locations;
- In-situ headspace analysis of samples using a photo ionisation detector (PID) to check for signs of volatile hydrocarbon contamination in soil and groundwater from exploratory hole locations;
- Variable head permeability testing, in boreholes for granular and cohesive material respectively;
- Installation of groundwater and gas monitoring standpipes in selected boreholes;
- Retrieval of representative groundwater samples from monitoring standpipes in selected boreholes;
- Ground gas monitoring from standpipes installed in selected boreholes;
- Laboratory geotechnical and geoenvironmental testing of selected soil and groundwater samples;
- Reinstatement of an equivalent standard of all third-party assets, land and access routes; and

- Preparation of a Factual Ground Investigation Report (GIR) in electronic PDF and AGS format.
- Pre and post condition photographic records of all exploratory hole locations.

- The *Client* has drafted a Bill of Quantities (BoQ) scheduling the GI requirements; a copy of which is included in the Site Information. This BoQ has been provided to the Contractor for their information and reference only. For the avoidance of doubt the Scope defines the works the Contractor is required to undertake' Should the Contractor choose to use the BoQ to help facilitate the delivery of the required works then the *Contractor* is responsible for checking the accuracy and completeness of this document and ensuring that it fully reflects the requirements of the Scope. A full and detailed schedule of the soil and groundwater laboratory testing suites is provided in Appendix B.

**Pre-Ordering of Materials**

The following materials for the main works contract should be procured:

- 2No Tidal Outfall Gates – See performance specification (ENV000148C-JAC-MZ-3PB-SP-ME-0001) in Appendix E.

- Precast concrete box culvert:

A 140m long culvert is required. The culvert should be constructed from precast sections. The internal dimensions of the culvert should be 1.2m high x 1.5m wide. Dimensions providing an equivalent area or alternative proposals should be submitted to the client for approval. The box culvert is to have a design life of 120 years and should be rated for highways loading. The culvert should be suitable for minimum cover of 300mm and maximum cover of 1.5m. The culvert should have fillets on the internal corners (100mm x 100mm) and a section thickness of 200mm.

The culvert requires 1No inspection chamber along its length, therefore 1No box culvert section to have 675mm x 675mm opening in soffit. The *Contractor* is responsible for determining culvert unit lengths and numbers to ensure suitable for proposed installation methodology under the Main works contract.

The *Contractor* shall arrange for the materials to be delivered to the Penketh & Whittle Main Works compound between the following dates:

| Material | Earliest Delivery Date | Latest Delivery Date |
|---|---|---|
| Precast Box Culvert | 4th November 2021 | 18th November 2021 |
| 2 No Tidal Outfall Gates | 10th December 2021 | 10th January 2022 |

The *Contractor* shall be responsible for any necessary safe storage and / or insurance of the materials prior to the stated delivery to site windows.

**Compound Set up:**

The Contractor is to set up, maintain and keep secure a compound suitable for delivering the main works until Sectional Completion date 1. The Contractors site establishment shall meet the EA's minimum standard requirements. An indicative layout is included in Appendix A, the set up should include:

- Site Welfare and Office Facilities
- Staff Car Park Area
- Waste Segregation Area
- Materials Storage Area

**Design of Siphon culvert under the railway and canal.**

Refer to section S300

**Surveys**

The *Contractor* shall undertake a topographic survey of the area adjacent to the inlet structure. For details see Appendix F.

The *Contractor* shall undertake GRP survey trial pits to confirm the line and level of the two United Utilities assets (pressured foul sewer and rising main) and the gas main within the works area. The *Contractor* will arrange suitable United Utilities supervision and approval. The *Contractor* should allow 4 weeks notice for utility providers to attend site.

## S 200 General constraints on how the *Contractor* provides the *works*

### S 201 General constraints

The *Contractor* shall give due consideration to the following documents when planning and undertaking the *works*:

| Document Title | Reference | Revision | Location |
|---|---|---|---|
| Site Information Pack | ENV000148C-JAC-ZZ-00-TN-HS-0002 | P01 | Separate Document |
| Pre-Construction Information Pack | ENV000148C-JAC-ZZ-00-HS-Z-0001 | P02 | Separate Document |

Refer to 412_12_SD01 the EA Minimum Technical Requirements; Section 1.39 for additional clauses on restrictions on the use of the Site.

The trans-Pennine Public Right of Way should remain open during the works.

### S 202 Environmental Constraints

The Client has produced an EAP to identify any environmental constraints and considerations associated with the works and any required mitigation actions. The EAP is included in the Site Information.

The EAP includes, but is not limited to, actions relating to: protected species, invasive non-native species and pollution.

The *Contractor* shall comply with the recommendations of the Environmental Action Plan (EAP) when undertaking the *works*, namely:

- Maintain safe access to public areas.
- Undertake pre works condition survey (including photos) of site compound, access routes, and locations of all boreholes and slit trenches.
- Ensure that appropriate traffic management plans are prepared for the works.
- Plan all vegetation clearance to be undertaken between September 2021 and 15th of February 2022 inclusive. Where this is not possible, pre-site clearance checks will be required no more than 24 hrs in advance of vegetation clearance (15th of February to August inclusive). If active nests are found works may not commence within 10 m until young have fledged.
- Provide transport routes and parking areas in advance of the start of the *works*.
- Immediately prior to the start of the *works*, erect clearly visible warning notices on all access routes, where required.

The *Client* shall appoint an Environmental Clerk of Works (ECoW) to works alongside the *Supervisor* and monitor the *Contractor's* environmental performance and compliance with the EAP.

The *Contractor* is required to maintain a record of the carbon footprint incurred in delivering the works and provide this to the *Client* on completion of the *works*. Information should be presented in the *Client's* Carbon Calculator template.

The *Contractor* shall endeavour to minimise the carbon footprint of their activities by following the principles of the *Client's* Carbon Reduction Hierarchy (Avoid / Reduce / Replace / Offset).

**S 203 Professional Attendance**

When undertaking the GI, the *Contractor* shall ensure full time attendance with the following qualifications:

- A Ground Engineer with at least five years of experience in ground investigation;
- At least one member of staff trained to administer first-aid; and
- Other Professional Attendance as required to deliver the *works*

The *Contractor* shall ensure continuity of staff as far as is reasonably practicable.

The Ground Engineer will be suitably qualified and experienced to supervise all geoenvironmental and geotechnical intrusive ground investigation activities including logging of trial pits / boreholes, taking samples from trial pits / boreholes, undertaking field testing (e.g. soil headspace tests), taking photographs of pits / soil and rock cores, groundwater measurements, providing daily records and preliminary logs (except where records are for activities are solely carried out by boring operatives).

The Ground Engineer shall also have undertaken appropriate unexploded ordnance (UXO) awareness training.

The Ground Engineer will also hold asbestos awareness training and will have at least one member of staff available to undertake non-licensed asbestos work in accordance with the Control of Asbestos Regulations 2012 as required.

The Ground Engineer will have specific prior experience of the design, construction and installation of gas/ groundwater monitoring wells.

The Ground Engineer shall be contactable for the duration of the agreed daily working hours (to be confirmed with the *Client*) and shall be responsible for taking photographs, providing daily records and the production of preliminary logs in accordance with BS EN 5930, BS EN 1997-2 and BS EN ISO 14688-2 as clarified in this specification.

All operatives present on site during the works shall hold an appropriate Construction Industry Training Board (CITB) Construction Skills Certification Scheme (CSCS) card or equivalent and have undertaken asbestos awareness training.

Trainee operatives may be permitted subject to prior acceptance of the *Contractor's* risk assessment and method statements by the *Supervisor* prior to the commencement of site works.

Trainee operatives in boring and drilling shall hold a red CSCS trainee card and must be under the direct supervision on site of a CSCS Land Drilling (Lead Driller) audit card holder.

**S 204 Hazardous Ground, Land Affected by Contamination and Notifiable and Invasive Weeds**

All sites have been classified as either Red or Yellow in accordance with BDA guidance. If ground conditions are encountered which are not consistent with this description, then the classification must be re-assessed by the *Contractor*, and appropriate mitigation proposed and implemented for the remainder of the works. Made Ground may be present associated with existing structures such as the canal, railway, utilities, historical industrial land use and landfill. Such areas may contain a wide-range of contaminants including coal tars, asbestos, polycyclic aromatic hydrocarbons (PAHs), hydrocarbons, volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), polychlorinated biphenyls (PCBs) and heavy metals. This specification comprises a 'main' geoenvironmental ground investigation in accordance with British Standard BS 10175 to confirm ground conditions and likely waste management options prior to construction of the FRMS. As well as natural samples, it should be noted that Made Ground and sediment samples (including potential contamination) shall also be scheduled for geotechnical and/or chemical laboratory testing. The *Contractor* shall inform the *Client* and designer of the potential Health and Safety requirements, along with potential cost and programme implications regarding the geotechnical and chemical laboratory testing of Made Ground in relation to the potentially contaminated samples.

Should the *Contractor* encounter contaminated soil or groundwater during the *works*, the *Supervisor* shall be informed immediately and the *Client* will confirm how to proceed

If there is potential for asbestos containing materials, then the *Contractor* shall complete an appropriate risk assessment in accordance with the Control of Asbestos Regulations 2012 and the CAR SOIL Industry Guidance 'Interpretation for managing and working with asbestos in soil and construction and demolition materials' (CL:AIRE 2016).

A pre-mobilisation walkover survey of the site identified the potential for invasive species in the general vicinity of the site. Required mitigation or protection measures associated with notifiable and invasive vegetation is detailed in the Environmental Action Plan (EAP) which is included within the Site Information.

Where invasive species are encountered on site, the *Contractor* shall:

- take all necessary precautions to prevent the spread of the invasive species;
- ensure that any spoil contaminated with invasive species is disposed to landfill in accordance with the relevant regulations;
- inform the geotechnical and chemical laboratories prior to any samples being dispatched from site.

**S 205 Services**

The *Contractor* is responsible for locating buried services and shall undertake their own services searches to ensure completeness of data.

The *Contractor* shall conduct checks on the possible presence of underground services prior to commencement of any exploratory hole location in accordance with "Specification for underground utility detection, verification and location", PAS 128:2014. All borehole positions shall be commenced from hand dug inspection pits excavated prior to drill rig setup to allow potential relocation of holes in the event of buried services being encountered or suspected.

The *Contractor* is to agree the precise locations of exploratory holes with the *Supervisor* in consultation with the designer. The *Contractor* shall confirm to the *Supervisor* that exploratory hole locations satisfy the minimum safe working distance from third party assets. These include the surface water sewer and foul sewer owned by United Utilities and the existing gas main at the Penketh Culvert Site. The services are to be suitably located and marked out, prior to work commencing. It should be noted that the indication of the two United Utilities assets on the Location Plans (Appendix A) are indicative layouts only.

The *Contractor* shall undertake the works in accordance with the Specification for safe working in the vicinity of Cadent assets - requirements for third parties, GD-SP-SSW-22 when working near the gas main to the south of the canal. This includes:

- Mechanical excavators and any other powered mechanical plant shall not be sited or moved above the pipeline unless written authority has been given by the asset owner; and
- Due to the potential of toothed excavator buckets to damage pipelines, toothed buckets are not permitted.

Provided the gas pipeline has been clearly located and marked, boreholes shall be located at least 15m distance and trial pits at least 3m distance from the existing gas main.

In accordance with "Avoiding Danger from Underground Services", HSG47, the *Contractor* shall check the ground surface when breaking ground with a signal generator and Cable Avoidance Tool (CAT) and a Ground Penetrating Radar (GPR) survey prior to breaking ground.

**S 206 Contamination Avoidance and / or Aquifer Protection Measures Required**

The Wilmslow Sandstone bedrock, which is a principal aquifer is not anticipated to be encountered at the proposed GI depths. However shallower water bearing strata are likely to be encountered, therefore aquifer protection measures shall be implemented during drilling where Made Ground is also encountered, with particular care taken when drilling through suspected landfill material. The boreholes shall be commenced using a suitable diameter drill casing to facilitate insertion of a reduced diameter drill casing as the borehole progresses. Temporary casing shall penetrate below the Made Ground at a minimum depth of 1.5m to allow a minimum 1m thickness of bentonite pellets to be inserted into the base of the borehole to form a plug. Water shall be added to the borehole and left for 3 to 4 hours to ensure that the bentonite pellets become sufficiently hydrated. Drilling may then re-commence through the bentonite plug using a reduced diameter drill casing. All aquifer protection measures shall be established in accordance with EA guidance 'Guidance on the design and installation of groundwater quality monitoring points – Science report SC020093 (2006)'.

Bentonite seals below groundwater shall be placed using a pre-mixed bentonite slurry introduced using a tremie pipe. The seal should extend 1m above and 1m below the stratum boundary (2m in total); however, the details shall be confirmed on site by the *Supervisor* in consultation with the designer.

