Additional Site Investigations

1. Purpose or these works

Additional site investigation is required to determine ground conditions in respect of potential for land contamination, at certain locations within the contract area. It is also necessary to determine the depth of made ground at the western end of the proposed works.

Please see attached "*20191009 CSI Exploratory Hole Location Plan 1*" & "*20191009 CSI Exploratory Hole Location Plan 2*" for locations.

2. Main works proposed

The works to be carried out according to this specification include the installation of 10 new boreholes installed at various points across the site. These boreholes are required to penetrate the made ground deposits only.

None of the boreholes will be fitted with instrumentation and may be backfilled with arisings upon completion.

In particular this site investigation is required:

- to determine the superficial geological profile in the specific area of the borehole;
- to establish groundwater levels;
- to identify the presence and extent of any ground or groundwater contamination.

3. Scope of the investigation

Window Sampling

The investigation will include 10 no. window sampling boreholes, to depths up to 2.0m.

Laboratory testing

Laboratory testing of soil is required for contamination purposes.

Disturbed soil/waste samples are required from the boreholes to establish existing contaminant loading. Analyses of the solid components will be undertaken.

Chemical testing will include appropriate chemical testing for presence and concentrations of contaminants in soils.

Surveying

Surveying of position and level of all site investigation positions will be carried out as part of these works.

4. Geology and Ground Conditions

A description of local superficial geological conditions is described in the following document, available from Swindon Borough Council:

- Atkins, Technical note Fleming Way Bus Boulevard, Geotechnical Interpretative Report (GIR), Dated February 2019.

5. Particular Restrictions

The Contractor will be required to comply with the directions at site given by Swindon Borough Council's Project Manager.

The Contractor should be aware that all investigation locations are within existing public highway, and working methods should allow for this.

6. Particular Borehole Requirements

All boreholes are to be infilled to the underside of the topsoil layer or any road or hardstanding construction.

Samples of soil (and groundwater if appropriate) obtained during boring shall be submitted for accredited laboratory analysis.

Decontamination: All soil and groundwater sampling/testing equipment shall be decontaminated at the start and end of each excavation, and in between the collection of each sample so as to be able to evaluate low concentrations of a chemical contamination accurately.

'Down hole' drilling equipment and temporary casing shall require decontamination during, and upon completion of, the investigation. The use of mineral based oils and lubricants on the drilling casing and tools is prohibited. Vegetable oils should be used to lubricate casing.

Decontamination shall be achieved by washing using a detergent solution or with portable washing equipment then rinsed with clean water.

7. Particular Instrumentation and Monitoring Requirements

None.

8. Particular Accredited Laboratory Testing Requirements

All testing shall be carried out in accordance with such British Standards, MCERTS, and UKAS requirements as may be applicable to the testing and reporting upon the material or substance being tested.

Samples selected for chemical testing shall be analysed for the following parameters (Table 1) and to the reporting threshold limits set out in Table 4. Table 3 presents the chemical testing required for each location.

Table 1 Analytical Suite requirements - soils

Test Parameter	Symbol	Soil Contaminant
Metals[1]		Y
pH value	pH	Y
Sulphate (water soluble)	SO_4	N
Polyaromatic Hydrocarbons (16 EPA priority PAH's, individually speciated.)	PAH	Y
Benzene/toluene/ethylbenzene/xylene	BTEX	Y
Semi-volatile organic compounds (SVOC)	SVOC	Y
Total petroleum hydrocarbons (speciated aliphatic and aromatic with carbon banding)	TPH	Y
Asbestos (presence, type and percentage)	Asb	Y
Soil Organic Matter	SOM	Y

[1] includes arsenic, boron, cadmium, chromium (3 and 6 states), copper, lead, mercury, nickel, selenium, zinc

9. Particular Reporting Requirements

The Contractor will prepare a factual report of the Site Operations. The draft reports will be submitted 10 days after completion of exploratory fieldwork. Within 7 days of receipt of any comments from Swindon Borough Council the Contractor shall provide updated copy of the final factual report.

10. Schedule of Exploratory Holes

The exploratory hole locations are presented in Table 2.

Table 2: SI Window Sampler borehole details

Location	Depth
WB01	2.0m
WB02	2.0m
WB03	5.0m
WB 04	5.0m
WB05	2.0m
WB06	5.0m
WB07	2.0m

Location	Depth
WB08	2.0m
WB09	2.0m
WB10	2.0m

The sampling regime shall be as detailed in Table 3.

11. Observations

The Investigation Contractor shall make detailed field observations, including:-

- geotechnical exploratory hole logs;
- groundwater level observations (boreholes, including entries, rest levels, on strike and at the end/beginning of each working day), and assessed inflow rates (window samples and open excavations);
- colour, odour and any other pertinent factors, such as visually identified contaminants and hazardous materials;
- date and time of sampling.
- brief description of individual samples for chemical testing ,including any unusual features (e.g. the inclusion of any pieces of metal)

These observations shall be included in the Site Investigation Report (see below).

12. Reporting Requirements

When reporting the results of the fieldwork, the in-situ chemical analyses and other measurements, the following information shall be provided by the Investigation Contractor as part of the Site Investigation Report:

- accurate plan showing exploratory hole locations.
- a record of the date, location and depth in relation to ordnance datum of samples taken and any other field observations made as detailed above.
- exploratory hole logs with descriptions of strata and notes on groundwater observations.
- results of the in-situ tests on groundwater, in tabular form with results, dates, background readings, levels.
- a full set of accredited laboratory test results including certificates of analysis detailing the analysis results, analytical method, units, detection limits, sample type, origin of sample, client reference site reference, accredited laboratory reference number, date of sampling, date of receipt at the accredited laboratory and date of testing.

Table 3 Schedule of soil and leachate sampling (provisional)

Location	Stratum	Req depth sample (m)	Soil testing requirements
WB01	Made ground	0.3 1.3	Asbestos
WB02	Alluvial clay	0.3 1.3	Asbestos
WB03	Made ground	0.3	Asbestos
WB04	Made ground	0.3	Asbestos
WB05	Alluvial clay	0.5 2.0	Metals, pH ,PAH ,TPH, SO_4 , Asbestos, OMC Asbestos
WB06	Made ground	0.5 1.5	Metals, pH ,PAH ,TPH, SO_4 , Asbestos, OMC, SVOC, VOC Asbestos
WB07	Alluvial clay	0.5 1.5	Asbestos Asbestos
WB08	Made ground	0.5 1.5	Asbestos Asbestos
WB09	Made ground	0.5 1.5	Asbestos Asbestos
WB10	Alluvial clay	0.5 1.5	Asbestos Asbestos

*Note

- OMC=Organic matter content (%)
- PAH=Polyaromatic hydrocarbons
- TPH=Total petroleum hydrocarbons – speciated/carbon banded arom/aliphatic
- SO_4=Sulphate (acid soluble)

Table 4 Limit of detection

Substance	Required lower limit of detection
Asbestos	0.001%