Phase II Geoenvironmental Site Assessment

Site: Higher Standen Drive, Clitheroe
Reference: 17-912-R2-1
Date: November 24

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QUALITY ASSURANCE

Report reference	**17-912-R1 – Interim Report**

REV REF:	DESCRIPTION	AUTHOR	CHECKED	AUTHORISED	DATE
R1-1	First issue	GC	KK	AS	30/11/24

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EXECUTIVE SUMMARY

Site Address	Higher Standen Drive, Standen, Clitheroe BB7 1FT.
Grid Reference	N 374676 E 440681
Site Area	2.57 Ha
Proposed Development	The Trustees of the Standen Estate intend to construct a low-rise residential development comprising 68 dwellings with associated gardens, estate roads and infrastructure.
Current Site Use	The site is an irregularly shaped parcel of land located to the south east of Clitheroe, with access available from Higher Standen Drive, on the eastern boundary of the site. Currently the site comprises an open field, with trees present at the western boundary, alongside a tributary of the Pendleton brook. There is also a single tree located close to the centre of the field. There are no structures or stone wall located within the site. The site is located on a slight slope, with a fall of approximately 8 meters from the north east corner towards the western boundary of the site.
Site History	An examination of the relevant Ordnance Survey maps shows that the site has remain undeveloped agricultural fields since the earliest available mapping. The only minor changes relating to field boundaries. There is no evidence of structures on the site being present at any point in the recorded site history.

ENVIRONMENTAL SETTING

Geology	Drift Geology	Till (Devensian)
	Bedrock Geology	Clitheroe Limestone Formation and Hodder Mudstone Formation.
	Faults	The nearest geological fault is located 174m to the north west of the site, trending north west to south east, with a downthrow to the south west.
Geomorphology	A review of relevant records indicates that the site has not been subject to significant anthropogenic changes with the current site topography broadly representing natural landform.	
Hydrogeology	A Secondary (undifferentiated) Aquifer has been recorded on site in the drift geology with a Secondary A Aquifer in the bedrock geology.	
	The Groundsure report indicates that the site is not located within a groundwater source protection zone. Furthermore, there are no groundwater/potable abstractions within 1 km of the site.	
Hydrology	The nearest surface water feature is a tributary of the Pendleton Brook, located on the Western boundary of the site. Due to the local topography, it is likely that any shallow groundwater, if present, will flow in a south westerly direction towards the Pendleton Brook tributary.	
	The site is located within Flood Zone 1 - no risk of flooding	

Utility Locations	An 11 kV cable is present along the northwestern boundary of the site. There are no other below ground utilities at the site.
Landfill Sites and Waste Sites	There are no active or historic landfills within 250 m of the site.
Radon	Radon Class 1 - less than 1% of homes are estimated to be at or above the Action Level. No radon protection measures required.
Unexploded Ordnance	Low risk UXO area – no further assessment required.
PFAS	No potential current or historical sources of PFAS have been identified on site. No further risk assessment required.
Hazardous Installations	No hazardous installations that could potentially prejudice the proposed construction of the development have been identified within influencing distance of the subject site.
Previous Reports	The following previous report has been completed for the site: • Phase I Geoenvironmental Site Assessment, Higher Standen Drive (ref: 17912-R1-1), September 2024. The key findings are summarised in Section 1.5 and where necessary, data has been used to support the geoenvironmental assessment.

E3P GROUND INVESTIGATION

Ground Investigation Works	E3P has completed an intrusive ground investigation comprising: • 6 x window sample probeholes; • 8 x mechanically excavated trial pits; and • Construction of 4 No. environmental monitoring installations.
Ground Conditions	**Made Ground** No Made Ground was encountered during the investigation.
	Topsoil – 0.00 m bgl to 0.35 m bgl Topsoil was encountered within all exploratory hole locations to depths ranging from 0.15 m to 0.35 m bgl. The topsoil comprised brown sandy CLAY, without significant anthropogenic inclusions.
	Superficial – 0.15 m bgl to >5.45 m bgl Superficial deposits were encountered within all exploratory locations to a proven depth of 5.45 m bgl. The base of the superficial deposits was not encountered in any of the exploratory locations. Superficial deposits generally comprise brown slightly gravelly slightly sandy CLAY with fine to medium, angular to subrounded gravel of sandstone and mudstone. These deposits gradually become more gravelly with depth. Underlying these deposits at approximately 1.20 m bgl, the deposits are recorded as grey slightly sandy gravelly CLAY which increases in stiffness with depth.
	Solid Geology Solid geology was not encountered during the ground investigation.

	Groundwater Limited groundwater was encountered during the intrusive investigation. Groundwater strikes were encountered in WS101 and WS102 at 1.00 m and 4.00 m bgl and 1.00 m bgl, respectively. Seepages were encountered at 1.00 m and 1.50 m bgl in TP104 and TP108, respectively.

CONTAMINATED LAND ASSESSMENT

Initial Conceptual Site Model	There has been very little historical activity on site and therefore the likelihood of potentially contaminated soils is considered to be low.
Human Health	No elevated concentrations of potential contaminants of concern have been identified when compared with Tier 2 GACs for a residential end use (with plant uptake). Asbestos was not identified in any of the eleven samples submitted for analysis. Based on the above there is no unacceptable level of risk to human health for future end users and construction workers. Preliminary chemical analysis has confirmed the topsoil, and subsoil is likely to be suitable for re-use within any landscaped areas; however further chemical analysis in accordance with an agreed testing frequency will be required to confirm this prior to placement in any landscaped areas.
Controlled Waters	The site is considered to pose a low risk to controlled waters.
Ground Gas	Ground gas monitoring indicates the site falls into a classification Characteristic Situation 1; as such gas protection measures are not required. It should be noted that at this stage gas monitoring at the site remains ongoing.
Potable Water Infrastructure	A UKWIR Risk Assessment will be required to confirm the most suitable potable water supply pipework. Chemical analysis suggests that PE pipe is likely to be suitable.

GEOTECHNICAL ASSESSMENT

Underground Obstructions & Subterranean Hazards	Obstructions have not been identified to date and significant obstructions are not anticipated.
Allowable Bearing Capacity	Generally, the underlying cohesive deposits are to be firm, medium strength, with a net Allowable Bearing Capacity (ABC) of in excess of 80kN/m² at an approximate depth of 1 meter below ground level (bgl). The ABC typically increases with depth.

Foundation Options	The suitable target founding stratum has been identified as the underlying stiff to very stiff CLAY. Following this assessment, it is recommended that shallow strip foundations, bearing upon the stiff to very stiff CLAY, is the most cost-effective solution. A deeper foundation solution will be required in any areas were soft to firm clays are recorded (such as WS105). The final foundation solution will be dependent on the structural loadings, elevation and should be designed by a suitably qualified structural engineer.
Foundations Near Trees	Foundation depths within the conjectured influence of former, existing or proposed trees will need to be deepened to ensure that structural loading bears within the underlying target founding stratum, which cannot be subject to volumetric instability associated with fluctuation in moisture content.
Heave Precautions Near Trees	Given that the underlying clay is of low volume change potential, heave precautions will not be required to the internal face of a foundation less than 1.5 m in depth. Heave precautions will be required to the underside of floor slabs (where there is no 200 mm void) and pile ground beams are required within the modelled influencing distance of trees.
Building Floor Slabs	A ground bearing slab will be viable for the residential buildings, but it will need to be constructed on a granular sub-base with the thickness designed by a structural engineer to ensure that settlement tolerances are taken into consideration.
Soakaway Drainage	Soakaway drainage is unlikely to be suitable due to the presence of low permeability cohesive deposits across the site.
Sulphate Assessment	Concrete classification of DS-1, AC-1s applicable across the site.
Highway & Infrastructure Construction	Where a proposed highway or infrastructure is to be constructed, remediation works will be required to ensure the site is engineered to a suitable geotechnical design specification.
CBR Design %	Natural clay soils will provide a CBR in the order of 2–4% during drier climatic periods. However, if water is allowed to shed onto the formation, the CBR will reduce to < 2%, which will require specialist engineering of the subgrade.
Enabling Earthworks	Development levels are unlikely to change significantly; however, an element of cut-and-fill works will likely be required to prepare the development platform. As part of the earthworks design, materials should be assessed and characterised prior to re-use in the construction of upfill to a geotechnical design. All future earthworks should be completed in accordance with a Geotechnical Design Report (GDR) that will consider the ground model within the context of the potential for settlement induced by surcharge from earthworks, dynamic and permanent loading of the development and all known hazards.
Waste Characterisation	Any material that is to be disposed off-site should undergo assessment using Technical Guidance WM3: *Waste Classification – Guidance on the classification and assessment of waste*. This can be done upon request and in line with the Environment Agency sampling frequencies.

RECOMMENDATIONS

Based on the findings of the Geoenvironmental site assessment and the various conclusions drawn, the following additional works are recommended to be completed in due course:

- Foundations to be designed by suitably qualified Structural Engineer.
- Geotechnical Earthworks Specification
- Enabling Works Strategy.

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DRAWING LIST

1. INTRODUCTION

1.1. BACKGROUND

E3P has been commissioned by Steven Abbott Associates LLP, on behalf of the Trustees of the Standen Estate (the Client) to undertake a Phase II Geoenvironmental Site Assessment at Higher Standen Drive, Standen, Clitheroe ; herein referred to as the site.