At locations where aquifer protection measures have been established and the hole is to be sunk into the bedrock, a further reduction and seal may be required. In all such instances the advice of the *Supervisor*, in consultation with the designer, must be sought prior to continuing drilling.

The requirement for a seal between superficial and bedrock strata will be dependent upon:

- Cohesive nature of the superficial deposits;
- Presence of groundwater within superficial deposits; and
- Visual / olfactory signs of contamination within the ground / groundwater below Made Ground, and whether contamination appears to be sufficiently mobile to migrate along the borehole annulus into the principal aquifer during drilling.

Vegetable oil-based lubricants shall be used on drilling equipment exposed to soil, such as casing threads to prevent contamination of soil arising from hydrogen-based lubricants.

Suitable management should be implemented to ensure the investigation derived soils and water do not migrate from the exploratory holes. No drilling returns, or arisings are to be allowed to escape into watercourses and / or any site drainage. Purged water recovered from any monitoring wells during development should be appropriately disposed of and not discharged to land.

All water added to boreholes is to be of potable quality.

Drip trays and spill kits are required for motorised plant and portable generators on site.

If asbestos containing materials are suspected, the *Supervisor* and designer shall be informed, and the *Contractor* shall manage the handling of Asbestos in accordance with the requirements set out in S204.

In the event of potentially contaminated materials being encountered, measures to avoid cross contamination with non-contaminated materials shall be employed. Contaminated and non-contaminated samples and arisings shall be stored separately.

Should contaminated materials be encountered, arisings should be placed on sandbagged polyethylene plastic sheeting ((and disposed of off-site at an appropriately licensed facility.

**S 207 Known / Suspected Mine Workings, Mineral Extractions, etc…**

There are no known historical or current mineral extractions or natural cavity areas within 1000m of the site.

**S 208 Maximum Period for Boring, Pitting or Trenching Through Hard Material, Hard Stratum or Obstructions**

The maximum period for boring excavating through hard material, a hard stratum, or an obstruction shall be 1 hour, at which time the *Contractor* shall obtain instruction on how to proceed from the *Supervisor* in consultation with the designer.

**S 209 Reinstatement Requirements**

The *Contractor* shall conduct a pre and post construction inspection, and take photographs/videos, of the asset(s), access routes, and investigation locations with the *Supervisor*.

The pre-construction condition shall be agreed with the *Client* and *Supervisor* before commencement of any work. Sufficient photographs shall be taken to show the condition of the whole of the site (including access points and access routes) prior to the start of works and an analogous set of photographs on completion of the investigation and reinstatement shall also be taken (post-construction).

All exploratory holes are to be left in a safe condition following completion. The level of reinstatement shall be agreed with the *Supervisor* prior to commencement. This shall be to the condition of the location prior to the start of work, unless otherwise agreed with the *Supervisor*.

All public footpaths and crossings coinciding with access routes shall be maintained in such a condition that the general public can safely use these routes. All man-made structures shall be left neat, safe and “as found” or better. Working areas around boreholes must be reinstated to the pre-works condition.

Should land drains be encountered, the *Supervisor* shall be notified immediately. The *Contractor* will be instructed how to proceed.

The position of any damaged land drains is to be carefully marked in and surveyed as part of the exploratory hole survey works by the *Contractor*.

Trial pits are to be backfilled with arisings placed in reverse order to excavation and finished on a like-for-like basis with reference to the original ground profile. Backfill placed in each trial pit is to be compacted sufficiently and mounded to allow for subsequent settlement. No materials with any visual or olfactory evidence of contamination are to be left at the ground surface.

The *Contractor* shall provide all facilities for the on-site storage of waste materials (including arisings). The *Contractor* shall undertake laboratory testing required, to facilitate off-site disposal of waste generated by the site works. The *Contractor* shall be responsible for the off-site disposal of waste generated by the site works. The *Client* assumes no removal.

Boreholes with a groundwater monitoring installation shall be finished with a raised lockable cover (as specified by the *Supervisor* in consultation with the designer) secured in concrete.

All exploratory holes with no requirement for a monitoring installation are to be finished on a like-for-like basis with reference to the original ground surfacing. Boreholes without monitoring installations shall be backfilled with a bentonite grout mix unless otherwise instructed by the *Supervisor* in consultation with the designer.

[redacted].

**S 2010 Unavoidable Damage to be Reinstated by the *Contractor***

The *Contractor* shall take all reasonable measures to avoid damage to access routes and working areas.

Any damage along access routes and within/around working areas caused by the *Contractor* shall be reported to the Supervisor and shall be rectified to the satisfaction of the *Supervisor*, prior to demobilising from site.

Operations shall be confined to the minimum area of ground required for the safe execution of the works.

On completion of each exploratory hole, all equipment, surplus material and refuse of any kind shall be cleared away.

**S 2011 Accuracy of Exploration Hole Locations**

The *Contractor* shall survey the final position of all exploratory holes relative to National Grid Coordinates and Ordnance Datum Level. Coordinates shall be to the nearest 0.1m and elevations to the nearest 0.05m. The following levels shall be surveyed and recorded by the Contractor at each exploratory hole location:

- Ground Level; and
- Top of standpipe and cover level, where a monitoring installation is present.

The coordinates and levels shall be included on the respective exploratory hole logs.

**S 2012 Photography Requirements**

The *Contractor* shall undertake a pre-entry and post works survey is required for each exploratory hole location to include the access routes, the working area prior to breaking ground and reinstatement of land.

Photographs of trial pits shall be undertaken in accordance with the *works* specification and a minimum of three photographs per pit shall be taken, one of the sides, the base and one of the spoil heaps.

All core samples shall be photographed in accordance with the *works* specification (S1700).

Where undisturbed samples are not used for laboratory testing, they shall be extruded and photographed following completion of the laboratory testing phase.

The *Supervisor* in consultation with the designer, may instruct photography of recovered bulk samples.

**S 2013 Access to Exploratory Hole Locations**

The *Contractor* will confirm to the *Supervisor* any areas where vegetation clearance is required to facilitate the *works*. The *Client* shall liaise with landowners, advising any areas requiring vegetation clearance, and the method(s) by which it will be done, prior to the start of the investigation. The *Contractor* shall provide a method statement for vegetation clearance, including consideration of ecological constraints, which shall be reviewed and accepted by the *Client's* Environmental Clerk of Works (ECoW) prior to the commencement of any vegetation clearance.

**S 2014 Unexploded Ordnance (UXO)**

The Preliminary UXO Threat Assessment across the site records a low level of UXO risk with no further mitigation measures required. It should be noted that the adjacent area south of the River Mersey is indicated to have a moderate level of UXO risk.

The *Contractor's* Ground Engineer is required to have undertaken appropriate UXO awareness training prior to the commencement of the investigation.

**S 2015 Confidentiality**

The *Contractor* does not disclose information in connection with the *works* except when necessary to carry out their duties under the contract or their obligations under the contract

The *Contractor* may publicise the services only with the *Client's* written permission.

**S 2016 Security and protection on the site**

The *works* involve activities in the immediate vicinity of a series of footpaths and public rights of way and within general public open space. The *Contractor* must pay due regard to public safety at all times during the delivery of the *works*. Site security requirements are detailed in S 1700.

The *Contractor* shall be responsible for the security of the plant, equipment and personnel whilst present on the site.

All working areas shall be securely fenced off for the duration of the site works to restrict unauthorised access to the public and from livestock. Under no circumstances shall plant or equipment or open excavations be left unattended unless adequately secured.

**S 2017 Traffic Management**

Access to the various drilling locations may involve the movement of equipment and machinery along and across narrow public roads and footpaths. The *Contractor* shall be responsible for the safety of all site staff and the public that may be affected by the *works* and employ appropriate traffic management measures such as signage and banksmen. The *Contractor's* transport arrangements must not impact on the surrounding infrastructure, and local road system, causing delays or damage to infrastructure.

**S 2018 Restricted Working Hours**

Unless otherwise agreed, the hours of working shall be between 08.00 and 18.00 Monday to Friday.

Should out of hours working be required, the *Contractor* shall seek consent from the *Client* seven working days prior to the proposed works for permission to work alternate hours to those outlined above.

**S 2019 Consents and Approvals**

The *Contractor* obtains all necessary consents and approvals associated with any temporary works and allows the statutory period for their determination within their programme.

**S 2020 Pollution Prevention and Control**

The *Contractor* complies with *Client's* Safety, Health, Environment and Wellbeing Code of Practice with regards to pollution prevention and reporting.

All environmental incidents shall be reported to the *Project Manager* at the first practical opportunity.

The *Contractor* shall consult with the relevant statutory bodies including the Fire Authority, and the Local Authority (Emergency Planning) and prepare an 'Emergency Pollution Response Plan' (EPRP). This plan will cover the procedures to be followed to limit the spread of pollution in the event of an incident. The *Contractor* shall incorporate the EPRP into any relevant Method Statement(s).

**S 2021 Flooding**

The *Contractor* shall register with the Environment Agency Flood Warning service before commencing the *works* (via. Schedule 8) and provide them with a telephone number and email address where flood warnings can be sent.

The *Contractor* is to maintain existing flow capacity of the watercourse at all times during the course of the *works.* Any temporary works associated with the execution of the *works* must not increase flood risk.

**S 2022 Protection of the *works***

The *Contractor* must ensure the works are to be protected against damage specifically from vandalism, traffic and flooding.

**S 2023 Cleanliness of the roads**

Throughout the contract, the *Contractor* co-operates with the highway authority concerning access to the *works* via the public highway. The *Contractor* informs the *Project Manager* of any requirements or arrangements made with the relevant authorities.

The *Contractor* promptly removes mud and debris from the highway and public access routes.

**S 2024 Consideration of Others**

The *Contractor*'s methods of working shall be designed and selected, wherever possible, to minimise disturbance to the general public and occupiers of adjacent premises.

**S 2025 Control of site personnel**

The *Contractor* must have and use a written procedure for the control of people working on or visiting the Site.

Site personnel shall:

- Carry identification
- Hold current CSCS cards
- Be appropriately trained and inducted for the role undertaken
- Be equipped with a mobile telephone

**S 2026 Site cleanliness**

The *Contractor* shall keep the Site organised, clean and tidy.

**S 2027 Deleterious and hazardous materials**

The *Contractor* will minimise and control the use of deleterious and hazardous material.

## S 300 Contractor's design

### S301 General Requirements

The *Contractor* is to undertake the detailed design of the length of the Penketh Brook overflow culvert which passes underneath the railway and canal.

The detailed design will include the inverted siphon and shafts as presented in the outline design detailed on drawings ENV00148C-JAC-CS-3PB-DR-C-0007, ENV00148C-JAC-CS-3PB-DR-C-0008, ENV00148C-JAC-CS-3PB-DR-C-0009 (included in Appendix D).

The GI undertaken as part of this Contract is to be used by the *Contractor* to inform the detailed design of the siphon culvert alongside available borehole and trial pit information from British Geological Society (BGS) and elsewhere. Detailed design to be based on outline design provided (Appendix D).

If any new information raises doubts on any of the outline design assumptions or raises questions about the viability of the outline design then the *Contractor* should notify the *Client* who will then confirm how to proceed.

### S302 Design Constraints

The planning application has been approved and a copy of the approval and conditions is included in the site information. The *Contractor* should work within the constraints of the application and notify the client if there is a requirement to alter the assumption in the application.

The inception pit is to be located to the south of the railway with the reception pit located to the north.

### S302 Temporary and Permanent works design

The *Contractor* will determine the preferred shaft and culvert construction method to be submitted to the *Client* for acceptance. This shall consider geotechnical, safety and practical constraints.

The *Contractor* will undertake all temporary and permanent works design for the shafts and tunnel. The Contractor should note NR have confirmed the check category is 1b (NR/L2/CIV/003).

The *Contractor* should undertake the temporary works design to Eurocodes for excavation, lateral ground support and management of ground water.

The *Contractor* should undertake the temporary works design to Eurocodes for the shaft base to support construction activity and flotation during all construction stages.

The *Contractor* should undertake the temporary works design of tunnel opening, culvert opening and thrust wall as appropriate.

The *Contractor* should undertake the permanent works design of a 6m diameter shaft structure to support all anticipated permanent loadings for a 120-year design life. Permanent works design should

accommodate hydraulic benching and maintenance access requirements shown on drawing ENV00148C-JAC-CS-3PB-DR-C-0009. The *Contractor* should note the requirement to design a small box culvert section to link the reception pit to the new channel downstream of the southern shaft.

The *Contractor* should produce a set of design drawings for *Client* acceptance. The *Contractor* should then produce approved for Construction drawings for the shaft design including all reinforcement drawings and associated bar bending schedules.

The *Contractor* should undertake the permanent works design of tunnel/pipejack to Eurocodes, for ground, railway and canal loadings, as well as pipe-jacking loads. The structure should have a design life of 120 years.

The *Contractor* should produce a set of design drawings for *Client* acceptance. The *Contractor* should then produce approved for Construction drawings for the Tunnel design including all reinforcement drawings and associated bar bending schedules.

### S303 Design Coordination

The *Contractor* shall attend monthly progress meetings/calls to provide progress updates and ensure integration with the wider design requirements.

The *Contractor* shall liaise with the Designer and the Principal Designer to ensure a coordinated design is achieved.

### S304 Consultation Requirements

The *Contractor* shall lead the engagement with the third parties who are impacted by the siphon works and produce a design that is approved by all.

Network Rail: An F001 has been approved by Network Rail (see Site Information). The *Contractor* shall prepare and submit an F002 and F003 that is of appropriate quality to secure approval from Network Rail.

Warrington Borough Council: An AIP has been submitted. The *Contractor* shall update and submit an AIP that is of appropriate quality to secure approval from WBC.

Cadent Gas: The *Contractor* shall submit details of the design and obtain approval. Initial consultation has been undertaken with Cadent Gas, the details of which will be made available.

National Grid: The *Contractor* shall submit details of the design and obtain approval.

United Utilities: The *Contractor* shall submit details of the design and construction methodology and obtain approval. Initial consultation has been undertaken with United Utilities, the details of which will be made available.

For United Utilities approval the *Contractor* should provide the following:

- Permanent loading calculations (if any)
- Line and level of sewer both sewers
- Settlement calculations showing expected settlement under the MVSP
- Details of emergency procedures should there be a utility strike on the MVSP
- Details on how the sections of tunnel are to be constructed

### S305 Documentation

The *Contractor* should provide information to be compiled as part of the health and safety file. This should include a design report, calculations, operation and maintenance manual, information on residual risks and a decommissioning statement.

## S 400 Completion

### S 401 Completion definition

It is an absolute requirement of the contract that Completion is only certified when:

i. All of the deliverables have been provided and accepted by the *Client*.
ii. The *Client*'s latest version of the Project Cost Tool, or its successor has been populated.
iii. All BIM Data has been transferred to the *Client*'s databases
iv. The relevant phase of the *Client*'s carbon tool has been completed.
v. Site inspection with the *Supervisor* to demonstrate that all working areas have been re-instated to an acceptable standard.

### S 402 Pre-Completion inspection

Prior to Completion the *Contractor* shall arrange a site inspection with the *Supervisor* to demonstrate that all working areas have been re-instated to an acceptable standard.

## S 500 Programme

### S 501 Programme requirements

The *Contactor* shall provide details of the resources, and equipment required for each activity on the programme and a supervisory staff histogram, as part of the programme or as an excel file, for the whole of the works.

The programme shall be produced with a detailed forecast of actual defined cost and forecast defined cost which shall be amended and submitted at the frequency described in the Contract Data for the programme submissions.

The *Contractor's* programme shall include the submission of the BEP and Master Information Delivery Plan (MIDP).

The *Contractor* provides a fully logic linked critical path programme in both Microsoft Project Format (Version 2016) and pdf format at the frequency described in the Contract Data.

The *Contractor* shall ensure that the programme includes appropriate time allowances for the internal quality assurances and review of all deliverables prior to issue to the *Client.*

The *Contractor* shall allow the *Client* a two week period to review each of the deliverables prior to their finalisation and this should be reflected in the programme.

### S 502 Revised programme

In any revised programme the *Contractor* will provide the *Client and Project Manager* with a clear explanation for any changes to dates, durations, resources and/ or activities.

### S 503 Methodology Statement

The *Contractor* shall provide the *Client* and *Project Manager* with a high level Methodology Statement with every issue of the programme to outline the proposed resources, methods and sequencing of activities for the delivery the *works* in accordance with the requirements of the contract.

## S 600 Quality management

### S 601 Samples

Not applicable – the *Contractor* is not required to provide any material samples for acceptance by the *Client*.

### S 602 Quality management system

The *works* shall be carried out in accordance with a quality management system(s) established in accordance with BS EN ISO 9001, BS EN ISO 14001 and BS OHSAS 18001.

The *Contractor* submits to the *Project Manager* his quality management system one week after the starting date.

The *Contractor's* quality management system shows:

- how the *Contractor* ensures the *works* meet the *Contractor*'s quality statement;
- who manages the *Contractor*'s quality management system; and,
- how the *Contractor* checks work items (including tests and inspections), records this check and certifies as complete.

Records to demonstrate compliance with the above shall be made available to the *Supervisor* on request. Method statements shall be issued to the *Supervisor* prior to commencement of works, including but not limited to; identification of buried services/utilities, crossing existing services and environmental protection.

All geotechnical and environmental laboratory testing shall be carried out following the methodologies certified by MCERTS and / or be UKAS accredited.

**S 603 BIM requirements**

The BIM Information Manager is the Project Manager. The *Contractor* shall comply with the Client's BIM requirements.

Appendix 1 to the CIC BIM Protocol is to be replaced with the project specific Information Delivery Plan (IDP), provided by the *Client*.

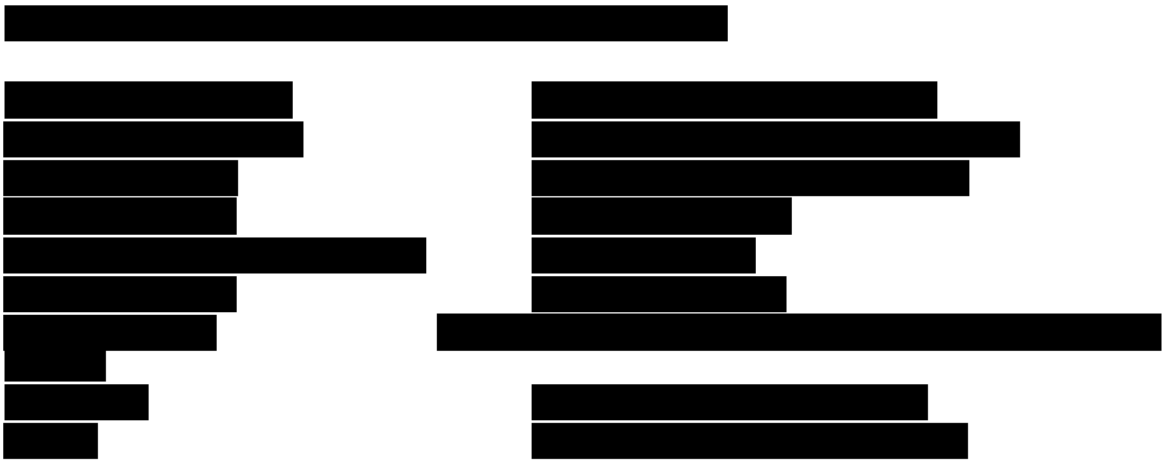
All *Client* issued information referenced within the Information Delivery Plan remains within the Site Information unless it is referenced elsewhere within the Scope.

## S 700 Tests and inspections

A full and detailed schedule of the soil and groundwater laboratory testing suites is provided in Appendix C.

## S 800 Management of the *works*

### S 801 Project team – Others



On appointment the *Contractor* is to provide a detailed contact list of all their team members who will be involved in delivering the *works*.

### S 802 Communications

As part of the general project management duties the *Contractor* shall, as a minimum, communicate with the *Client* and wider Project Team in the following ways:

- Monthly Progress Reporting (including progress update report, record of deliverables issued, comments on the programme, financial updates & forecasts of actual expenditure vs forecast expenditure and risk management updates) to align with the *Client*'s project reporting timetable.
- Attend a start-up workshop within 1 weeks of contract award with the *Client* and wider project team.
- Attend monthly progress meetings arranged by the *Client*.
- Provide updates to the *Client* via phone, telecom or virtual meeting format on at least a weekly basis.
- Co-operate with the *Client* in the role of the BIM Information Manager; including production of BIM Execution Plan and updated Master Information Delivery Plan using the BIM Implementation Plan and MIDP structures provided by the *Client*.

The *Contractor* is to make full use of the *Client's* web-based project collaboration tool (currently Asite) for the handover of project deliverables. Fastdraft will be used for the administration of the contract.

## S 900 Working with the *Client* and Others

### S 901 Sharing the Working Areas with the *Client* and Others

The *Contractor* is not expected to have to share the Working Area with others. However, the *Contractor* shall be aware of general public and landowner activities in the immediate vicinity and shall ensure that the public and landowners are appropriately segregated from the *works*.

### S 902 Co-operation

In undertaking the *work*s, it is expected that the *Contractor* will, as necessary, communicate and cooperate directly with the entire *Client* team, their designer, the Principal Designer and other suppliers, stakeholders and landowners.

The *Contractor* is required to co-operate with Others in obtaining and providing information which they need in connection with the *works*. Throughout the *works*, the *Contractor* shall regularly keep all affected stakeholders up to date on progress with the *works*.

## S 1000 Services and other things to be provided

### S 1001 Services and other things for the use of the *Client, Project Manager* or Others to be provided by the *Contractor*

The *Contractor* shall allow the *Supervisor* (and their site representatives) full access to their site office and welfare facilities.

The *Contractor* shall provide, at least, the following for use by the *Supervisor*:

- Toilet and hand-washing facilities;
- Facilities for preparing hot food and hot drinks;
- A room for drying clothes;
- Desk and chair within a shared office area.

### S 1002 Services and other things to be provided by the *Client*

The *Client* will serve Notices of Entry to provide the *Contractor* with access to the site(s) on the *possession date*.

The *Client* by virtue of section 165(1) of the Water Resources Act 1991 ("the Act") has general powers to carry out flood defence and drainage works in connection with a main river. The *Client* is responsible for negotiating agreements with third parties regarding access for carrying out the works, and will exercise the powers of entry contained in section 172 of the Act for the purpose of carrying out the works and will serve any notices of entry required under paragraph 1 of Schedule 20 of the Act for access within the boundaries of the site.

## S 1100 Health and safety

### S 1101 Health and safety requirements

Health and safety is the number one priority of the *Client.* The *Contractor* will promote and adopt safe working methods and shall strive to deliver solutions that provide optimum safety to all.

The *Contractor* is to ensure that the works are undertaken in accordance with the requirements of the *Client's* Safety, Health, Environment and Wellbeing Code of Practice.

The *Contractor* is to make use of *Client's* Health and Safety reporting tools – AirsWeb.

### S 1102 Method statements

The *Contractor* prepares risk assessments and method statements (RAMS) for each operation and activity.

The *Contractor* will ensure the RAMS for each operation and activity includes;

- risk assessments of the work;
- people and resources proposed;
- timing and sequencing of materials and equipment;
- indication of activities that represent a higher level of safety, health and environment risk;
- safety, health and environment controls proposed; and,
- any permit to work proposals.

The *Contractor* shall provide a schedule of the RAMS are to be produced during the course of the *works* and provide to the *Supervisor*. The *Contractor* shall make available for inspection and review any of the RAMS requested by the *Supervisor*.

### S 1103 CDM Reg requirements

The *Contractor* shall undertake the role of Principal Contractor for the *works* and shall comply with their duties and responsibilities under the CDM Regulations 2015.

The *works* are an integral part of the Penketh and Whittle FRMS project which is notifiable under the CDM 2015 Regulations.

The *Client* has appointed a Principal Designer (PD) under the CDM 2015 Regulations for this contract and associated contracts.

The *Contractor* shall liaise with the appointed Principal Designer as necessary during the delivery of the *works*.

## S 1200 Subcontracting

### S 1201 Restrictions or requirements for subcontracting

The *Contractor* shall advise the *Project Manager* of their intention to sub-contract any elements of the *works* and shall provide details of the proposed sub-contractor for acceptance by the *Project Manager* prior to their appointment.

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## S 1300 Title

No requirements.

## S 1400 Acceptance or procurement procedure

Not applicable.

## S 1500 Accounts and records

### S 1501 Additional Records

In accordance with Clause 52.2 the *Contractor* shall keep the following additional records for inspection and review by the *Project Manager* as requested:

- Timesheets and site allocation sheets,
- Equipment records,
- Forecasts of the total Defined Cost,(Forecasts are to include, but not be limited to costs to date, costs to completion including detailed breakdown of staff, sub-contract and major material items)
- Specific procurement and cost reports

The format and presentation of records to be submitted to the *Project Manager* for acceptance.

## S 1600 Parent Company Guarantee (Option X4)

Not required.

## S 1700 W*orks* specification

The *works* shall be undertaken in accordance with CESWI as modified by, the *Client's* Minimum Technical Requirements (MTRs).) as modified by the scope.

The Specification for the *works* (primarily associated with the GI works) shall be the 'UK Specification for Ground Investigation, Second Edition' published by ICE Publishing on behalf of the Site Investigation Steering Group, modified and extended by any Substitute Clause or Additional or Cancelled Clause or Table listed in Schedules 4 and 5. Any Clauses in the Specification which relate to work or materials not required for these GI *works* shall be deemed not to apply.