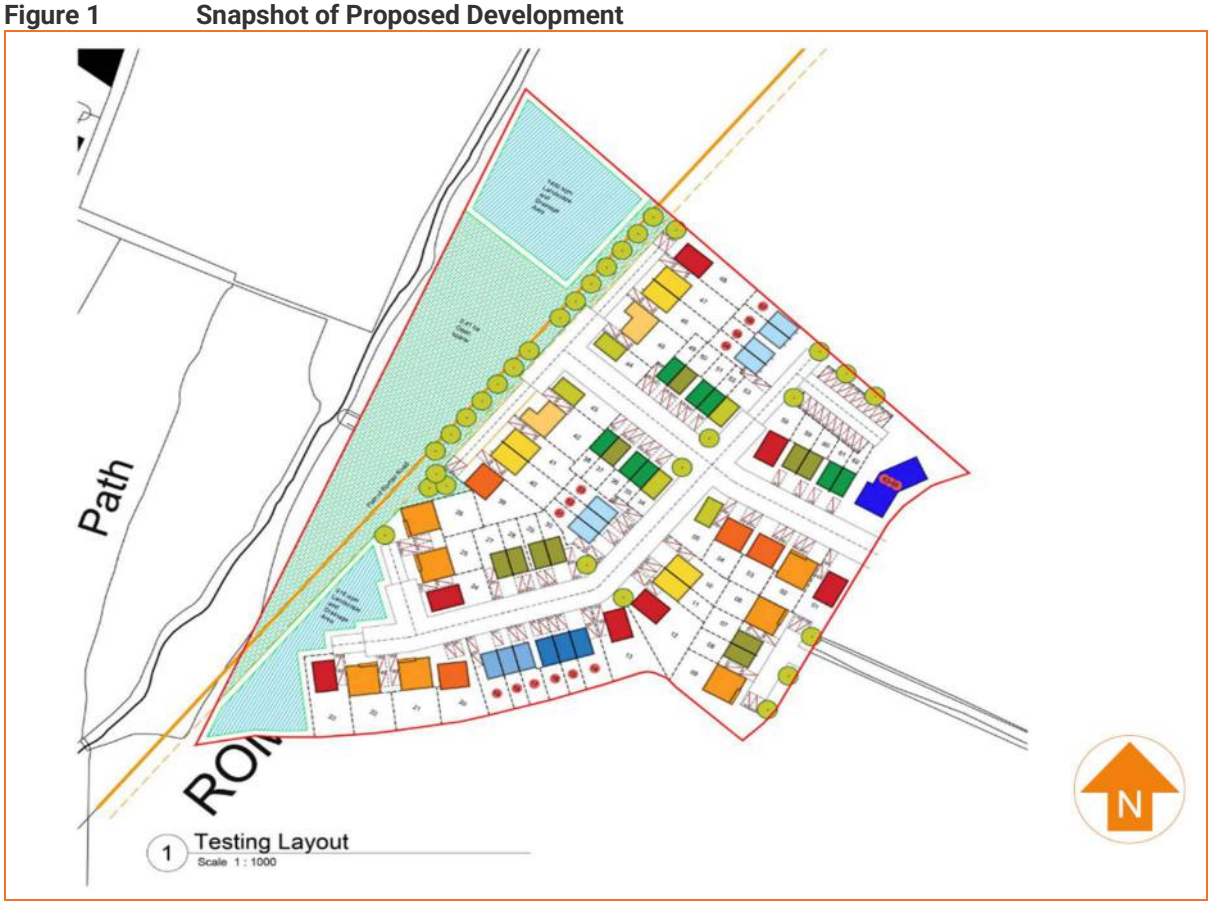
This report is required to determine potential contaminated land liabilities, remediation requirements and geotechnical engineering works that will be required as part of the proposed development.

1.2. PROPOSED DEVELOPMENT

The Trustees of the Standen State intend to construct a low-rise residential development comprising 68 residential dwellings with associated gardens, estate roads and infrastructure. Drawing 17-912-002 (APPENDIX IV) identifies the proposed development layout.

A snapshot of the Proposed Development Layout is indicated in Figure 1.

Figure 1 Snapshot of Proposed Development



1.3. OBJECTIVES AND SCOPE

The objectives of the geoenvironmental investigation are as follows:

- Undertake a phase of sampling and analysis to provide an overview of the environmental issues identified.
- Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site concerning the site's future use and off-site receptors.
- Assess the geotechnical information and provide recommendations concerning foundations, pavement construction and floor slabs.
- Assess the coal mining-related information and provide recommendations regarding any future treatment; and,
- Provide recommendations regarding future works required.

1.4. SCOPE OF WORKS

The scope of works includes the elements included in Table 1.

Table 1 Scope of Works

GROUND INVESTIGATION
• Design of suitable ground investigation
• Window sample probeholes with the construction of environmental monitoring installations
• Mechanically excavated trial pits.
• Soil and groundwater sampling
TESTING AND MONITORING
• In-situ geotechnical testing
• Chemical and geotechnical analysis
• Groundwater monitoring
• Ground gas monitoring
ASSESSMENT AND REPORTING
• Factual and interpretative reporting
• Contamination risk assessment and conceptual site model
• Geotechnical assessment and interpretation

1.5. PREVIOUS REPORTS

The following previous report has been completed:

Table 2 Previous Reports

AUTHOR	TITLE / REFERENCE	CLIENT	DATE
E3P	Phase I Geoenvironmental Site Assessment, Higher Standen Drive (ref: 17912-R1-1), September 2024.	The Trustees of the Standen Estate	08/05/24

The key findings are summarised below and where necessary, data has been used to support the E3P Phase II Geoenvironmental Site Assessment.

- *The site is currently rural fields, with Ribblesdale school to the north and the tributary of Pendleton Brook with agricultural land beyond to the west. Residential developments are currently underway to the south and east.*
- *The site has a slight slope, with a fall of approximately 8 meters from the north east corner towards the western boundary of the site.*
- *The superficial deposits (Till) are designated as a Secondary (undifferentiated) Aquifer and the mudstone bedrock has been identified as a Secondary 'A' Aquifer. The site is not located within a source protection zone for groundwater abstraction. No groundwater abstractions are recorded within 1km.*
- *The site is not located within a Coal Mining Reporting Area.*
- *The Envirocheck indicates the site to lie in a location where <1% of homes are homes is above the radon action.*
- *Review of the EA Flood Zone Map for the area indicates that the site lies within Flood Zone 1, which is defined as the area with a low potential risk of flooding from fluvial or tidal sources.*
- *A tributary of Pendleton Brook forms the western boundary of the site and is considered to be a sensitive receptor.*
- *No active or historic landfills are located within 250 m of the site.*
- *There has been very little historical activity on site and therefore the likelihood of potentially contaminated soils is considered to be low.*
- *Trees are present along the Western boundary of the site and low permeability drift deposits are anticipated, therefore the influence of tree removal in this area should be considered.*

1.6. LIMITATIONS

The limitations of this report are presented in APPENDIX I.

1.7. RISK CLASSIFICATION

The description of risk classification and the likely action required as set out in CIRIA C552 are included in APPENDIX III.

1.8. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed or with whom an assignment has been agreed. Should any third party wish to use or rely upon the report's contents, written approval must be sought from E3P; a charge may be levied against such consent.

2. E3P GROUND INVESTIGATION

2.1. GENERAL OVERVIEW

A ground investigation has been designed with exploratory holes advanced to provide general coverage of the site. The investigation has also been used to collect geotechnical information to assist in the design and construction of the proposed development.

Exploratory fieldwork was completed between in the 14th October 2024. The works are summarised in Table 3.

2.2. SCOPE OF INVESTIGATION

A summary of the fieldwork completed are included in Table 3.

Table 3 Summary of Fieldwork

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)	MONITORING WELLS RESPONSE ZONE (m bgl)
General Ground Conditions Including the Presence/Nature of Obstructions	WS101	Window Sample Probehole	5.45	1.00–4.00
	WS102		4.43	1.00–4.00
	WS103		4.40	1.00–3.00
	WS104		2.40	1.00–2.00
	WS104A		1.00	N/A
	WS105		5.45	1.00–5.00
	WS106		4.41	N/A
	TP101	Mechanically Excavated Trial Pits	2.20	N/A
	TP102		2.30	
	TP103		2.20	
	TP104		2.30	
	TP105		2.00	
	TP106		2.00	
	TP107		2.15	
	TP108		2.30	

Window sample probeholes were advanced to undertake in-situ detailed geotechnical testing, obtain environmental samples and install groundwater and ground gas monitoring wells.

Mechanically excavated trial pits were advanced to investigate ground conditions and to retrieve environmental samples, spatially distributed to offer the maximum site coverage.

The sampling locations are illustrated in Drawing 17-912-006 (APPENDIX IV). The ground conditions encountered are indicated on the logs, which are provided in APPENDIX VI.

The locations were recorded using hand-held GPS and what3words to an accuracy of 3 metres.

Return visits were made to monitor installations for groundwater level and gas concentrations. In addition, selected wells were purged and samples of groundwater recovered for chemical analysis.

2.3. IN-SITU STANDARD PENETRATION TESTING (SPT)

In-situ geotechnical testing was conducted using the standard penetration test (SPT) and, where the ground is granular, a 60° cone (SPT(C)) was used instead of the sampling tube.

The results are shown in the probehole logs in Appendix VI, presented in Table 20 and discussed in Section 5.

2.4. LABORATORY ANALYSIS

Selected soil samples were submitted for a range of chemical analysis, summarised in Table 4.