Any Schedules referred to in the Specification which are not used shall be deemed not to apply.

The Investigation Supervisor is the Supervisor under the NEC4 Engineering and Construction Contract. In the below specification text there where there are references to the 'Investigation Supervisor' this is the Supervisor under the NEC4 Engineering and Construction Contract.

S1.1 to S1.8 of the 'UK Specification for Ground Investigation' do not apply as the relevant information is included in S100 to S1600 of this Scope.

Clause references within S1700 refer to clauses in the 'UK Specification for Ground Investigation'. All other Section references (S100 to S1700) refer to sections within this Scope.

The following Specification Sections of Schedule 1 of the 'UK Specification for Ground Investigation' have been amended as detailed below and shall apply to these GI *works*.

**Specification Section 4: Percussion Boring - Particular Restrictions / Relaxations**

(Clauses 4.1 and 4.4) Permitted Methods and Restrictions

The minimum permitted diameter for cable percussion boreholes is 150mm, the minimum starting diameter is 200mm to allow for aquifer protection measures to be installed however consideration is required to allow for 2 No. reductions in borehole size. The minimum permitted diameter for dynamic sampling boreholes is determined by the maximum starting diameter possible for the equipment.

In accordance with "Avoiding Danger from Underground Services", HSG47, the Contractor shall check the ground surface at each exploratory hole location with a signal generator and Cable Avoidance Tool (CAT) and a Ground Penetrating Radar (GPR) survey prior to breaking ground.

The borehole shall be adequately secured and fencing erected during construction. The fencing is to be agreed with the *Supervisor* dependent on location, access, duration and activity.

At each exploratory hole location, an inspection pit shall be dug down to 1.2m and will be fully sampled, tested via in-situ hand shear vane and logged as if it were a trial pit (commencing directly beneath the topsoil layer). If any services are encountered, they are to be logged and their position recorded along with their type, size, depth and orientation. The inspection pit shall be, at least, the size of the largest diameter of drilling casing being used.

Cable percussive boreholes should be terminated should target depth be reached or less than 75% is recovered in the UT 100 sample, alternatively if in granular material after 3 SPT refusals or as agreed with the Investigation Supervisor.

Cable percussive boreholes should be switched to rotary core methods if target depth cannot be achieved using Cable percussive methods.

Boreholes may only be terminated above the scheduled depth with the agreement of the *Supervisor* in consultation with the designer.

(Clause 4.5) Backfilling

Boreholes shall not be backfilled without confirmation from the *Supervisor* in consultation with the designer. Backfill requirements will be specified by the *Supervisor* in consultation with the designer upon completion of the borehole.

Groundwater monitoring installations shall have response zones that do not cross stratum boundaries and shall be adequately sealed through Made Ground to minimise potential cross-contamination between strata.

No arisings shall be left on site or used to backfill any exploratory hole. Arisings shall be bagged up and removed by the *Contractor* for appropriate off-site disposal.

Reinstatement requirements are detailed in S 209

(Clause 4.6) Dynamic Sampling

All positions drilled using dynamic sampling shall be carried out using tracked rigs capable of gaining access to the proposed investigation locations. The dynamic sampling rigs shall have the capability to undertaking geotechnical sampling equal to a cable percussive rig with rotary coring follow-on and capable of taking undisturbed thin-walled samples (UT100), SPTs, bulk and disturbed sub-samples.

For each borehole, the *Contractor* shall select sampling tubes of sufficient diameter to allow, if required, follow-on with rotary drilling equipment (whose minimum diameter shall be 100mm, as per Clause 5.2. All equipment shall be capable of achieving the anticipated depth shown in Schedule 2.

Dynamic sampling techniques shall be switched to rotary core methods as agreed by the *Supervisor* in consultation with the designer.

It should be noted an exception to the above requirements applies to the two dynamic sample holes proposed on the eastern bank of the Whittle Brook. These locations shall be positioned as close to the Whittle Brook as is reasonably practicable (the contractor must agree the position of the locations with the Investigation Supervisor prior to breaking ground) and are required to allow collection of environmental soil samples and subsequent installation of a combined gas/groundwater monitoring standpipe in each hole. Rotary drilling and geotechnical sampling/testing are not required at these two locations.

Where access constraints apply, the *Contractor* shall have the capability to use a light manually transported dynamic sampling rig with SPT capability.

Window sampling holes may be carried out using hand-held plant if access or ground conditions prevent the use of tracked dynamic sampling plant as described above. Similar to dynamic sampling boreholes the *Contractor* shall provide a range of sampling tubes in order

to reach required depth as specified in Schedule 2. Window sampling tubes shall be extruded on site and photographed as per S 2012.

**Specification Section 5: Rotary Drilling - Particular Restrictions/ Relaxations**

(Clause 5.1) Augering Requirements and Restrictions

Not required.

(Clause 5.2) Particular Rotary Drilling Techniques

The *Contractor* shall ensure the Rotary Core follow-on commences from the base of the previously bored Cable Percussion or Dynamic Sampling hole where specified in the Schedule 2, or as instructed by the *Supervisor* in consultation with the designer. The chosen drilling equipment shall be capable of undertaking triple tube rotary coring to the target depths specified in Schedule 2.

The *Contractor* shall propose appropriate drill bits and core barrels with capabilities of coring into the anticipated strata.

All core holes must allow for the undertaking of in-situ SPTs.

(Clause 5.3) Drilling Fluid Type and Collection

Clean fresh water shall be used as a flush fluid. Polymer, foam or bentonite mud shall be used only where agreed in advance with the *Supervisor* in consultation with the designer. If used, these additives shall be biodegradable and non-toxic.

For each core run, the drill flush returns/losses shall be recorded on the driller's log.

Special precautions shall be taken to control and contain all drilling fluids. Well head arrangements, piping, tanking, and re-circulation shall all be carried out without spillage of drilling fluid(s). In the event of an accidental spillage, the *Contractor* shall follow the Environmental Incident Reporting Procedure as agreed with the Supervisor and make good to the satisfaction of the Supervisor.

(Clauses 5.4.1 and 5.4.2) Rotary Core Drilling Equipment and Core Diameter

Rotary core drilling shall be carried out by a triple tube coring system incorporating a removable inner liner. The liner shall be a single piece cylindrical semi-rigid plastic liner of minimum 1mm wall thickness. The equipment shall be capable of providing cores of at least 100mm diameter of quality Class 1 in accordance with BS EN 1997-2:2007 in soil and rock.

The *Contractor* shall arrange to have on site a range of drill bits and core springs that will allow the optimisation of clearance between the cut diameter of the core and the liner. The clearance should be of the order of 1mm for undisturbed sampling. The actual clearance shall be determined at the outset of the work and shall be agreed with the *Supervisor* in consultation with the designer.

On retrieval, an end cap shall be fitted to each length of a core retained within the liner to prevent damage and loss of moisture.

Drill runs shall not exceed 1.5m in length in any deposit unless agreed with the *Supervisor* in consultation with the designer. The core barrel shall be removed from the drill holes as often as may be required in order to get the best possible core recovery.

Core recovery of less than 90% in any drill run or core runs where there are signs of unsatisfactory disturbance will not be acceptable for payment unless the *Supervisor* in consultation with the designer is satisfied that a recovery greater than 90% is impracticable under the prevailing conditions. When core recovery is less than 90% of the length drilled, the *Supervisor* and designer shall be notified immediately, the length of the subsequent core run shall be reduced by half and necessary techniques, equipment, and skills shall be employed to achieve satisfactory recovery.

(Clause 5.4.6) Core Logging

The *Contractor* shall ensure that all cores are photographed and logged on site by a competent Geotechnical Engineer / Engineering Geologist with appropriate, relevant experience logging core, prior to sub-sampling.

Soil and rock logging and grading shall be carried out in accordance with BS 5930.

A tabulated fracture log of all discontinuities shall additionally be reported. Drilling induced fractures shall be identified.

Cores shall be kept for a period of 28 days after submission of the approved final report. After this time the *Supervisor's* in consultation with the designer permission shall be sought for their disposal. The *Contractor* shall dispose of all cores in accordance with the relevant waste transport and disposal regulations.

(Clause 5.4.7) Core Sub-Samples for Laboratory Testing

Immediately after opening, photographing, and logging of cored samples, Class 1 (EC7 compliant) sub-samples shall be selected for further laboratory testing. All core sub-samples shall be protected from moisture, stress loss and disturbance using suitable techniques (e.g. tinfoil, waxing, cling-film etc.).

Subject to the condition of soil and weak cores, sub-samples are to be taken at nominally 1.5m intervals, unless otherwise specified by the *Supervisor* in consultation with the designer. Core sub-samples should be minimum 300mm in length to allow for the required geotechnical laboratory testing. Additional core sub-samples may be instructed by the Investigation Supervisor.

The location of recovered core sub-samples shall be identified by spacers with clear labelling of the depth range and sub-sample number.

(Clause 5.4.8) Address for Delivery of Selected Cores

Not required

(Clause 5.5.1) Rotary Open-Hole Drilling General Requirements

Not required.

(Clause 5.5.2) Rotary Open-Hole Drilling for Locating Mineral Seams, Mine Working etc.

Not required.

(Clause 5.6.1) Open-Hole Resonance (Sonic) Drilling

Not required.

(Clause 5.7) Backfilling

Boreholes shall not be backfilled without confirmation from the *Supervisor* in consultation with the designer.

Boreholes without monitoring installations shall be backfilled with bentonite pellets on completion, ensuring the pellets are poured gradually and evenly to prevent the formation of voids within the backfill.

(Clause 5.8) Core Photographic Requirements

The *Contractor* shall obtain rock core photographs in adequate lighting in accordance with Specification Clause 5.8 prior to logging / sub-sampling.

Class 1 sub-samples shall be photographed prior to sealing.

All sub-sample locations are to be identified by spacers with clear labelling of the sub-sample, depth range and sub-sample number.

Zones of core loss shall be identified by spacers with clear labelling of the core loss and the depth range.

Core photographs in electronic format shall be presented by the *Contractor* in the factual report submission. Additionally, photographs shall be included as fully referenced associated files within AGS digital data format.

**Specification Section 6: Pitting and Trenching - Particular Restrictions / Relaxations**

(Clauses 3.8.3 and 6.1) Indirect Detection of Buried Services and Inspection Pits

The *Contractor* must obtain their own service plans from asset owners to assess the risk posed by buried services prior to breaking ground. The detection and avoidance of buried services is the responsibility of the *Contractor*. Any data provided to assist with this, is for information only and the *Contractor* shall satisfy themselves of the completeness and accuracy of such data.

The *Contractor* must satisfy themselves that adequate desktop utility record searches have been undertaken and that underground utility surveys are carried out in accordance with PAS 128 (BSI, 2014) prior to commencement of any exploratory location

In accordance with “Avoiding Danger from Underground Services”, HSG47, the *Contractor* shall check the ground surface at each exploratory hole location with a signal generator and

Cable Avoidance Tool (CAT) and a GPR survey prior to breaking ground. The GPR, CAT and signal generator scans should cover a minimum 10m$^2$ area centred on each of the specific exploratory hole locations, unless otherwise agreed with the *Supervisor* due to working constraints. Should buried utilities be detected within this area, the survey area may be extended in agreement with the *Supervisor* to allow for relocation of the exploratory hole if required.

All Trial Pits and Inspection Pits shall be scanned for services using a CAT and signal generator at 0.5m, 1.0m and 1.2m below ground level as the pit is excavated. All exploratory holes shall commence from the base of the inspection pit.

If services are indicated by the cable avoidance tool and signal generator prior to hand digging, the location shall be marked on the surface using a marker point and a new location shall be agreed with the *Supervisor*. The new location shall be surveyed in kind.

All GPR and CAT operators shall be competent and suitably trained in the use of the equipment and indirect detection of buried services.

(Clauses 6.2 and 6.3) Restrictions on Plant or Pitting/Trenching Methods

Any trial pitting required close to the watercourse should be properly risk assessed and planned and appropriate measured put in place to prevent collapse of the trench or introducing material into the watercourse.

People-plant interface at the working area shall be addressed in the pitting and trenching method statement so as to minimise the risks to site personnel. Although not prescriptive or considered exhaustive, examples of such measures may be:

- demarcation or fencing of the working area;
- clear explanation of roles on site, responsibilities and lines of communication;
- interaction between *Supervisor* and other parties (such as UXO specialist, ecologist etc); and permitting.

Due to the proximity of the GI with existing buried services, a toothless bucket shall be used unless otherwise agreed with the asset holders. All trial pits shall be backfilled and reinstated on the day of excavation and no pits shall be left open overnight or unsupervised.

In areas where buried services pose a residual risk, trial pits should be excavated in thin layers (not more than 100mm thick) and be closely supervised by an appropriately experienced Ground Engineer or equivalent.

(Clause 6.5) Entry of Personnel

Entry of personnel into any excavation is not permitted under any circumstances.