Table 4 Summary of Laboratory Analysis

CHEMICAL ANALYSIS
• Metals • pH, total sulphate, water-soluble sulphate (2:1 extract) • Sulphide • Cyanide • Phenols • Total and speciated polycyclic aromatic hydrocarbons (PAHs) • Asbestos identification • Speciated and banded total petroleum hydrocarbons (TPHs) • Total Organic Carbon (TOC)
GEOTECHNICAL ANALYSIS
• Atterberg limits determinations • Moisture content • Single stage triaxial • Particle Size Distribution (PSD) Tests; and • Soil Density/Moisture Content Relationship

2.5. STORAGE, PRESERVATION AND TRANSPORT OF SAMPLES

Measures taken to ensure the quality and integrity of the collected samples, from collection to receipt of the samples by the laboratory, are summarised in Table 5.

Table 5 Sample Integrity Information

SUBJECT	CHEMICAL SAMPLING	
	Soil	**Groundwater**
Storage	Glass jars supplied by the laboratory were used for the collection of soil samples to be analysed for VOCs. Plastic tubs were used to collect soil samples for metals analysis, and asbestos screening.	Glass vials supplied by the laboratory were used for the collection of samples to be analysed for VOCs. Samples to be analysed for lower volatility compounds were stored in laboratory-prepared glass jars.
Preservation	Soil and groundwater sample containers were filled to minimise headspace prior to sealing and stored at a low temperature within cool boxes with cooling aids to minimise the loss of volatile contaminants and reduce microbial activity during the collection of samples.	
	Soil	**Groundwater**
Sample Integrity	Dedicated disposable nitrile gloves were worn and changed between sample collections to prevent cross-contamination.	Groundwater samples were collected using dedicated plastic tubing, which was changed between monitoring well locations to prevent cross-contamination.
Transport	Samples were stored and shipped in dedicated sample boxes provided by the laboratory. Sample details were recorded on the laboratory chain of custody form enclosed with the samples prior to dispatch. Scheduling information for the samples was confirmed with the laboratory via email.	

Chemical analysis has been undertaken by an accredited laboratory with the testing results summarised and discussed in Section 4 and the testing certificates included in APPENDIX VII.

Geotechnical samples were collected as required per location immediately after excavation, labelled and sealed to minimise moisture loss. The geotechnical samples were collected and couriered by a dedicated courier to an accredited geotechnical testing laboratory.

The testing results are summarised and discussed in Section 5 and the testing certificates included in Appendix VIII.

3. GROUND AND GROUNDWATER CONDITIONS

3.1. SUMMARY OF GROUND CONDITIONS

The ground investigation generally confirms the published geology and identifies the strata set out in Table 6.

Table 6 Summary of Strata

HOLE	DEPTH TO STRATUM (M BGL)			
	TOPSOIL	SANDY CLAY	GRAVELLY CLAY	GRAVELLY SANDY CLAY
TP101	0.00 – 0.20	-	-	0.20 – 2.20
TP102	0.00 – 0.30	-	1.20 – 2.30	0.30 – 1.20
TP103	0.00 – 0.25	-	-	0.25 – 2.20
TP104	0.00 – 0.20	-	-	0.20 – 2.30
TP105	0.00 – 0.35	-	-	0.35 – 2.00
TP106	0.00 – 0.25	-	-	0.25 – 2.00
TP107	0.00 – 0.15	-	-	0.15 – 2.15
TP108	0.00 – 0.20	0.20 – 1.20	-	1.20- 2.30
WS101	0.00 – 0.25	3.00 – 5.45	-	0.25 – 3.00
WS102	0.00 – 0.25	0.25 – 4.43	-	-
WS103	0.00 – 0.20	0.20 – 1.40	-	1.40 – 4.40
WS104	0.00 – 0.30	0.30 – 2.10	-	2.10 – 2.40
WS105	0.00 – 0.30	0.30 – 1.00	-	1.00 – 2.00
WS106	0.00 – 0.25	0.25 – 2.00	-	2.00 – 4.00

3.2. MADE GROUND

Made Ground was not encountered in any of the exploratory hole locations

3.3. TOPSOIL

Topsoil was encountered within all exploratory hole locations to depths ranging from 0.15 m to 0.35 m bgl. The topsoil comprised brown sandy CLAY, without significant anthropogenic inclusions.

A Depth of Topsoil Plan is presented as Drawing 17-752-008 in APPENDIX IV.

3.4. SUPERFICIAL DEPOSITS

Superficial deposits were encountered within all exploratory locations to a proven depth of 5.45m bgl. The base of the superficial deposits was not encountered in any of the exploratory locations.

Superficial deposits generally comprise brown slightly gravelly slightly sandy CLAY with fine to medium, angular to subrounded gravel of sandstone and mudstone. These deposits gradually become more gravelly with depth.

Underlying these deposits at approximately 1.20 m bgl, the deposits are recorded as grey slightly sandy gravelly CLAY which increases in stiffness with depth.

3.5. SOLID GEOLOGY

The solid bedrock geology was not encountered during the ground investigation.

BGS boreholes within close proximity to the site do not confirm the depth to bedrock.

3.6. GROUNDWATER

The depth of the groundwater strikes and seepages are shown on the exploratory hole records in APPENDIX VI and are summarised in Table 7.

Table 7 Summary of Groundwater Strikes

LOCATION	DEPTH TO STRIKE (m)	NOTES
WS101	1.00 and 4.00	Strike within CLAY.
WS102	1.30	Strike within CLAY
TP104	1.00	Seepage in CLAY, Perched.
TP108	1.50	Seepage in CLAY, Perched.

Monitoring was undertaken using an electronic dip meter and interface probe to record the depth to groundwater. These results are summarised in Table .

3.7. VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

Visual and olfactory evidence of potential contamination has not been identified during the site investigation.

3.8. OBSTRUCTIONS

No obstructions were identified during the course of the intrusive investigation.

4. TIER 2 QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

E3P has undertaken a Tier 2 qualitative land risk assessment with respect to human health, controlled waters and ground gas to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

4.1. DEVIATING SAMPLES

Best practice sampling procedures including the use of appropriate sampling containers and adhering to the laboratory holding times for each contaminant analysis, were undertaken in order to avoid samples being deviating.

4.2. SAMPLE ANALYSIS POPULATION

Table 8 summarises the chemical analysis testing scheduled.

Table 8 Summary of Testing Schedule

TYPE OF SAMPLE	NO. OF SAMPLES	DETERMINANDS
TOPSOIL	4	Speciated PAH
	4	pH, heavy metals, TOC
	4	Banded TPH
	4	Asbestos ID
Natural CLAY	5	Speciated PAH
	5	pH, heavy metals, TOC
	5	Banded TPH

4.3. HUMAN HEALTH RISK ASSESSMENT

At Tier 2 stage, the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM/CIEH S4UL (S4UL3267).

The Tier 2 screening values for residential with plant uptake have been utilised for this assessment due to the proposed development being a residential end use. To remain conservative at an early stage, the screening values based on a 1% SOM have been utilised for this assessment.

The results of the comparison have been summarised in Table 9.

Table 9 Summary of Inorganic and Hydrocarbon Toxicity Assessment for a Residential End Use With Plant Uptake

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PL	ASSESSMENT
Arsenic	mg/kg	37	9	15	-	1	No Further Action
Cadmium	mg/kg	11	9	1.4	-	1	No Further Action
Chromium (VI)	mg/kg	6.0	9	< 0.50	-	1	No Further Action
Lead	mg/kg	200**	9	200	-	1	No Further Action
Mercury	mg/kg	1.2	9	0.08	-	4	No Further Action
Nickel	mg/kg	130	9	64	-	1	No Further Action
Selenium	mg/kg	250	9	1.6	-	1	No Further Action
Copper	mg/kg	2400	9	34	-	1	No Further Action
Zinc	mg/kg	3700	9	230	-	1	No Further Action
Cyanide – Total	mg/kg	791	9	1.0	-	1	No Further Action
Phenols – Total	mg/kg	120	9	< 0.10	-	1	No Further Action
Asbestos	Fibres	NFD	4	NFD	-	3	No Further Action
Naphthalene	mg/kg	2.3	9	1.20	-	4	No Further Action
Acenaphthylene	mg/kg	170	9	< 0.10	-	2	No Further Action
Acenaphthene	mg/kg	210	9	< 0.10	-	1	No Further Action
Fluorene	mg/kg	170	9	< 0.10	-	1	No Further Action
Phenanthrene	mg/kg	95	9	0.46	-	2	No Further Action
Anthracene	mg/kg	2400	9	0.19	-	2	No Further Action
Fluoranthene	mg/kg	280	9	0.92	-	2	No Further Action
Pyrene	mg/kg	620	9	0.80	-	2	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	9	0.43	-	2	No Further Action
Chrysene	mg/kg	15	9	0.31	-	2	No Further Action
Benzo(b)Fluoranthene	mg/kg	2.6	9	0.47	-	2	No Further Action
Benzo(k)Fluoranthene	mg/kg	77	9	0.15	-	2	No Further Action
Benzo(a)Pyrene	mg/kg	2.2	9	0.41	-	2	No Further Action
Indeno(123-cd)Pyrene	mg/kg	27	9	0.28	-	2	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24	9	< 0.10	-	2	No Further Action
Benzo(ghi)Perylene	mg/kg	320	9	0.23	-	2	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	100	9	< 1.0	-	4	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	27	9	< 1.0	-	4	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	74	9	< 1.0	-	4	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	140	9	< 1.0	-	4	No Further Action
TPH C16-C21 (aromatic)*	mg/kg	260	9	< 1.0	-	1	No Further Action
TPH C21-C35 (aromatic)*	mg/kg	1100	9	< 2.0	-	1	No Further Action

Notes
PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation

Abbreviations: GAC = general assessment criteria, N = number of samples, MC = maximum concentration; Loc of Ex = location of exceedance; PL = Contaminant Pathway; NFD = no fibres detected.

The pathway noted in the table is the primary pathway, however it may not be the only pathway of that contaminant
* The Tier 2 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. E3P has utilised the Tier 2 values for aliphatic compounds for the volatile and semi volatile fractions (C5-C12) and the Tier 2 values for aromatic compound for the non-volatile fractions (C12-C35). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.
** Tier 2 GAC for lead taken from C4SL CL:AIRE

Referring to Table 9, no elevated concentrations of potential contaminants of concern have been identified when compared with Tier 2 GACs for a residential end use (with plant uptake).

Asbestos was not identified in any of the eleven samples submitted for analysis.

Based on the above there is no unacceptable level of risk to human health for future end users and construction workers.

Preliminary chemical analysis has confirmed the topsoil, and subsoil is likely to be suitable for re-use within any landscaped areas; however further chemical analysis in accordance with an agreed testing frequency will be required to confirm this prior to placement in any landscaped areas.

4.4. CONTROLLED WATERS RISK ASSESSMENT

E3P has undertaken a controlled waters risk assessment for the site based on the consideration of the conceptual site model and the sensitive receptors which are summarised in Table 10.

Table 10 Controlled Waters Conceptual Model and Sensitivity Profile

DISCUSSION		SENSITIVITY RATING
Contaminant Source		
Made Ground No potential sources of contamination were identified as part of the Phase I site assessment. Made Ground has not been encountered within any of the exploratory hole locations. Elevated concentrations of contaminants have not been encountered within chemical analysis of the soils.		**Low**
Pathway		
Vertical Migration The site is underlain by cohesive CLAY deposits, which will restrict the vertical migration of contaminants. The presence of these low permeability superficial deposits will offer protection to the underlying aquifer.		**Low**
Lateral migration Lateral migration of contaminants is considered possible given the restriction in vertical migration due to the low permeability, however, given that no sources of contamination have been identified the risk to the tributary of Pendleton Brook which forms the western boundary of the site is considered to be low as there is no complete pollutant linkage.		**Low**
Receptor		
Aquifer Classification in Superficial Drift Deposits	Secondary Undifferentiated (Devensian Till).	**Low**
Aquifer Classification in Bedrock	Secondary A Aquifer (Undifferentiated) Clitheroe Limestone Formation And Hodder Mudstone Formation.	**Moderate**
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not affected.	**Low**
Distance to the Closest Groundwater Abstraction Point	No groundwater abstractions identified within a 2 km radius.	**Low**
Is the Site Located Within 50 m of a Surface Watercourse?	A tributary of the Pendleton Brook runs along the Western boundary of site.	**Medium**

The ICSM developed within the context of the site setting has not identified a viable pollutant linkage, given the absence of any sources of contamination and the presence of low permeability superficial deposits.

The Tier 2 assessment in line with LCRM (2023) has included a comparison of leachate analysis from samples of the Topsoil and groundwater samples to environmental quality standards (EQS) and drinking water standards (DWS).

EQS will be viewed as a priority given the pollutant linkage is with the tributary of Pendleton Brook, however where there are no regulatory guidance values for EQS, the DWS will be utilised in their absence.

Water samples were obtained utilising a bailer. These are presented in Table 11.

Table 11 Comparison of Groundwater Analysis with Tier 2 Screening Levels

DETERMINAND	UNIT	EQS [1, 2] AA	DWS [3,4]	NO. OF GW SAMPLES	MAX CONC. IN GROUNDWATER	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
Arsenic	µg/l	50	10	2	0.69	2	1.6	-	No Further Action
Cadmium	µg/l	0.08-0.25	5	2	0.16	2	< 0.11	-	No Further Action
Chromium (VI)	µg/l	3.4	–	2	<20	2	< 20	-	No Further Action
Chromium (III)	µg/l	4.7	50	2	6.4 (WS101)	2	7.0	TP105 (EQS)	Further Action
Copper	µg/l	1	2000	2	3.2 (WS101) 5.4 (WS102)	2	6.4 6.2	TP105 (EQS) TP101 (EQS)	Further Action
Total Cyanide	µg/l	1	50	2	<0.005	2	< 0.0050	-	No Further Action
Lead	µg/l	1.2	10	2	1.3 (WS101)	2	4.8 4.0	TP101 (EQS) TP105 (EQS)	Further Action
Mercury	µg/l	–	1.0	2	<0.01	2	< 0.05	-	No Further Action
Nickel	µg/l	4	20	2	4.6 (WS101)	2	4.7	TP105 (EQS)	Further Action
Selenium	µg/l	–	10	2	<0.50	2	< 0.50	-	No Further Action
Zinc	µg/l	10.9	–	2	55 (WS101) 53 (WS102)	2	60 13	TP105 (DWS) TP101 (DWS)	Further Action
pH	6–9			2	7.5	2	7.5	-	No Further Action
Polycyclic Aromatic Hydrocarbons									
Naphthalene	µg/l	2	10*	2	<0.50	2	< 0.010	-	No Further Action
Anthracene	µg/l	0.1	10*	2	<0.50	2	< 0.010	-	No Further Action
Benzo[b]fluoranthene	µg/l	0.00017*	10*	2	<0.50	2	< 0.010	-	No Further Action
Benzo[k]fluoranthene	µg/l	0.00017*	10*	2	<0.50	2	< 0.010	-	No Further Action
Benzo(a)pyrene	µg/l	0.00017*	10*	2	<0.50	2	< 0.010	-	No Further Action
Indeno(123-cd) pyrene	µg/l	0.00017*	10*	2	<0.50	2	< 0.010	-	No Further Action
Fluoranthene	µg/l	0.0063	10*	2	<0.50	2	< 0.010	-	No Further Action
Benzo(ghi)perylene	µg/l	1.7–4	10*	2	<0.50	2	< 0.010	-	No Further Action
Aromatic Hydrocarbon									

DETERMINAND	UNIT	EQS [1, 2] AA	DWS [3,4]	NO. OF GW SAMPLES	MAX CONC. IN GROUNDWATER	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
TPH C5-C7 (benzene)	µg/l	10	1	2	<0.1	2	< 0.10	-	No Further Action
TPH C7-C8 (toluene)	µg/l	74	700	2	<0.1	2	< 0.10	-	No Further Action
TPH C8-C10 (xylene)	µg/l	30	300	2	<0.1	2	< 0.10	-	No Further Action
TPH C10-C12 (naphthalene)	µg/l	2	90	2	<0.1	2	< 0.10	-	No Further Action
TPH C12-C16	µg/l	–	90	2	<0.1	2	< 0.10	-	No Further Action
TPH C16-C35	µg/l	–	90	2	<0.2	2	< 0.10	-	No Further Action
Aliphatic Hydrocarbon									
TPH C5-C6	µg/l	–	1000[5]	2	<0.1	2	< 0.10	-	No Further Action
TPH C6-C8	µg/l	–	1000[5]	2	<0.1	2	< 0.10	-	No Further Action
TPH C8-C10	µg/l	–	300	2	<0.1	2	< 0.10	-	No Further Action
TPH C10-C12	µg/l	–	300	2	<0.1	2	< 0.10	-	No Further Action
TPH C12-C16	µg/l	–	300	2	<0.1	2	< 0.10	-	No Further Action
TPH C16-C21	µg/l	–	300**	2	<0.1	2	< 0.10	-	No Further Action
TPH C21-C35	µg/l	–	300**	2	<0.1	2	< 0.10	-	No Further Action

Notes2
 # Solubility <0.01µg/l
AA – Annual Average
** Polyaromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water*
*** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.*

1. The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (legislation.gov.uk)
2. The Water Supply (Water Quality) Regulations 2018 (legislation.gov.uk)
3. Guidelines for drinking-water quality, 4th edition, incorporating the 1st addendum (who.int)
4. CL:AIRE publishes Petroleum Hydrocarbons in Groundwater guidance (claire.co.uk)
5. *A total TPH criteria of 1000 mg/kg will act as a surrogate criterion for remaining aliphatic and aromatic TPH fractions.*

4.4.1. CONTROLLED WATER RISK ASSESSMENT AND MITIGATION

This comparison indicates that the data exceeds the EQS and DWS values for the following inorganic compounds:

Table 12 Summary of Controlled Waters Risk Assessment

EXCEEDANCE OF EQS	EXCEEDANCE OF DWS
• Chromium III (Leachate and Groundwater) • Copper (Leachate and Groundwater) • Lead (Leachate and Groundwater) • Nickel (Groundwater) • Zinc (Leachate and Groundwater)	• No exceedances

It should be noted the leachate test is aggressive (de-ionised water) and is not in aqueous equilibrium (steady state) within the solid sample. This may cause rapid dissolution and overestimation of the aqueous phase concentrations compared to groundwater in contact with contaminated soils.

4.4.2. M-BAT ASSESSMENT

The exceedances of copper, lead and nickel are marginal and not considered to be a significant risk to the tributary of Pendleton Brook

Due to exceedances in ground water samples for copper, nickel and zinc, an m-BAT assessment has been completed to assess the bioavailability of the metals with respect to surface water receptors (tributary of Pendleton Brook). The chemical values from the groundwater analysis have been input into the assessment. In the absence of DOC or Ca within the suite of testing, conservative published values have been used.