(Clause 6.7) Alternative Pit and Trench Dimensions

As specified for trial pits.

Inspection pit dimensions shall be appropriate to the diameter of the borehole being drilled (at applicable locations).

(Clause 6.9.2) Abstracted Groundwater from Land Affected by Contamination

As specified.

On site measures for collection and temporary storage of contaminated groundwater (prior to the availability of laboratory test results to determine appropriate disposal) shall be agreed with the *Supervisor* in consultation with the designer.

(Clause 6.10) Backfilling

Backfilling of pits shall be carried out as soon as practicable. Trial pits are to be backfilled with arisings placed in reverse order to their excavation and finished on a like-for-like basis with reference to the original ground surface or bund/cutting slope profile. Backfill is to be compacted every 0.2m using the excavator bucket and lightly mounded at ground level to allow for subsequent settlement. Any cobble or boulder size material encountered during the excavation shall be backfilled into the pit/trench first. Any surplus material shall be heaped over the trial pit location.

(Clause 6.12) Photographic Requirements

Refer to S 2012

Additional photographs shall be taken where there is significant variation in the different faces of the trial pits and arisings generated due to variations in strata with depth.

(Clause 6.12.12) Artificial Lighting

Where necessary, the *Contractor* shall ensure that adequate additional lighting is supplied for the duration of the excavation and inspection.

(Clause 6.13) Provision of Pitting Equipment and Crew for *Supervisor's* Use

Not required.

(Clause 3.7.5) Archaeological Artefacts

Where archaeological artefacts are found, work should halt, and the *Supervisor* shall be informed immediately, and the advice of an archaeological specialist shall be sought. The *works* should not recommence until instructed by the *Supervisor*.

**Specification Section 7: Sampling and Monitoring During Intrusive Investigation - Particular Restrictions/ Relaxations**

(Clause 7.6.1) Address for Delivery of Selected Geotechnical Samples

Not required.

(Clause 7.6.2) Retention and Disposal of Geotechnical Samples

As specified.

(Clause 7.6.3 – 7.6.11) Frequency of Sampling for Geotechnical Purposes

**Inspection Pits**

In accordance with the frequency outlined in Clause 7.6.11.

Small disturbed and bulk samples shall be obtained from each inspection pit with hand shear vane tests undertaken on cohesive materials encountered.

**Machine Excavated Trial Pits**

In accordance with the frequency outlined in Clause 7.6.11.

Two large bulk samples shall be acquired within any granular strata encountered.

**Cable Percussive Boreholes**

In accordance with the frequency outlined in Clause 7.6.4.

Where appropriate ground conditions are encountered, Class 1 UT100 thin wall open-tube samples (OS/TW) shall be undertaken from the base of the inspection pit and thereafter on a continuous and alternating basis with SPTs. If ground conditions are not suitable for thin-walled samples, thick wall open-tube sampling (OS/TKW) may be used upon agreement with the *Supervisor* in consultation with the designer.

The cutting shoe sample is also to be retained as a bag sample.

**Dynamic Sample Boreholes**

In accordance with the frequency outlined in Clause 7.6.4.

Where appropriate ground conditions are encountered, Class 1 UT100 thin wall open-tube samples (OS/TW) shall be undertaken from the base of the inspection pit and thereafter on a continuous and alternating basis with SPTs. If ground conditions are not suitable for thin-walled samples, thick wall open-tube sampling (OS/TKW) may be used upon agreement with the *Supervisor* in consultation with the designer.

If the ground conditions are not suitable for the use of OS/TW or OS/TWK sampling, an SPT shall be undertaken at the base of the 1.2m inspection pit. Thereafter, windowless sampling shall be undertaken in 1m runs with an SPT undertaken at the end of each run.

Samples retrieved by windowless sampling shall be sub-sampled during or immediately after logging. The following sub-sampling frequency shall be followed:

- Small disturbed samples shall be taken from the top and bottom of each windowless sample tube, ensuring samples do not cross geological boundaries;
- A bulk disturbed sample shall be taken from each windowless sample tube, ensuring at least one bulk disturbed sample is taken of each soil type and that the sample does not cross a geological boundary.

All sub-samples shall be appropriately sealed immediately after sub-sampling to preserve moisture content.

Piston samples should be taken if very soft ground is encountered.

The cutting shoe sample is also to be retained as a bag sample.

(Clause 7.6.5) Open-tube and Piston Sample Diameters

Driven open tube sampling shall recover a minimum 100mm Class 1 sample.

(Clause 7.6.5) Retention of Cutting Shoes Samples

As specified.

(Clause 7.6.12) Delft and Mostap Sampling

Not required.

(Clause 7.7) Groundwater Level Measurements During Exploratory Hole Construction

As specified.

(Clause 7.8) Special Geotechnical Sampling

Not required.

(Clause 7.9.2) Address for Delivery of Selected Samples

Not required.

(Clause 7.9.3) Retention and Disposal of Contamination/WAC Samples

As specified.

(Clause 7.9.4) Frequency of Contamination Sampling

Samples shall not be recovered from depths spanning more than one stratum, or from the boundary of two strata.

Environmental soil samples shall be taken at 0.25m bgl, 0.5m bgl, 1.0m bgl and thereafter, one sample per 0.5m depth through Made Ground. In natural soil, a sample is to be taken at 1m intervals, unless otherwise instructed by the *Supervisor* in consultation with the designer.

In addition, samples shall be taken at a change of stratum and samples shall be collected by the Contractor whenever visual or olfactory signs of contamination or potential asbestos containing materials (ACMs) are encountered.

Separate samples of any suspected asbestos-containing material are required. These must be obtained, stored and transported in accordance with CAR 2012 and CAR SOIL 2016. Representative samples of Made Ground and suspected fragments of asbestos-containing materials are to be undertaken by a person who has completed the appropriate training. Suspected asbestos material must not be broken up. All samples of suspected pieces of asbestos-containing materials must be double bagged in re-sealable bags and then placed in plastic tubs. All bags and containers to be marked “suspected asbestos” and carry an asbestos warning label as detailed in the aforementioned regulations.

To avoid confusion in relating sample depths to recorded strata, all sample depths shall be recorded to reflect the stratum from which the sample is taken and are not to be recorded as the depth of the boundary between strata. In addition, the depth ranges from which the sample was recovered shall be recorded on all sample containers and associated documentation.

All environmental samples shall be collected in accordance with BS10175:2017 to mitigate against potential cross contamination between samples.

The uppermost environmental soil sample(s) shall be obtained from below the root-zone (if present) wherever practicable.

Sediment samples shall be obtained (standing on the bank) from the bed of the water course/feature at least 2m from the bank, using an extendable pole or similar where possible or as otherwise agreed with the *Supervisor* in consultation with the designer. Sediment samples shall be free from debris/vegetation.

Sample quantities and containers shall be selected in consultation with the analytical laboratory applicable to the proposed testing suite(s) (refer to Scope - Appendix C for suites) such that all the requested analyses can be completed.

(Clause 7.9.5 and 7.9.6) Sampling Method

All environmental sample containers shall be completely filled and the lid securely fitted immediately on sampling and the filled containers placed into a cool box. Samples for environmental testing shall be stored in chilled cool boxes provided by the analytical laboratory and kept away from direct sunlight, sources of warmth/heat, and potential sources of contamination (e.g. fuels and solvents) at all times. The cool box shall be kept at a temperature of between $3^0c \pm 2^0c$ until such time that the cool box is received by the analytical laboratory.

The environmental sample containers should be filled as fully as possible and large air gaps avoided. These should be clearly labelled with the project, the date, the exploratory hole name and the depth from which the sample was obtained.

Where Made Ground and sediment samples are collected, sufficient sample mass must be obtained in appropriate containers to allow soil, soil leaching and Waste Acceptance Criteria analysis to be carried out on each sample, if required.

When collecting samples for the determination of volatile organic compounds (VOCs), the sampling technique and sample container employed should minimise the loss of volatiles.

Sediment samples shall be obtained using a weighted sediment sampling 'grab'. The *Contractor's* proposed method of sediment sampling shall be agreed with the *Supervisor* in consultation with the designer prior to the start of the.

**Note**: The *Contractor* is required to submit copies of the appointed laboratory's analytical testing methods including detection limits for approval by the *Supervisor* in consultation with the designer a minimum of 14 days prior to commencing intrusive work to allow the *Supervisor* in consultation with the designer to review and provide comment.

Confirmation of the laboratory's required sample containers and minimum mass (soil and sediment) and volume (groundwater) must be sent to the *Supervisor* at least 14 days prior to the commencement of the ground investigation.

(Clause 7.9.8) Headspace Testing

All environmental samples of Made Ground and sediment, and any natural material showing visual/olfactory signs of contamination are to be subject to field headspace testing using a Photo Ionisation Detector (PID) fitted with a 10.6 eV lamp. Additional headspace testing on samples of natural material may be required and will be advised by the *Supervisor* in consultation with the designer. The PID must be calibrated in accordance with the manufacturer's instructions and the calibration certificate shall be supplied. (Note: the PID is also to be used for the post-GI monitoring detailed in Specification Section 12).

All headspace test results shall be recorded on the relevant daily records (see Specification Section 13).

## Specification Section 8: Probing and Cone Penetration Testing Particular Restrictions / Relaxations

Not required.

## Specification Section 9: Geophysical Testing Particular Restrictions/ Relaxations

(Clause 9.1.1) Geophysical Survey Objectives

**GPR surveys for utility identification**

Reference shall be made to requirements outlined in specification Section 6.

(Clause 9.1.1) Requirement for Ground Specialist Geophysicist

The GPR operator shall be competent and suitably trained in the use of the equipment and indirect detection of buried services.

(Clause 9.1.1) Trials of Geophysical Methods

Not required.

(Clause 9.1.1) Types of Geophysics Required

**GPR surveys for utility identification**

Reference shall be made to requirements outlined in Specification Section 6.

(Clause 9.2) Information Provided

**GPR surveys for utility identification**

Reference shall be made to requirements outlined in Specification Section 6.

(Clause 9.3) Horizontal Data Density

Not required.

(Clause 9.4) Level Datum

Not required.

(Clause 9.7) Geophysical Survey Report

Not required.

## Specification Section 10: In Situ Testing Particular Restrictions/ Relaxations

(Clause 10.3) Tests in Accordance with British Standards

**Standard Penetration Test (SPT)**

These shall be carried out as per S1.12.3 and as described in BS EN ISO 22476-3.

**Variable Head Permeability Test**

Variable head tests shall be carried out as described in BS EN ISO 22282-2:2012 in exploratory holes specified within Schedule 2. Additional, variable head permeability tests in-situ and within monitoring installations, may be instructed by the *Supervisor* in consultation with the designer.

Required test depths shall be specified to the *Contractor* depending on the ground conditions encountered.

The Contractor shall prepare the specified response zone with a filter pack comprising pea gravel to reduce the impact of borehole collapse during the test. The gravel shall be inserted into the casing upon reaching the specified test depth then the casing shall be pulled back to create a supported response zone.

Both falling and rising head tests are to be undertaken at each specified test depth. In-situ tests will be within the borehole and not the installation.

**In-situ Hand Vane Tests (HV)**

These shall be carried out as per S1.15.2 and as described in BS 5930:2015.

(Clause 10.4) Hand Penetrometer and Hand Vane for Shear Strength

Hand vane tests shall be carried out on suitable samples of cohesive material retrieved from inspection pits at 0.5m, 1.0m and 1.2m.

In trial pits, from the base of the inspection pit, hand vane tests are to be conducted at 0.5m intervals on suitable samples of cohesive material.

The *Contractor* should be aware of the inherent instability of trial pits. Tests can be undertaken on cohesive soils from the excavator bucket. Entry into the pit is not permitted.

(Clause 10.5.1) Self-boring Pressuremeter and High Pressure Dilatometer Testing and Reporting

Not required.

(Clause 10.5.2) Driven or Push-in Pressuremeter Testing and Reporting Requirements

Not required.

(Clause 10.5.3) Menard Pressuremeter Tests

Not required.

(Clause 10.6) Soil Infiltration Test

Not required.

(Clause 10.7) Special In Situ Testing and Reporting Requirements

Not required.

(Clause 10.8) Interface Probes

The *Contractor* shall have an oil-water interface probe available on site for the duration of the GI and post-fieldwork monitoring period. All groundwater level readings shall be taken using the interface probe.

The *Contractor* shall record the presence of light and dense non-aqueous phase liquid (LNAPL and DNAPL) at the top and bottom of the water column within each monitoring well throughout the post-fieldwork monitoring period.

(Clause 10.9) Contamination Screening Tests

Refer to Clause 7.9.8 Headspace Testing.

(Clause 10.10) Metal Detection

Reference shall be made to requirements outlined in Specification Section 6.