Where the Risk Characterisation Ratio (RCR) is greater than 1, this indicates the bioavailable concentration is above the EQS and the receptor is therefore at risk. In this instance, the RCR has not been exceeded for copper, nickel or zinc within groundwater or surface water samples, and as such they are not considered to be bioavailable.

In light of the above assessment, E3P do not consider the site to pose an unacceptable level of risk to surface waters for copper, nickel and zinc. It should also be noted the site is currently uncapped and the proposed development will largely encapsulate the site, thus limiting the potential for infiltration and therefore leaching potential.

Furthermore, it is noted that elevated concentrations of contaminants have not been identified within the soils and therefore, it is unlikely that contaminated groundwaters are attributable to the site.

4.4.3. DISCUSSION OF CONTROLLED WATERS RISK ASSESSMENT

Historically, the site has been subjected to little anthropogenic change with mapping showing the site as largely undeveloped throughout its history and as such Made Ground was not encountered in any of the exploratory hole.

The site is underlain by a generally cohesive CLAY from 0.15 m bgl to depths in excess of 5.45 m bgl which will inhibit vertical and lateral migration.

Exceedances of heavy metals were identified within groundwater from WS101 and WS102. It is noted that there were no exceedances of contaminants within the corresponding soil samples within these locations. Furthermore, the monitoring wells within all three locations were set within natural deposits.

Leachate analysis also indicated elevated heavy metal contamination; however, the test is aggressive and can cause an overestimation of the results. Furthermore, in the absence of Made Ground deposits at the site, the leachate analysis was undertaken on the topsoil which will be stripped prior to development.

The underlying secondary A bedrock aquifer is considered a potential receptor. However, it is noted that the site is underlain by low permeability deposits which will limit vertical migration, additionally none of the elevated concentrations exceed the assessment criteria for DWS and therefore, there is no complete source pathway receptor linkage for the underlying aquifer. Furthermore, given that there are no groundwater abstraction boreholes in the locality, this aquifer is not used as a strategic water resource and, therefore, the overall risk is reduced.

Migration towards the tributary of Pendleton Brook is considered likely given the low permeability drift deposits that underlie the site will restrict vertical migration. Therefore, an m-BAT assessment has been undertaken which determined that the metals are not bioavailable.

The proposed development will create hardstanding cover across the majority of the site, thus reducing the amount of infiltration generated. This will, in turn, reduce the potential for leachate generation and migration within the curtilage of the site. Taking the above into account there is considered to be a low risk to controlled waters and the wider environ.

4.5. GROUND GAS RISK ASSESSMENT

4.5.1. RATIONALE

Hazardous ground gas qualitative risk assessment is based on a conceptual site model (CSM) similar to that used for soil and groundwater contamination sources (i.e., source-pathway-receptor pollutant linkages).

The risk can be assessed based on knowledge of the ground conditions and CSM and a measure of hazardous gas concentrations and gas flow at the site within monitoring standpipes.

4.5.2. SOURCES AND PATHWAYS OF GROUND GAS (RE-ASSESSMENT OF CSM)

Table 13 summarises the potential sources and pathways of ground gas within the context of the recorded site setting and proposed development.

Table 13 Identified Potential Sources of Ground Gas

SOURCE
Superficial Strata The site is underlain by low permeability deposits to a depths greater than 5.45 m bgl. No potential sources of ground gas were identified either as part of the Phase I assessment or during the intrusive investigation.
Solid Strata Not encountered. The site is not located within a Coal Mining Reporting Area.
Landfill Sites (Off-site) There are no historic or active landfill sites within influencing distance of the site.
Other Gases The site is unaffected by radon.

4.5.3. MONITORING FREQUENCY

The CIRIA C665 guidance on gas risk assessment includes recommendations for periods and frequencies for monitoring visits. These recommendations take into account the nature of the proposed development and the likely generation potential of the source.

The proposed development comprises residential properties, which would be classified as a Type A development (high sensitivity) in accordance with BS8485:2015+A1:2019. However, it is considered that the likely generation potential of the identified gas sources (taking into account the likelihood of future increases in gas generation) would be best classified as very low.

Therefore, within the context of the proposed school end-use and ground gas generation potential, the gas assessment requires six visits over three months, with at least two sets of readings at low or falling atmospheric pressure.

4.5.4. GROUND GAS RISK ASSESSMENT METHODOLOGY

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in:

- CIRIA Report 665 – Assessing risks posed by hazardous ground gases to buildings (2007)
- BS8485:2015+A1:2019 – Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

BS8485 provides guidance on the level of gas protection requirements based upon the characteristic situation (CS) and the proposed development based on building type.

Therefore, in accordance with BS8485, based on the measured flow rates and hazardous gas concentrations, individual hazardous gas flow rates (Q_{hg}) shall be derived for each monitoring point, from which the site characteristic hazardous gas flow rate (Q_{hgs}), and then the Characteristic Situation (CS) can be determined.

The following equation should be utilised:

$$Q_{hg} = q\left(\frac{C_{hg}}{100}\right)$$

Where:
q is the measured flow rate (in litres per hour) of combined gases from the monitoring standpipe
C_{hg} is the measured hazardous gas concentration (in percentage volume/volume).

The subsequent derived gas screening value (GSV) should be the maximum Q_{hg} (flow rate x concentration as a percentage volume) for all the monitoring events.

A 'worst case check' may be carried out using the maximum recorded flow in any hole with the maximum concentration in any hole to present the plausible worst-case conditions. Adoption of the worst case Q_{hg} requires thorough justification and reference to the CSM.

The final derived GSV can then be used to characterise the site as summarised in Table 14.

Table 14 Site Characterisation by GSV (BS8485:2015)

CS	HAZARD POTENTIAL	GSV (L/HR) FOR METHANE AND CARBON DIOXIDE	ADDITIONAL FACTORS
CS1	Very Low	< 0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	< 0.70	Typical measured flow rate <70 l/h (otherwise consider an increase to CS3)
CS3	Moderate	< 3.5	N/A
CS4	Moderate to High	< 15	N/A
CS5	High	< 70	N/A
CS6	Very High	> 70	N/A

Notes

1) *The CS is equivalent to the characteristic GSV in CIRIA C665.*
2) *The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter should be considered.*
3) *Gas Screening Value is the Borehole Gas Volume Flow Rate, in litres per hour, multiplied by the concentration in the air stream of the particular gas being considered.*
4) *The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.*

4.5.5. MONITORING METHODOLOGY

Concentrations of methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2) (hydrogen sulphide) were measured using a calibrated infrared gas analyser (GFM435) with gas flow rates measured using an integrated flow meter.

Gas measurements were recorded for a minimum of 300 seconds (5 minutes) at each location, increasing to 600 seconds if elevated concentrations identified, at which point the maximum concentration of CH_4 and CO_2, together with the lowest concentration of O_2 were recorded.

The results of the ground gas monitoring are presented in Table 15.

In addition to the raw data, the results for each individual standpipe have been assessed with reference to guidance provided in BS8485:2015. Based on the initial peak measured flow rates and hazardous gas concentrations, individual hazardous gas flow rates (Q_{hg}) have been derived for each monitoring point, from which an individual Characteristic Situation (CS) can ultimately be determined.

4.5.6. SUMMARY OF MONITORING RESULTS

Table 15 presents of the ground gas and groundwater monitoring results to date.

Table 15 Summary of Ground Gas Monitoring Results

WELL	STRATA	DATE	CH_4 PEAK (%V/V)	CH_4 STEADY (%V/V)	CH_4 Q_{hg} (l/hr)	CO_2 PEAK (%V/V)	CO_2 STEADY (%V/V)	CO_2 Q_{hg} (l/hr)	O_2 (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	PEAK FLOW (l/hr)	STEADY FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS101	Natural CLAY Drift	24/10/2024	0.1	0.1	0.0001	1.4	1.3	0.0014	17.9	1004	Falling	0.1	0.1	1.00 – 4.00	3.76	1.05
		07/11/2024	0.1	0.1	0.0020	2.1	2.1	0.042	17.3	1018	Falling	2.0	0.1		3.77	1.18
WS102	Natural CLAY Drift	24/10/2024	0.1	0.1	0.0001	0.4	0.3	0.0004	18.7	1004	Falling	0.1	0.1	1.00 - 4.00	3.83	1.14
		07/11/2024	0.1	0.1	0.0021	2.3	2.3	0.0483	18.9	1018	Falling	2.1	0.1		3.95	1.36
WS104	Natural CLAY Drift	24/10/2024	0.1	0.1	0.0001	2.0	2.0	0.0020	16.4	1004	Falling	0.1	0.1	1.00 – 2.00	2.02	1.18
		07/11/2024	0.1	0.1	0.0020	3.0	3.0	0.0600	16	1018	Falling	2.0	0.1		2.01	1.30
WS105	Natural CLAY Drift	24/10/2024	0.1	0.1	0.0001	0.9	0.3	0.0009	18.5	1004	Falling	0.1	0.1	1.00 – 5.00	4.85	1.55
		07/11/2024	0.1	0.1	0.0019	2.2	1.8	0.0418	17.3	1018	Falling	1.9	0.1		4.84	1.64

Notes

CIRIA Characteristic Situation		Q_{hg}		
	CS1	*<0.07*	*Typical Max CO2 <5 % Typical Max CH4 <1 %*	*Values in BOLD exceed CS1 Thresholds*
	CS2	*<0.7*	*Flow rate not to exceed 70 l/hr otherwise consider increase to CS3*	*Values in BLUE denote water above level of response zone (flooded)*
	CS3	*<3.5*		
	CS4	*<15*	*Quantitative Risk Assessment required to evaluate scope of protective measures*	

4.5.7. GROUNDWATER

Limited groundwater was encountered during the intrusive investigation. Groundwater strikes were encountered in WS101 and WS102 at 1.00 m and 4.00 m bgl and 1.00 m bgl, respectively. Seepages were encountered at 1.00 m and 1.50 m bgl in TP104 and TP108, respectively.

Due to the predominantly low permeability cohesive drift stratum, which is slow to recharge, it is likely that water levels are representative of surface water collecting within the standpipes and not a true representation of groundwater.

4.5.8. BAROMETRIC PRESSURE

Visit 1 was undertaken during a period of falling pressure with pressure recorded to be 1004 mbar.

Visit 2 was undertaken during high falling pressure with pressure recorded to be 1018.

Further gas monitoring visits are to be completed.

4.5.9. GAS FLOW

Steady flow rates were recorded to be 0.1 l/hr (limit of detection of the analyser).

Peak flow was recorded at 2.1 l/hr within WS102 and during the second visit. This is considered to be a result of high groundwater causing compression in the wells.

4.5.10. GAS CONCENTRATIONS

The maximum methane value recorded within the monitoring wells was 0.1% v/v (limit of detection of the analyser).

Carbon dioxide concentrations were recorded at concentrations ranging from 0.4% v/v to 3.0% v/v (WS104).

4.5.11. CONCLUSION

The determined Characteristic Situation for each standpipe is presented in Table 13.

Table 13 Gas Risk Profile and Location

WELL	MAX FLOW (l/hr)	MAX CH_4 (%V/V)	MAX CH_4 Q_{hg} (l/hr)	MAX CO_2 (%V/V)	MAX CO_2 Q_{hg} (l/hr)	CHARACTERISTIC SITUATION
WS101	2.0	0.1	0.0020	2.1	0.0420	CS1
WS102	2.1	0.1	0.0021	2.3	0.0483	CS1
WS104	2.0	0.1	0.0020	3.0	0.0600	CS1
WS105	1.9	0.1	0.0019	1.8	0.0418	CS1

The gas monitoring data confirms the findings of the CSM; Glacial Till is not considered a ground gas source and will restrict the flow of ground gas and no gas sources have been identified during the initial site assessment. In light of the above, the preliminary ground gas assessment suggests that the site should be classified as CS1 and no gas protection measures are likely to be required. Ground gas monitoring is currently ongoing, and a full assessment will be included as an addendum to this report.

4.6. POTABLE WATER SUPPLY

This section provides a summary of the site investigation data with reference to the selection of potable water supply pipework. The assessment is made with reference to the UK Water Industry Research (UKWIR) publication "Guidance on the selection of Water Supply Pipes to be used in Brownfield Sites."

Table 17 Pipeline Selection PE Threshold Concentrations

CONTAMINANT GROUP	PE-THRESHOLD (mg/kg)	CONCENTRATIONS AT CURRENT PIPELINE DEPTH (mg/kg)
Total VOC	0.5	N/A
Total BTEX And MTBE	0.1	N/A
Total SVOCs (Excluding PAH and those substances marked with an *)	2	N/A
EC5-EC10 Aliphatic and Aromatic Hydrocarbons	2	<1.0
EC10-EC16- Aliphatic and Aromatic Hydrocarbons	10	<1.0
EC16-EC40 Aliphatic and Aromatic Hydrocarbons	500	<1.0
Phenols (From SVOC Analysis)*	2	N/A
Cresols and Chlorinated Phenols (From SVOC Analysis)	2	N/A
Ethers*	0.5	N/A
Nitrobenzene*	0.5	N/A
Ketones*	0.5	N/A
Aldehydes*	0.5	N/A
Amines	Fail	N/A
Other Consideration		
Are there any exceedances of the PE threshold outside of the pipeline depth?	No	
Is free product present in soil and groundwater?	None	
Could hydrocarbon impact at greater depth than current pipeline depth be mobilised by rising groundwater levels?	No hydrocarbon impact has been identified.	
Will soils impacted with above determinands likely be utilised elsewhere on site?	Currently unknown	
Will soils be imported to site as part of any future earth works	Currently unknown. The importation of materials may affect the WIR Risk Assessment which should be updated after completion.	

Notes - Pipe line depth normally between 0.75m–1.35m

Based on the assessment of current site conditions it is likely that PE pipe will be suitable for the proposed development.

4.7. DEVELOPED CONCEPTUAL SITE MODEL

Following the completion of the intrusive site investigation, chemical analysis and risk assessment, the conceptual model shown in Table 18 has been prepared for the site.

Table 18 Developed Conceptual Model

CONTAMINANT RISK			LIKELIHOOD	SEVERITY	MITIGATION DISCUSSION	RESIDUAL RISK
SOURCES	**MIGRATION PATHWAYS**	**RECEPTORS**				
Metals, PAHs and TPHs present in soil	Accidental ingestion and/or dermal contact with contaminated soil and/or leachate. **PL1/PL2**	Human Health – construction workers	Low likelihood	Low	No elevated concentrations have been identified. **Recommendation:** Construction works to be completed with appropriate PPE and welfare facilities.	Very low
		Human Health – end users				
	Inhalation of contaminated dust. **PL3**	Human Health – end users	Low likelihood	Low		Very low
Asbestos (Asbestos containing materials (ACM) and loose fibres)	Inhalation (of fibres). Construction works disturbing bound material and releasing fibres. **PL3**	Human Health - Site personnel, end land users, and users of adjacent sites	Low likelihood	Low	Asbestos has not been identified in any of the soils analysed. **Recommendation:** Construction works completed with PPE and provision of welfare.	Very low
Sulphate from potential ash within the Made Ground.	Sulphate attack on concrete. **PL6**	Building concrete	Low likelihood	Medium	Concrete classification of DS-1, AC-1s applicable across the site **Recommendation:** Concrete should be designed in accordance with the chemical testing	Very low

CONTAMINANT RISK			LIKELIHOOD	SEVERITY	MITIGATION DISCUSSION	RESIDUAL RISK
SOURCES	**MIGRATION PATHWAYS**	**RECEPTORS**				
					results. Construction works to be completed with appropriate PPE and welfare facilities.	
Organic contaminants such as hydrocarbons, solvents	Ingestion of tainted water supply. **PL7**	Human Health – End Users Water pipeline	Low likelihood	Low	No elevated concentrations of TPH have been identified at pipeline depth across the west of the site (0.75–1.35 m). **Recommendation:** PE pipe is likely to be suitable following a pipeline risk assessment.	Very low
Phytotoxic contaminants	Direct contact (plant uptake). **PL8**	Flora	Low likelihood	Low	No elevated concentrations of contaminations identified. Should impacted soils be encountered during the build phase a clean cover system should be installed in garden areas.	Very low
CONTROLLED WATERS						
Mobile contaminants	Leaching of contaminants from topsoil through infiltration and percolation of rainwater. **PL5**	Secondary B bedrock aquifer Tributary of Pendleton Brook	Low likelihood	Low	Exceedances of heavy metals were identified within leachate testing on topsoil samples from TP101 and TP105.	Very low

CONTAMINANT RISK			LIKELIHOOD	SEVERITY	MITIGATION DISCUSSION	RESIDUAL RISK
SOURCES	**MIGRATION PATHWAYS**	**RECEPTORS**				
					Lateral and vertical migration will be hindered by the low permeability drift deposits. Furthermore, the topsoil deposits will be stripped prior to commencement of development works.	
Groundwater	Vertical and lateral migration. **PL5**	Secondary A bedrock aquifer Tributary of Pendleton Brook	Low likelihood	Low	Elevated concentrations of heavy metals have been identified within groundwater samples from WS101 and WS102. The concentrations are not elevated above DWS and therefore the risk to the underlying aquifer is considered to be low.	Very low

CONTAMINANT RISK			LIKELIHOOD	SEVERITY	MITIGATION DISCUSSION	RESIDUAL RISK
SOURCES	MIGRATION PATHWAYS	RECEPTORS				
					An m-BAT assessment has been undertaken on the groundwater data which indicates that the heavy metals as not bioavailable and therefore do not present a risk to the tributary of Pendleton Brook. Furthermore, it in the absence of elevated concentrations within soil samples, it is considered unlikely that the source of these heavy metals originates from the site.	
	Contact with contaminated groundwater. **PL2**	Human Health – site personnel	Low likelihood	Low	Groundwater is not expected to rise above ground level or the final level of the road.	Very low
	Contaminants leached from the Made Ground and from off-site sources may be mobilised to greater distances through advective flow. **PL5**	Human Health – end users	Low likelihood	Low	Impacted groundwater could transport contaminants vertically and horizontally through permeable strata. However, the site works will not exacerbate this, and site work will be undertaken above the water table. Groundwater will need to be considered for surrounding developments.	Very low

CONTAMINANT RISK			LIKELIHOOD	SEVERITY	MITIGATION DISCUSSION	RESIDUAL RISK
SOURCES	**MIGRATION PATHWAYS**	**RECEPTORS**				
GROUND GAS						
Ground gases (methane and carbon dioxide)	Inhalation of ground gas. **PL4** Accumulation of ground gas in confined spaces (asphyxiation or explosion)	Human Health – site personnel	Low likelihood	Low	The ground gas risk assessment suggests that the site can be classified as CS1 given no likely sources of ground gas have been identified. Gas protection measures are not considered to be required.	Very low
		Human Health – end users	Low likelihood	Low		Very low
		Infrastructure and services	Low likelihood	Low		Very low
Radon	Inhalation of ground gas. **PL4** Accumulation of ground gas in confined spaces (carcinogenic)	Human Health – site personnel	Unlikely	Low	The site is in an area where less than 1% of homes are above the Radon Action Level, therefore no further assessment is required.	Very low
		Human Health – end users	Unlikely	Low		Very low

Main Exposure Pathways:
PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = vapour/gas inhalation; PL5 = vertical / lateral migration; PL6 = corrosion of concrete; PL7=tainting of water supply; PL8 = uptake by plants.