**Specification Section 11: Instrumentation Particular Restrictions/ Relaxations**

(Clause 11.2) Protective Covers for Installations

All boreholes with installations as specified in Schedule 2 shall be provided with raised lockable steel covers set in concrete surround. All installations shall be clearly labelled using indelible ink with the location reference as specified in Schedule 2.

(Clause 11.3) Protective Fencing

The *Contractor* shall agree with the landowner if wooden post markers are required at each monitoring installation.

(Clauses 11.4.1 and 11.4.2) Standpipe and Standpipe Piezometer Installations

50 mm diameter standpipes are to be installed for gas and groundwater monitoring purposes in boreholes specified in Schedule 2.

The *Supervisor* in consultation with the designer shall confirm the requirements upon completion of the borehole, on receipt of the logged ground descriptions, depths, groundwater and in-situ testing results, from the *Contractor*.

Installation response zones should be adequately sealed through Made Ground to minimise potential cross contamination of geological strata. Drainage should be provided as specified in BS 5930 to ensure surface cover chambers do not become flooded with surface water.

Standpipe installations to be completed as generally specified in Clause 11.4.1 with the following particular restrictions / relaxations:

- All gas and groundwater monitoring standpipes to be fitted with a rubber bung and gas valve left in the closed position;
- Filter material to comprise washed, clean, non-carbonate filter gravel with a granular diameter of no more than 5mm; and
- Bentonite seals below groundwater to be placed using bentonite pellets that are adequately hydrated following placement.

(Clause 11.4.3) Other Piezometer Installations

Not required.

(Clause 11.4.5) Development of Standpipes and Standpipe Piezometers

Well development shall be undertaken in accordance with Environment Agency Science Report SC020093: Guidance on the design and installation of groundwater quality monitoring points, and the British Standard ISO 5667-11:2009 Water quality – Sampling – Part 11: Guidance on sampling of groundwater.

All monitoring wells shall be developed between 24 and 72 hours following installation. Records of well development shall be kept by the Investigation Supervisor to demonstrate the satisfactory development of each well.

Purged water shall be adequately contained to prevent the ingress of contaminated waters or sediments to surface water bodies.

All purged groundwater shall be properly contained and removed from the site for treatment/ disposal. Measures to permit the containment and off-site removal of purged waters should be implemented at each position prior to the commencement of purging.

(Clause 11.5) Ground Gas Standpipes

All standpipes are to be dual purpose for groundwater level and ground gas monitoring.

(Clause 11.6) Inclinometer Installations

Not required.

(Clause 11.7) Slip Indicators

Not required.

(Clause 11.8) Extensometers and Settlement Gauges

Not required.

(Clause 11.9) Settlement Monuments

Not required.

(Clause 11.10) Removal of Installations

All monitoring installations shall be decommissioned following completion of the monitoring programme, which is one year from completion of the site works.

Decommissioning shall comprise the following:

- Removal of headworks and concrete surround;
- Excavation to 1m below ground level;
- Backfill the standpipe with bentonite pellets and / or clean pea gravel (as appropriate); and
- Reinstatement to match surrounding ground (e.g. topsoil and subsoil).

Decommissioning shall be completed in accordance with Environmental Agency Guidance 'Good practice for decommissioning redundant boreholes and wells', October 2012.

(Clause 11.11) Other Instrumentation

Not required.

**Specification Section 12: Installation Monitoring and Sampling Particular Restrictions / Relaxations**

(Clause 12.2) Groundwater Level Readings in Installations

Unless instructed otherwise by the *Supervisor* in consultation with the designer, the *Contractor* shall undertake the following groundwater monitoring in each specified hole:

- Upon completion of the installation;
- Daily during the fieldwork period including the last day;
- Monthly thereafter for a further period of 12 months.

The *Contractor* shall demonstrate the satisfactory performance of each installation prior to leaving site.

The *Contractor* shall report the monitoring results after each visit in the form of a spreadsheet.

(Clause 12.3.1) Groundwater Sampling from Installations

Groundwater sampling should be undertaken at each monitoring well by the *Contractor* on two occasions approximately one month apart as directed by the *Supervisor* in consultation with the designer. The first round of sampling shall be undertaken at the end of the fieldwork period before demobilising from site.

Prior to collecting water samples from groundwater monitoring installations, each installation shall be developed a minimum of 1 day after completion of the borehole installation (refer to Clause 11.4.5).

Sampling and purging of the boreholes shall be undertaken a minimum of 3 days after well development has been completed and shall be undertaken in consultation with the Investigation Supervisor. The following water quality parameters shall be recorded at the well-head during purging: temperature, pH, electrical conductivity, oxygen-reduction potential and dissolved oxygen. The stable purged water flow rate (from the pump outlet) shall also be recorded.

Samples of groundwater shall be taken once the stabilisation of the following monitored water parameters (pH, electrical conductivity and dissolved oxygen) has been achieved or three well

volumes (refer to well volume calculation shown within Clause 11.4.5) have been removed, whichever is first.

Stabilisation of water quality parameters shall be taken as: pH: ±0.1pH units; temperature ±0.1˚c; conductivity and oxygen-reduction potential as ±5% of the reading; and dissolved oxygen as ±10% of the reading. All sets of readings recorded during purging are to be supplied to the Investigation Supervisor such that the required stabilisation criteria are demonstrated.

Copies of the instrument calibration certificates shall be provided to the *Supervisor* and designer prior to the first monitor visit.

Water samples shall be placed in appropriate sample containers using relevant preservatives for the proposed suite (refer to Annex 2 for suites). Applicable sample containers / preservatives for each sample shall be selected in consultation with the analytical laboratory.

Any purged water from the monitoring installations shall be stored in appropriate containers and disposed of off-site by the *Contractor* at an appropriate facility.

(Clause 12.3.2) Purging/Micro-purging

Purging or micro purging is required as appropriate when taking groundwater samples from every standpipe.

(Clause 12.4) Ground Gas Monitoring

Monitoring is required in all combined groundwater/ground gas standpipes on completion of the fieldwork.

Ground gas monitoring should be conducted in all monitoring wells after the ground investigation fortnightly over a 12 week period (6 visits) using appropriately calibrated equipment. All staff undertaking gas monitoring shall be trained in the proper use of the equipment. Copies of the instrument calibration certificates shall be provided to the *Supervisor* prior to the first monitoring visit.

The *Contractor* shall provide details of the equipment to be used and be able to demonstrate that the equipment has been calibrated in accordance with the manufacturer's requirements.

The *Contractor* shall provide the following information at each monitoring well location:

- Record weather conditions, ground conditions (whether surface is wet, moist/dry), atmospheric pressure (via analyser) including the daily trend (i.e. falling or rising) and make a note of general wind strength and borehole ID.
- Record condition of well installation, i.e. if tap is open, well damaged/vandalised.
- Record gas flow rate and monitor peak and steady gas flow (in litres per hour) for 1 minute. Ensure flow rate is zeroed before opening well tap.
- Record peak and steady state gas concentrations (in percentage by volume) for methane, carbon dioxide, oxygen, hydrogen sulphide and carbon monoxide.
- Record water level and depth to base of well (in metres below ground level and metres above Ordnance Datum) using a dip meter.
- Record any oil (both LNAPL and DNAPL) using an oil-water interface probe.

The *Contractor* shall ensure that well caps and taps are in good working order and if needed replace them, prior to securing the well and locking the cover.

Calibration certificates for gas monitoring equipment shall be included in the report.

Prior to the start of the post-fieldwork monitoring period the *Contractor* shall supply the *Supervisor* and designer with a spreadsheet containing all of the dates for the gas (and groundwater) monitoring/sampling visits. The programme shall be updated following every monitoring visit.

(Clause 12.5) Sampling from Ground Gas Installations

Not required unless instructed by the *Supervisor* in consultation with the designer, following review of data gathered during the first ground gas monitoring visit.

(Clause 12.8) Other Monitoring

Not required.

(Clause 12.9) Sampling and Testing of Surface Water Bodies

Separate samples of sediment and surface water are to be collected from selected locations on the Whittle Brook and leachate collection/reed bed treatment system ponds by the *Contractor* on two occasions approximately one month apart as directed by the *Supervisor* in consultation with the designer.

The separate sediment and surface water samples shall be placed in appropriate sample containers using relevant preservatives as appropriate for the proposed analytical suite (refer Scope – Appendix C for suites). Applicable sample containers / preservatives for each sample shall be selected in consultation with the analytical laboratory.

**Specification Section 13: Daily records Particular Restrictions/ Relaxations**

(Clause 13.1) Information for Daily Records

As specified.

(Clause 13.4) Special In Situ Tests and Instrumentation Records

Not required.

**Specification Section 14: Geotechnical Laboratory Testing Particular Restrictions / Relaxations**

(Clause 14.1.1) Investigation Supervisor or Contractor to Schedule Testing

The *Supervisor* in consultation with the designer shall confirm the schedule of testing based on preliminary logs and schedule of available samples prepared by the *Contractor*. The schedule of samples shall be provided along with the preliminary log by the *Contractor* within 24 hours of sample collection.

(Clause 14.1.2) Tests Required

To be confirmed by the *Supervisor* in consultation with the designer and *Client*.

The *Contractor* shall agree any variations from the testing identified in the Schedule of Ground Investigation Activities (Appendix B) and Schedule 2 of S 1700 with the *Supervisor* in consultation with the designer and *Client*.

Testing is to include, but not limited to:

- Moisture content;
- Atterberg limits;
- Particle size distribution by wet sieving;
- Organic matter content;
- Sedimentation by pipette;
- Compaction;
- Laboratory hand shear vane;
- Direct shear;
- One-dimensional consolidation;
- Triaxial; and
- Ground/ groundwater aggressivity (BRE Special Digest 1).

Any open tube samples that are not tested shall be split, logged and photographed.

(Clauses 14.2.1 and 14.4) Specifications for Tests Not Covered by BS 1377 and Options Under BS 1377

Not required.

(Clause 14.3) UKAS Accreditation to be Adopted

All tests shall be UKAS accredited.

(Clause 14.5) Rock Testing Requirements

To be confirmed by the *Supervisor* in consultation with the designer.

The *Contractor* should assume that geotechnical rock testing is required as specified in the Schedule of Ground Investigation Activities (Appendix B) and Schedule 2 of S 1700.

(Clause 14.6) (Test Suites A-D) Chemical Testing for Aggressive Ground / Ground for Concrete

BRE Test suites for Greenfield and Brownfield Sites without Pyrite (BRE Suites A and C, BRE Special Digest 1) will be required.

(Clause 14.7) Laboratory Testing on Site

Not required.

(Clause 14.8) Special Laboratory Testing

Not required.

**Specification Section 15: Geoenvironmental Laboratory Testing Particular Restrictions / Relaxations**

(Clause 15.1) Investigation Supervisor or Contract to Schedule Testing

The *Contractor* shall confirm all geo-environmental laboratory testing requirements with the *Supervisor* in consultation with the designer.

The *Contractor* should assume that testing is as specified in the Schedule of Ground Investigation Activities (Appendix B) and Schedule 2 of S 1700.

(Clause 15.2) Accreditation Required

UKAS accreditation required. MCERTS accreditation required where applicable.

(Clause 15.3) Chemical Testing for Contamination

The required chemical test suites for soil, soil leachate and water samples are detailed in Scope – Appendix B and is summarised below:

- Suite E – Soil and Sediment Suite;
- Suite F – Soil and Sediment Leachate Suite;
- Suite G – Groundwater and Surface Water Suite; and

The *Contractor* shall detail limits of detection, test methods and accreditations which can be offered for each individual determinant. Detection limits for the protection of human health and the environment are detailed in Scope – Appendix B suites. The laboratory to be used and the turnaround times shall also be detailed by the *Contractor.* Turnaround times shall be 10 working days or less, including for any subcontracted analyses.

(Clause 15.4) Waste Characterisation

The *Contractor* shall undertake any characterisation necessary to dispose of waste materials generated by the site works, including (but not limited to): soil arisings, purged groundwater, un-scheduled soil samples and scheduled soil samples following completion of laboratory testing.

(Clause 15.5) Waste Acceptance Criteria Testing

Waste Acceptance Criteria (WAC) testing is required. The suite of tests is outlined in Scope – appendix C:

- Suite H – WAC Total Waste Suite.

To be confirmed by the *Supervisor* in consultation with the designer.

(Clause 15.6) Laboratory Testing on Site

Not required.

(Clause 15.7) Special Laboratory Testing

Not required.

**Specification Section 16: Reporting Particular Restrictions / Relaxations**

(Clauses 16.1 and 16.2.1) Form of Exploratory Hole Logs

Driller's logs and preliminary logs shall be submitted to the *Supervisor* and designer within 24 hours of completion of the exploratory hole.

A blank geo-environmental testing schedule with details of all samples taken shall be issued to the *Supervisor* and designer within 24 hours of environmental soil, water and sediment samples being undertaken for scheduling to be confirmed and laboratory testing to commence within 48 hours of sampling.