LEVEL OF RISK	
Very Low	
Low	
Low/Moderate	
Moderate	
Moderate/High	
High	

5. GEOTECHNICAL ASSESSMENT

5.1. SOIL CONSISTENCY

Undrained shear strength values were measured using laboratory undrained triaxial tests. Results of the tests are presented in Table 19, which indicate the clay soils to be firm to stiff.

Table 19 Summary of Undrained Shear Strength in Triaxial Compression – Laboratory Test

LOCATION	SAMPLE DEPTH (m)	LAB DESCRIPTION	UNDRAINED SHEAR STRENGTH (kN/m2)	CONSISTENCY
WS104	0.50 – 1.00	Brown slightly sandy slightly gravelly CLAY	38	Soft

Results of the standard penetration tests, including undrained shear strengths derived from SPTs are included in Table 20.

Table 20 Standard/Cone Penetration Test Results

BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m²)	ALLOWABLE BEARING CAPACITY (kN/m²)*
WS101	1.00	Sandy CLAY	14	14.11	N/A	Medium Strength	Stiff	70.57	**145.09**
	2.00	Gravelly CLAY	13	11.88	N/A	Medium Strength	Stiff	59.38	**122.09**
	3.00	Sandy CLAY	38	33.05	N/A	Very High Strength	Very Stiff	165.23	**339.72**
	4.00	Sandy CLAY	42	35.48	N/A	Very High Strength	Very Stiff	177.42	**364.77**
	5.00	Sandy CLAY	42	34.84	N/A	Very High Strength	Very Stiff	174.22	**358.20**
WS102	1.00	Sandy CLAY	8	8.07	N/A	Medium Strength	Stiff	40.33	**82.91**
	2.00	Sandy CLAY	18	16.44	N/A	High Strength	Very Stiff	82.22	**169.04**
	3.00	Sandy CLAY	48	41.74	N/A	Very High Strength	Very Stiff	208.72	**429.12**
	4.00	Sandy CLAY	50	42.24	N/A	Very High Strength	Very Stiff	211.21	**434.25**
WS103	1.00	Sandy CLAY	9	9.07	N/A	Medium Strength	Stiff	45.37	**93.27**
	2.00	Gravelly CLAY	17	15.53	N/A	High Strength	Very Stiff	77.65	**159.65**
	3.00	Gravelly CLAY	23	20.00	N/A	High Strength	Very Stiff	100.01	**205.62**
	4.00	Gravelly CLAY	50	42.24	N/A	Very High Strength	Very Stiff	211.21	**434.25**
WS104	1.00	Sandy CLAY	16	16.13	N/A	High Strength	Very Stiff	80.65	**165.82**
	2.00	Sandy CLAY	50	45.68	N/A	Very High Strength	Very Stiff	228.38	**469.56**
WS105	1.00	Sandy CLAY	6	6.05	N/A	Low Strength	Firm	30.24	**62.18**
	2.00	Sandy CLAY	15	13.70	N/A	Medium Strength	Stiff	68.52	**140.87**
	3.00	Sandy CLAY	27	23.48	N/A	High Strength	Very Stiff	117.40	**241.38**
	4.00	Sandy CLAY	38	32.10	N/A	Very High Strength	Very Stiff	160.52	**330.03**
	5.00	Sandy CLAY	18	14.93	N/A	Medium Strength	Stiff	74.67	**153.51**

NOTES
* The Allowable Bearing Capacity (ABC) should be considered indicative.
The interpretation of in situ mass undrained shear strength (cu) data from SPT Blow Count (N) results and the influence of the Plasticity Index (PI) was reported in Standard Penetration Test in Insensitive Clays and Soft Rocks. Stroud (1974). The standard penetration test and the engineering properties of glacial materials subsequently. Stroud and Butler (1975) and (1989).
Allowable bearing capacity on sands. Soil Mechanics in Engineering Practice Terzaghi, K. & Peck, R.B. 1996.

5.2. PARTICLE SIZE DISTRIBUTION

Particle Size Distribution Tests have been undertaken on selected samples of granular material via wet sieve to obtain information on the soil fractions.

The results are included in Table 21. The full results can be found in APPENDIX .

Table 21 Summary of Particle Size Distribution Test Results

LOCATION	DEPTH (M)	SOIL FRACTION (%)			
		COBBLES	GRAVEL	SAND	SILT/CLAY
TP105	0.50 (Natural)	0	8	17	75
TP107	1.50 (Natural)	31	27	11	31
TP108	1.00 (Natural)	0	5	17	78

5.3. SOIL DENSITY/MOISTURE CONTENT RELATIONSHIP

Dry density / moisture content relationship analysis has been conducted on soils using via utilising proctor compaction tests utilising a 4.5kg rammer.

The results of the tests have been summarised in Table 22. The full test results can be found in APPENDIX .

Table 22 Summary of Dry Density and Moisture Content

LOCATION	LABORATORY DESCRIPTION	TOP DEPTH (M)	METHOD OF COMPACTION	INITIAL MOISTURE CONTENT (%)	OPTIMUM MOISTURE CONTENT (%)	MATERIAL RETAINED ON 37.5 MM SIEVE (%)	MAX DRY DENSITY (MG/M³)	MATERIAL RETAINED ON 20.0 MM TEST SIEVE (%)
TP103	Silty slightly sandy slightly gravelly CLAY	0.50	4.5kg	22.2	17	1	1.84	1
TP107	Silty slightly sandy very gravelly CLAY	1.50	4.5kg	8.8	11	41	2.01	50

The proctor compaction tests have indicated that the materials on site are variable with the material in TP103 being wet of the optimum. It should be noted that if this material is excavated for use in a cut/fill operation careful consideration should be taken in the stabilisation of this material.

Engineering of this type of material will need to be completed during dry weather periods only.

5.4. SOIL PLASTICITY

The Atterberg limits determinations, summarised in Table 23, show the clay to be of low plasticity.

Table 23 Summary of Plasticity Index Test results

LOCATION	DEPTH (m)	NATURAL MOISTURE CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PASSING 425 MM SIEVE (%)	MODIFIED PLASTICITY INDEX	NHBC VOLUME CHANGE POTENTIAL
WS101	1.00 – 1.45	15.2	13	34	21	86	18.06	Low
WS102	2.00 – 2.45	26	18	32	14	99	13.86	Low
WS106	1.00 – 1.45	14	13	30	17	90	15.3	Low

The results of the Atterberg limits testing confirmed that the soils would be deemed to be "Low Volume Change Potential" in accordance with the classification system utilised by the LABC/NHBC industry guidance.

5.5. PH AND SULPHATE

Chemical analyses for pH and soluble sulphate content contained in APPENDIX VII (summarised in Table 24), shows that the soils at the site meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1 in accordance with BRE *Special Digest 1* (2005).

Table 24 Summary of pH and Sulphate Data

LOCATION	DEPTH (m)	SO_4 IN 2:1 WATER/SOIL (g/l)	PH VALUE	CLASSIFICATION
TP101	0.1	< 0.010	7.6	DS-1, AC-1s
TP101	1.2	0.060	8.5	DS-1, AC-1s
TP102	0.5	< 0.010	7.4	DS-1, AC-1s
TP105	0.1	< 0.010	7.2	DS-1, AC-1s
TP105	0.6	0.031	7.1	DS-1, AC-1s
TP106	1.5	< 0.010	8.2	DS-1, AC-1s
WS102	0.1	< 0.010	6.5	DS-1, AC-1s
WS105	0.1	0.044	6.4	DS-1, AC-1s
WS105	0.5	< 0.010	7.0	DS-1, AC-1s

5.5.1. HIGHWAYS AND CONCRETE

MCHW Series 600 provides a criteria of 1500mg/l for water-soluble sulphate within 500mm of any concrete structure.

A second criteria of 300 mg/l is given with respect to soils within 500mm of steel structures.

5.6. GROUNDWATER

Table 25 Summary of Groundwater Strikes

LOCATION	DEPTH (m bgl)	DESCRIPTION OF STRIKE	STRATA	EVIDENCE OF CONTAMINATION
Site Investigation Water Strike Information				
WS101	1	Seepage	CLAY	None
WS102	1.3		CLAY	None
WS101	4		CLAY	None
TP104	1	Perched in clay/ seepage	CLAY	None
TP108	1.5	Perched in clay/ seepage	CLAY	None
LOCATION	**DEPTH (M BGL)**	**PERIOD OF MONITORING (OCTOBER-NOVEMBER)**	**WEATHER CONDITIONS DURING MONITORING**	**COMMENTS**
Groundwater Monitoring Summary from Installations				
WS101	1.05	24/10/2024	Overcast	N/A
WS101	1.18	07/11/2024	Overcast	N/A
WS102	1.14	24/10/2024	Overcast	N/A
WS102	1.36	07/11/2024	Overcast	N/A
WS104	1.18	24/10/2024	Overcast	N/A
WS104	1.30	07/11/2024	Overcast	N/A
WS105	1.55	24/10/2024	Overcast	N/A
WS105	1.64	07/11/2024	Overcast	N/A

Shallow perched water is present across the site.