The *Contractor* shall supply a blank geotechnical testing schedule with the preliminary logs for the *Supervisor* in consultation with the designer to confirm testing requirements within 5 working days.

(Clause 16.2.2) Information on Exploratory Hole Logs

As specified.

(Clause 16.5.3) Variations of Final Digital Data Supply Requirements

Data to be supplied in error free AGS Version 4.03 format and Microsoft Excel® spreadsheet format.

Digital data to be supplied in a single file. Exploratory hole references to be as specified in Schedule 2.

**AGS Version 4.0.3 Data Format**

The *Contractor* shall be responsible for assigning GEOL_GEOL and GEOL_GEO2 codes within the AGS data, in collaboration with the designer.

Abbreviations, including but not limited to Legend Codes within AGS data shall comply with the requirements of the AGS4 format as detailed on the AGS website (http://www.ags.ork.uk) current at the time of contract award. All debris samples of suspected asbestos-containing materials are to be assigned SAMP_TYPE “EA”.

**Microsoft Excel® X,Y Data Table Format**

The Microsoft Excel® data table shall include all the data for a particular sample type and must be in ‘x,y’ format, with sample names in row 1 and chemical determinands in column A. Data type (i.e. soil, soil leachate, topsoil/subsoil, water, WAC) to be separated by tab within the Excel® file. Contractor shall provide all field and laboratory data in digital form, as well as in paper and pdf form and shall include all data from subcontractors.

Example of Excel® x,y data format:

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lab No | 1420467 | 1420468 | 1420469 | 1420470 | 1420471 | 1421095 | 1421096 | 1421097 | 1421098 | 1421099 | 1422255 | 1422256 |
| | | | | Sample ID | BH01 | BH02 | BH03 | BH04 | BH05 | BH06 | BH07 | BH08 | BH09 | BH10 | BH11 | BH12 |
| | | | | Depth | 0.50 | 1.00 | 0.50 | 0.70 | 0.25 | 0.25 | 0.50 | 1.00 | 0.25 | 0.50 | 0.25 | 0.50 |
| | | | | Other ID | | | | | | | | | | | | |
| | | | | Sample Type | SOIL | SOIL | SOIL | SOIL | SOIL | ES | ES | ES | ES | ES | ES | ES |
| | | | | Sampling Date | 09/11/18 | 09/11/18 | 09/11/18 | 09/11/18 | 09/11/18 | 12/11/18 | 12/11/18 | 12/11/18 | 12/11/18 | 12/11/18 | 14/11/18 | 14/11/18 |
| | | | | Sampling Time | n/s | n/s | n/s | n/s | n/s | n/s | n/s | n/s | n/s | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | | | | | | | | | | |
| Asbestos Quantification | DETSC 1102 | 0 | | | | | | | | | | | | | | |
| **Metals** | | | | | | | | | | | | | | | | |
| Arsenic | DETSC 2301# | 0.2 | mg/kg | 4.8 | 4.2 | 3.7 | 11 | 4.9 | 7.2 | 2.7 | 4.3 | 4.0 | 2.7 | 4.8 | 4.3 | |
| Boron, Water Soluble | DETSC 2123# | 0.2 | mg/kg | 0.7 | 0.5 | 0.6 | 0.5 | 1.0 | 1.3 | 0.7 | 0.5 | 0.9 | 0.6 | 0.7 | <0.2 | |
| Cadmium | DETSC 2301# | 0.1 | mg/kg | 0.1 | 0.2 | 0.1 | 0.2 | 0.3 | 0.2 | <0.1 | <0.1 | 0.2 | <0.1 | 0.2 | <0.1 | |
| Chromium III | DETSC 2301* | 0.15 | mg/kg | 19 | 14 | 13 | 26 | 17 | 19 | 9.4 | 18 | 10 | 12 | 15 | 13 | |
| Chromium, Hexavalent | DETSC 2204* | 1 | mg/kg | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | |
| Copper | DETSC 2301# | 0.2 | mg/kg | 12 | 9.6 | 6.7 | 32 | 18 | 16 | 5.3 | 10 | 8.2 | 6.0 | 15 | 7.7 | |
| Lead | DETSC 2301# | 0.3 | mg/kg | 11 | 7.5 | 7.3 | 14 | 28 | 37 | 20 | 9.8 | 28 | 8.2 | 24 | 9.0 | |
| Mercury | DETSC 2325# | 0.05 | mg/kg | <0.05 | <0.05 | <0.05 | <0.05 | 0.07 | 0.13 | <0.05 | <0.05 | <0.05 | <0.05 | 0.07 | <0.05 | |
| Nickel | DETSC 2301# | 1 | mg/kg | 19 | 15 | 14 | 31 | 12 | 17 | 8.1 | 20 | 9.0 | 12 | 11 | 13 | |
| Selenium | DETSC 2301# | 0.5 | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | |
| Vanadium | DETSC 2301# | 0.8 | mg/kg | 24 | 22 | 17 | 34 | 39 | 27 | 18 | 34 | 19 | 18 | 24 | 23 | |
| Zinc | DETSC 2301# | 1 | mg/kg | 49 | 51 | 38 | 75 | 55 | 57 | 26 | 36 | 83 | 24 | 52 | 32 | |
| **Inorganics** | | | | | | | | | | | | | | | | |
| Loss on Ignition at 440oC | DETSC 2003# | 0.01 | % | | | | | | | | | | | | | |
| pH | DETSC 2008# | | | 7.6 | 7.7 | 7.7 | 7.1 | 7.5 | 6.6 | 6.6 | 7.0 | 6.6 | 7.3 | 7.0 | 7.2 | |
| Cyanide, Total | DETSC 2130# | 0.1 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | 0.3 | 0.2 | <0.1 | 0.3 | <0.1 | 0.2 | <0.1 | |
| Cyanide, Free | DETSC 2130# | 0.1 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.2 | 0.1 | <0.1 | 0.2 | <0.1 | 0.1 | <0.1 | |
| Thiocyanate | DETSC 2130# | 0.6 | mg/kg | <0.6 | <0.6 | <0.6 | <0.6 | 0.7 | 11 | 1.7 | <0.6 | 1.1 | <0.6 | 16 | 1.5 | |
| Organic matter | DETSC 2002# | 0.1 | % | 0.3 | 0.3 | 0.5 | 0.3 | 1.4 | 1.8 | 0.3 | 2.2 | 0.6 | 3.8 | 2.6 | 0.7 | |
| **Petroleum Hydrocarbons** | | | | | | | | | | | | | | | | |
| Aliphatic C5-C6 | DETSC 3321* | 0.01 | mg/kg | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | |
| Aliphatic C6-C8 | DETSC 3321* | 0.01 | mg/kg | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | |
| Aliphatic C8-C10 | DETSC 3321* | 0.01 | mg/kg | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | |
| Aliphatic C10-C12 | DETSC 3072# | 1.5 | mg/kg | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | |
| Aliphatic C12-C16 | DETSC 3072# | 1.2 | mg/kg | <1.2 | <1.2 | <1.2 | <1.2 | <1.2 | <1.2 | <1.2 | <1.2 | <1.2 | <1.2 | <1.2 | <1.2 | |
| Aliphatic C16-C21 | DETSC 3072# | 1.5 | mg/kg | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | |
| Aliphatic C21-C35 | DETSC 3072# | 3.4 | mg/kg | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | |
| Aliphatic C35-C40 | DETSC 3072* | 3.4 | mg/kg | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | <3.4 | |

**HazWasteOnline Data Table Format**

In addition to the ‘.AGS’ and Excel ‘x,y’ format data, all environmental soil data (Suite E) are also to be provided in ‘.HWOL’ format.

(Clause 16.5.3) Preliminary Digital Data

Fully checked and certified AGS data shall be supplied with each version of the Factual Report.

(Clause 16.6) Type(s) of Report Required

The *Contractor* shall produce the factual parts of the Ground Investigation Report including all the information required by Clause 16.8.1 and any additional information specified by the *Supervisor* in consultation with the designer.

(Clause 16.6.3) Electronic Report Requirements

The AGS data and associated Microsoft Excel® (.xls) files shall be complete and identical to the data provided in the paper and PDF of the Factual Report. The units of measurement and abbreviations within the AGS file shall match those presented in the AGS publication unless otherwise stated.

AGS data shall be checked using Key AGS for AGS format errors / integrity prior to inclusion within the data discs. The error logs should be provided with the AGS data file. All data shall be checked as factually correct.

Digital data shall be supplied in a single file.

Photographs to be in JPEG format.

All geoenvironmental data including the laboratory data and monitoring records shall be provided in excel format (as well as PDF and AGS).

(Clause 16.7) Format and contents of Desk Study Report

Not required.

(Clause 16.8) Contents of Ground Investigation Report (or Specified Part Thereof)

As specified in Clause 16.6 and in accordance with BS 5930 and EC7.

(Clause 16.9) Contents of Geotechnical Design Report (or Specified Part Thereof)

Not required.

(Clause 16.10.1) Times for Supply of Electronic Information

As specified.

(Clause 16.10.2) Electronic Information Transmission Media

The *Contractor* may issue the preliminary and draft information via email.

The final version of the Ground Investigation Factual Report shall be provided electronically.

(Clause 16.11) Report Approval

One checked, indexed and searchable electronic copy of the draft factual part of the Ground Investigation Report required for submission to the *Supervisor* and designer within 6 weeks from completion of intrusive works. In addition, a checked copy of the draft AGS files shall be submitted with the checked draft factual part of the Ground Investigation Report.

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

It is expected that, prior to submission, the Draft Factual Report and Draft AGS data will have been subject to a rigorous checking process by the *Contractor*, in accordance with the documented quality management system. These checking are expected to include, among other things, consistency with site records, completeness, factual accuracy and internal consistency. Should consistent errors of this type be identified within the draft report or AGS data then that document and / or data will not be accepted for review by the *Supervisor* and designer and will be returned to the *Contractor* for further checking and improvement at no additional cost until a draft of acceptable quality has been produced.

The final approved Factual Ground Investigation Report and Final AGS data shall be submitted by the *Contractor* within 2 weeks from receipt of the *Supervisor's* and designer's comments.

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**Schedule 2: Exploratory Hole Locations: Refer to Appendix C**

## Appendix A: Location Plans

## Appendix B: Soil and Groundwater Laboratory Testing Suite

**Note**: The Contractor is required to submit copies of the appointed laboratory's analytical testing methods including detection limits for approval by the Investigation Supervisor a minimum of 14 days prior to commencing intrusive work to allow the Investigation Supervisor to review and provide comment.

## Suite E1 – Soil / Sediment Suite

| Determinand | Limit of detection required/offered[2,3] | Test method required/offered[1] | Accreditation required/offered[4] |
|---|---|---|---|
| Metals, Semi-metalloids & Inorganics | | | |
| Arsenic | 2 | ICP-OES / MS | MCERTS/ UKAS |
| Boron (water soluble) | 0.5 | ICP-OES / MS | MCERTS/ UKAS |
| Cadmium | 0.02 | ICP-OES / MS | MCERTS/ UKAS |
| Chromium III | 0.9 | ICP-OES / MS | MCERTS/ UKAS |
| Hexavalent Chromium | 0.3 | Colourimetry | MCERTS/ UKAS |
| Copper | 1 | ICP-OES / MS | MCERTS/ UKAS |
| Lead | 0.7 | ICP-OES / MS | MCERTS/ UKAS |
| Mercury | 0.1 | ICP-OES / MS | MCERTS/ UKAS |
| Nickel | 0.2 | ICP-OES / MS | MCERTS/ UKAS |
| Selenium | 0.5 | ICP-OES / MS | MCERTS/ UKAS |
| Vanadium | 1 | ICP-OES / MS | MCERTS/ UKAS |
| Zinc | 2 | ICP-OES / MS | MCERTS/ UKAS |
| Total cyanide | 1 | Distillation | MCERTS/ UKAS |
| Free cyanide | 1 | Distillation | MCERTS/ UKAS |
| Thiocyanate | 1 | Distillation | MCERTS/ UKAS |
| Ammoniacal Nitrogen | 0.5 | Discrete Analyser | MCERTS/ UKAS |
| Ammonia (NH3) | 0.5 | Discrete Analyser | MCERTS/ UKAS |
| Orthophosphate (as PO4) - Water Soluble (2:1) | 0.3 | Colorimetric | MCERTS/ UKAS |
| pH | 0.1 pH units | Electrode | MCERTS/ UKAS |
| Asbestos Screen and identification | NBFO / BFO | Visual | MCERTS/ UKAS |
| Asbestos quantification (to 0.001% w/w) – to be completed if screen/ID proves positive. | 0.001% | Stereo-microscopy polarised light microscopy and dispersion staining | MCERTS/ UKAS |
| Total Petroleum Hydrocarbons (TPH) | | | |

| Determinand | Limit of detection required/offered[2,3] | Test method required/offered[1] | Accreditation required/offered[4] |
|---|---|---|---|
| TPH speciated by Aliphatic and Aromatic fractions, reported per Criteria Working Group banding (EC6-44), plus total Gasoline Range Organics, and BTEX compounds (including m,p & o-xylene) and MTBE. | 0.01 mg/kg (Speciated fractions) / 0.1 mg/kg (Total) | Total Petroleum Hydrocarbons by determination of Extractable Petroleum Hydrocarbons by GC-FID; Determination of Gasoline Range Hydrocarbons (GRO) and BTEX compounds (including MTBE) by Headspace GC-FID. | MCERTS/ UKAS |
| Phenols (speciated) | 0.05 | HPLC | MCERTS/ UKAS |
| Polycyclic Aromatic Hydrocarbons (PAH) USEPA 16 Speciated | | | |
| Acenaphthene | 0.01 | GC-MS | MCERTS/ UKAS |
| Acenaphthylene | 0.01 | | |
| Anthracene | 0.01 | | |
| Benz(a)anthracene | 0.01 | | |
| Benzo(a)pyrene | 0.01 | | |
| Benzo(ghi)perylene | 0.01 | | |
| Benzo(b)fluoranthene | 0.01 | | |
| Benzo(k)fluoranthene | 0.01 | | |
| Chrysene | 0.01 | | |
| Coronene | 0.01 | | |
| Dibenzo(ah)anthracene | 0.01 | | |
| Fluoranthene | 0.01 | | |
| Fluorene | 0.01 | | |
| Indeno(123cd)pyrene | 0.01 | | |
| Naphthalene | 0.01 | | |
| Phenanthrene | 0.01 | | |
| Pyrene | 0.01 | | |
| PAH Total | 0.01 | | |
| VOCs & TICs (see appendix for full technical spec) | 0.01 | HS-GC/GC-MS | MCERTS/ UKAS |
| SVOC & TICs (see appendix for full technical spec) | 0.01 | GC-MS | MCERTS/ UKAS |
| Polychorinated Biphenyls (7 congeners) | 0.001 | GC-MS | MCERTS/ UKAS |
| Soil Organic Matter (SOM) | 0.2% | Combustion | MCERTS/ UKAS |

**Explanatory Notes:**

Either Investigation Supervisor to specify the test method (except testing under MCERTs), limit of detection and accreditation required or Contractor to detail what can be offered under each of these categories.

Limits of detection should reflect the guideline/threshold values against which the test results will be compared. If limits of detection are close to such guideline/threshold values, laboratory method reporting limits should also be specified.

Units in mg/kg unless otherwise stated.

Accreditation to MCERTS where available, otherwise UKAS.

## Suite F – Soil / Sediment Leachate Suite

| Determinand | Limit of detection required/offered[2,3] | Test method required/offered[1] | Accreditation required/offered[4] |
|---|---|---|---|
| Antimony | 0.001 | ICP-OES / MS | UKAS |
| Arsenic | 0.001 | ICP-OES / MS | UKAS |
| Boron | 0.01 | ICP-OES / MS | UKAS |
| Cadmium | 0.00008 | ICP-OES / MS | UKAS |
| Chromium III | 0.001 | ICP-OES / MS | UKAS |
| Hexavalent chromium | 0.001 | ICP-OES / MS | UKAS |
| Iron | 0.01 | ICP-OES / MS | UKAS |
| Copper | 0.001 | ICP-OES / MS | UKAS |
| Lead | 0.001 | ICP-OES / MS | UKAS |
| Manganese | 0.001 | ICP-OES / MS | UKAS |
| Mercury | 0.00005 | ICP-OES / MS | UKAS |
| Nickel | 0.001 | ICP-OES / MS | UKAS |
| Selenium | 0.001 | ICP-OES / MS | UKAS |
| Vanadium | 0.001 | | |
| Zinc | 0.004 | ICP-OES / MS | UKAS |
| Cyanide (total) | 0.01 | ICP-OES / MS | UKAS |
| Cyanide (free) | 0.01 | ICP-OES / MS | UKAS |
| Ammoniacal Nitrogen as N | 0.01 | Distillation / KONE | Desirable if offered by laboratory |
| Ammonia (NH3) | 0.01 | Distillation / KONE | Desirable if offered by laboratory |
| Thiocyanate | 0.01 | Distillation | UKAS |
| pH | 1 | Electrode | |
| Sulphate | 3 | ICP-OES / MS | UKAS |
| **Other determinands may be scheduled by the Investigation Supervisor as required if contamination is encountered (such as polycyclic aromatic hydrocarbons (PAHs), VOCs, SVOCs and petroleum hydrocarbons)** | | | |
| **Leachate Preparation** | | | |
| Single Batch 2:1 | N/A | BS EN 12457 -1 | N/A |

Explanatory Notes:

1) Either Investigation Supervisor to specify the test method (except testing under MCERTs), limit of detection and accreditation required or Contractor to detail what can be offered under each of these categories.

2) Limits of detection should reflect the guideline/threshold values against which the test results will be compared. If limits of detection are close to such guideline/threshold values, laboratory method reporting limits should also be specified.

3) Units in mg/l unless otherwise stated.

4) Accreditation to MCERTS where available, otherwise UKAS.

## Suite G – Groundwater / Surface Water

| Determinand | Limit of detection required/offered[2,3] | Test method required/offered[1] | Accreditation required/offered[4] |
|---|---|---|---|
| Arsenic | 0.001 | ICP-OES / MS | MCERTS/ UKAS |
| Boron | 0.01 | ICP-OES / MS | MCERTS/ UKAS |
| Cadmium | 0.00008 | ICP-OES / MS | MCERTS/ UKAS |
| Chromium III | 0.001 | ICP-OES / MS | MCERTS/ UKAS |
| Chromium VI dissolved | 0.001 | ICP-OES / MS | MCERTS/ UKAS |
| Copper | 0.001 | ICP-OES / MS | MCERTS/ UKAS |
| Lead | 0.001 | ICP-OES / MS | MCERTS/ UKAS |
| Manganese | 0.001 | ICP-OES / MS | MCERTS/ UKAS |
| Mercury | 0.00005 | ICP-OES / MS | MCERTS/ UKAS |
| Nickel | 0.001 | ICP-OES / MS | MCERTS/ UKAS |
| Selenium | 0.001 | ICP-OES / MS | MCERTS/ UKAS |
| Zinc | 0.004 | ICP-OES / MS | MCERTS/ UKAS |
| Iron | 0.019 | ICP-OES / MS | MCERTS/ UKAS |
| Cyanide (total and free) | 0.01 | Distillation | MCERTS/ UKAS |
| Thiocyanate | 0.01 | Distillation | MCERTS/ UKAS |
| pH | pH units | Electrode | MCERTS/UKAS |
| Sulphide | 0.2 | Electrode | MCERTS/UKAS |
| Sulphate | 1 | Kone / ICP-OES / MS | MCERTS/ UKAS |
| Total Hardness as calcium carbonate | 1 | Calculation | MCERTS/ UKAS |
| Nitrite | 0.4 | Colourimetry | MCERTS/ UKAS |
| Nitrate | 0.4 | Colourimetry | MCERTS/ UKAS |
| Ammoniacal Nitrogen | 0.01 | Distillation /KONE | MCERTS/ UKAS |
| Chemical Oxygen Demand (COD) | 2 | Colourimetry | MCERTS/ UKAS |
| Biological Oxygen Demand (COD) | 5 | 5 day/dissolved oxygen | MCERTS/ UKAS |
| Sodium | 0.076 | ICP-OES / MS | MCERTS/ UKAS |
| Calcium | 0.012 | ICP-OES / MS | MCERTS/ UKAS |
| Magnesium | 0.036 | ICP-OES / MS | MCERTS/ UKAS |
| Bicarbonate | 2 | Titration | MCERTS/ UKAS |
| Potassium | 1 | ICP-OES / MS | MCERTS/ UKAS |
| Chloride | 2 | Spectrophotometric | MCERTS/ UKAS |
| Dissolved Orthophosphate (as PO4) | 0.02 | Spectrophotometric | MCERTS/ UKAS |
| Dissolved Organic Carbon (DOC) | 3 | Infra-red spectrophotometry | MCERTS/ UKAS |
| Phenol (speciated) | 0.002 | HPLC | MCERTS/ UKAS |
| PAH (USEPA16) speciated | 0.01 | GC-MS | MCERTS/ UKAS |

| Determinand | Limit of detection required/offered[2,3] | Test method required/offered[1] | Accreditation required/offered[4] |
|---|---|---|---|
| TPH CWG (including BTEX and MTBE) | 0.01 | GC-MS | MCERTS/ UKAS |
| VOCs & TICs (see appendix for full technical spec) | 0.01 | GC-MS | MCERTS/ UKAS |
| SVOC & TICs (see appendix for full technical spec) | 0.01 | GC-MS | MCERTS/ UKAS |
| Polychorinated Biphenyls (7 congeners) | 0.001 | GC-MS | MCERTS/ UKAS |
| Electrical Conductivity | 0.005 mS/cm | Conductivity Meter | MCERTS/ UKAS |
| **Other determinands may be scheduled by the Investigation Supervisor as required if contamination is encountered (for example TPH CWG, VOCs or SVOCs)** | | | |

**Explanatory Notes:**

1) Either Investigation Supervisor to specify the test method (except testing under MCERTs), limit of detection and accreditation required or Contractor to detail what can be offered under each of these categories.

Limits of detection should reflect the guideline/threshold values against which the test results will be compared. If limits of detection are close to such guideline/threshold values, laboratory method reporting limits should also be specified.

Units in mg/l unless otherwise stated.

Accreditation to MCERTS where available, otherwise UKAS.

## Suite H – Waste Acceptance Classification Batch Leaching Tests (Full Solid Waste including inert, Plus Two Batch Leachate Test) – BS EN 12457-3:2000

| Determinands | Limit of detection required / offered[2,3] | Test method required / offered[1] | Accreditation required / offered[4] |
|---|---|---|---|
| Eluate determinands (cumulative 10:1) mg/kg | | | |
| Antimony | 0.06 | ICP-OES / MS | MCERTS / UKAS |
| Arsenic | 0.5 | ICP-OES / MS | MCERTS / UKAS |
| Barium | 20 | ICP-OES / MS | MCERTS / UKAS |
| Cadmium | 0.04 | ICP-OES / MS | MCERTS / UKAS |
| Chromium | 0.5 | ICP-OES / MS | MCERTS / UKAS |
| Copper | 2 | ICP-OES / MS | MCERTS / UKAS |
| Mercury | 0.01 | ICP-OES / MS | MCERTS / UKAS |
| Molybdenum | 0.5 | ICP-OES / MS | MCERTS / UKAS |
| Lead | 0.5 | ICP-OES / MS | MCERTS / UKAS |
| Nickel | 0.4 | ICP-OES / MS | MCERTS / UKAS |
| Selenium | 0.1 | ICP-OES / MS | MCERTS / UKAS |
| Zinc | 4 | ICP-OES / MS | MCERTS / UKAS |
| Chloride | 800 | Kone/Colourimetry | MCERTS / UKAS |
| Fluoride | 10 | Kone/Colourimetry | MCERTS / UKAS |
| Sulphate | 1000 | Kone/ICP-OES | MCERTS / UKAS |
| Total Dissolved Solids | 4000 | Gravimetric | MCERTS / UKAS |
| Phenol Index | 1 | HPLC | MCERTS / UKAS |
| Dissolved Organic Carbon (TOC) | 500 | Infra-red | MCERTS / UKAS |
| **Solid determinands** | | | |
| TOC | 3% | ELTRA/ Combustion | MCERTS / UKAS |
| Loss on ignition (LOI) | 10% | Gravimetric | MCERTS / UKAS |
| BTEX | 6 | GC-FID | MCERTS / UKAS |
| PCBs 7 congeners | 1 | GC-MS | MCERTS / UKAS |
| Mineral Oils (C10-C40) | 500 | GC-FID | MCERTS / UKAS |
| pH | 6 units | electrode | MCERTS / UKAS |
| Acid neutralisation capacity | N/A | Titration | MCERTS / UKAS |
| PAH Total of 17 inc coronene | 100 | GC-MS | MCERTS / UKAS |

Explanatory Notes:

1) Either Investigation Supervisor to specify the test method (except testing under MCERTs), limit of detection and accreditation required or Contractor to detail what can be offered under each of these categories.
2) Limits of detection should reflect the guideline/threshold values against which the test results will be compared. If limits of detection are close to such guideline/threshold values, laboratory method reporting limits should also be specified.
3) Units in mg/kg unless otherwise stated.
4) Accreditation to MCERTS where available, otherwise UKAS.

## Appendix C: Schedule 2: Exploratory Hole Locations

## Appendix D: Drawings for Contractor Design

## Appendix E: Tidal Gate Performance Specification

## Appendix F: Topographic Survey