5.7. SITE PREPARATION

Our assessment has been based on the fact that the site will be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the *Manual of Contract Documents for Highway Works (MCHW)*. This should include the following:

- Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill.
- Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill.

5.8. FOUNDATION CONDITIONS AND ASSESSMENT OF POTENTIAL BEARING CAPACITIES

In due consideration of the identified ground conditions, in-situ and laboratory geotechnical testing, E3P has undertaken an assessment of the safe allowable bearing capacity (ABC) within the underlying natural stratum to assist in the detailed design of foundations and infrastructure and determine the target founding stratum. The results of this assessment are summarised in Table 26.

Table 26 Summary of ABC

COHESIVE SOILS			
Description	**Depth (range m bgl)**	**Undrained Shear Strength (Cu) (kN/m²)**	**Allowable Bearing Capacity (kN/m²)**
Firm CLAY	1.00–2.00	30.24	62.18
Stiff CLAY	1.00–2.00	40.33–82.22	82.91–169.04
Stiff gravelly CLAY.	2.00–4.00	59.38–211.21	122.09–434.25
Very stiff sandy CLAY.	2.00–5.00	77.65–228.38	159.65–469.56

Firm sandy CLAY was encountered between 1.00 – 2.00 m bgl in WS105 with an ABC of 62.18 kN/m^2, which would not be a suitable founding stratum and foundations in this location should be taken to the underlying stiff CLAY.

Elsewhere, the site is underlain by stiff to very stiff CLAY from depths of 1.00 m to 5.00 m bgl with an ABC of 82.91 – 469.56 kN/m^2. This is considered to be an appropriate founding stratum, and as such, it is anticipated that for the majority of the site the foundations will be taken to ~1.00 m bgl.

5.9. FOUNDATIONS OPTIONS APPRAISAL

Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe allowable bearing capacity, the following recommendations have been developed for the site of the potential foundation solutions that may be adopted for the future residential development. The suitable target founding stratum has been identified as the underlying stiff to very stiff CLAY.

Following this assessment, it is recommended that strip foundations, bearing upon the stiff to very stiff CLAY at depth of >1.00m bgl is the most cost-effective solution.

The final foundation solution will be dependent on the structural loadings, elevation and should be designed by a suitably qualified structural.

5.10. GROUND FLOOR SLABS

Current building control regulations require that where infilled ground is present to depths in excess of 600 mm, or where the substratum is variable in terms of the structure and settlement potential, or where clay soils are present within the influence of existing or proposed trees, a suspended floor slab is required.

In this instance, it is considered that for the substructures in the areas of site investigated, the underlying stratum would have less than 600 mm of infill and, as such, a suspended floor slab may not be required.

Where a cast in-situ suspended slab is utilised with no subfloor void, appropriate compressible material (heave) precautions will be required in the construction of the substructure.

In clay soils allowance should be made in the design for heave. This must incorporate either a clear void of a specified minimum depth under the suspended floor, or a proprietary compressible material/void former below the underside of the floor construction.

Ground bearing slabs should not be used in ground conditions where heave can occur or where the foundation depth is greater than 1.5 m. Under these circumstances a suspended floor construction should be used.

5.11. SETTLEMENT

The site has been appraised through desk-based information and site investigation data in order to inform geotechnical risk where possible. Table 27 below has been formulated to determine if settlement risks are required to be further appraised. Where any item is determined to be appraised a settlement appraisal for the site should be prepared upon receipt of development levels and layout.

Table 27 Summary of Geotechnical Information for Settlement

RISK	COMMENT	ASSESSMENT
Site is located in an area deemed to be at Risk from Ground Dissolution from desk-based information	The site is in a very low-risk area of ground dissolution based on BGS data searches.	No Further Assessment
Site is in an area where geology is reported as having a compressible risk from desk-based information	The site is located within an area at negligible risk for compressible ground.	No Further Assessment
Do historical maps indicate relic excavation features such as opencast or ponds that have been infilled.	None identified on historical mapping.	No Further Assessment
Has the site been proven to be underlain by anthropogenic materials to an unknown specification?	No Made Ground encountered during the investigation.	No Further Assessment
Have Oedometers and/or ground conditions reported compressible stratum on site?	Yes, very soft to firm organic clays identified in WS104 from 0.50 m to 1.00 bgl and WS105 to a depth of 1.00 m bgl.	**Further Assessment**
Have High walls been identified on site that could result in differential settlement?	None identified.	No Further Assessment
Has any evidence been observed on site indicating settlement (non-structural assessment)	None identified.	No Further Assessment
Is voided ground present beneath the site?	None identified.	No Further Assessment
Is the site in an area where a mobile groundwater regime is present in influencing distance of foundations and infrastructure?	N/A	No Further Assessment
Will the site be subject to changes in site levels that may induce heave or settlement?	Site levels understood to remain similar to existing levels.	No Further Assessment

A risk of future potential settlement has been identified with respect to compressible stratum; this is at shallow depth and it is likely that shallow strip foundations in this location will be taken to the underlying stiff to very stiff clay at 2.00 m bgl. It is therefore considered that on this occasion, a settlement assessment will not be required.

5.12. HEAVE PRECAUTIONS

The site has been proven to be underlain by clay soils which are susceptible to volumetric instability due to fluctuations in moisture content, particularly within influencing distance of trees as per the NHBC/LABC conjectures zones of influence.

The clay has been determined as being of low volume change potential. Table 28 shows where heave precautions are required for a trench fill, pier and beam and pile and beam foundation types which are in the zone of influence of trees which are to remain or be removed.

Table 28 Position of Heave Precautions

SITUATION	TRENCH FILL	PIER AND BEAM	PILE AND BEAM
External trench fill and pier foundations. Unless NHBC is satisfied that the soil is not desiccated compressible material should be provided to the:	Inside faces of external wall foundations deeper than 1.5m, based on the appropriate tree height.	All faces of pier foundations deeper than 1.5m, based on the appropriate tree height.	N/A
External ground beams. Unless NHBC is satisfied that the soil is not desiccated, compressible material or void formers should be provided to the:	N/A	Inside faces	Inside faces
Internal trench fill foundations and ground beams. Compressible material required:	No	No	No
External and internal ground beams. Compressible material, void former or void should be provided to the underside of:	N/A	All	All
Heave precautions required for proposed trees where the soil is not desiccated:	No	No	No

Note: Information taken from NHBC Standards 2024, Chapter 4.2, Table 8 – Position of heave precautions

A summary of heave precautions is presented in Table 29.

Table 29 Summary of Heave Precautions

VOLUME CHANGE POTENTIAL	VOID DIMENSION AGAINST SIDE OF FOUNDATION AND GROUND BEAM	VOID DIMENSION UNDER GROUND BEAMS, AND SUSPENDED IN-SITU CONCRETE GROUND FLOOR	VOID DIMENSION UNDER SUSPENDED PRECAST CONCRETE AND TIMBER FLOORS(1)
High	35mm	150mm	300mm
Medium	25mm	100mm	250mm
Low	0mm	50mm	200mm

In addition to the requirements of the 'Drainage' section, drainage near trees should incorporate additional provisions. Where there is a volume change potential within the ground, the provisions include:

- Increased falls to cater for any ground movement.
- Deeper and wider backfill of granular material.
- A drainage system that is capable of movement should heave and shrinkage occur.
- Drainage pipes should not be encased in concrete.
- Additional clearance is required where drains pass through the structure of a building to allow for additional movement.

5.13. HIGHWAYS CONSTRUCTION

Any highways design in the southern portion of the site vicinity of WS104 and WS105 will need to take account of the very soft to firm CLAY.

A programme of remediation and enabling works will be required to remediate the proposed road subgrade in accordance with the requirements of the Manual of Contract Documents for Highway Works Volume 1 Specification For Highway Works (Series 600-Earthworks) for a method compaction.

5.14. DRAINAGE

Where loose or soft materials have been identified at drainage invert levels, there will need to be consideration for the use of reinforced pipe bedding.

Shrinkage and heave of clay soils can affect pipelines. To protect against the effects of heave, drainage should be designed:

- To take account of potential ground movement as shown in Table 30, including where pipes and services pass through substructure walls or foundations.
- With gradients which may need to be steeper.
- To use alternative means of catering for the movement when sufficient falls cannot be provided, for example, by deepening the excavation and laying pipework on a granular bedding of suitable thickness to reduce the extent of potential movement.

Table 30 Potential Ground Movement for Drainage

VOLUME CHANGE POTENTIAL	HIGH	MEDIUM	LOW
Potential ground movement	150mm	100mm	50mm

5.15. EXCAVATIONS

Site observations indicated that excavations should be feasible in the near surface with normal plant to the central and northern areas of the site.

TP106 and TP107, excavated to the far south of the site, were unstable from shallow depth, due to the CLAY becoming more sandy and soft at shallow depth.

Due to the ground conditions in this area and likelihood of trench collapse, it is considered that all excavations within this area should be supported or battered back in accordance with guidance contained in CIRIA R97.

Table 31 Civil Engineering Excavation Risk Matrix

RISK ITEM	PRESENT	COMMENT
Running Sands	No	No running sand has been identified.
Minor Water Ingress	No	Minor water ingress will require localised dewatering/sump pumping during the construction of site drainage infrastructure. Ingress of water into foundation excavation will potentially flood foundation excavations, limiting the viability of spread foundations to be constructed.
Shallow Bedrock	No	Shallow bedrock has not been identified.

5.16. CONSTRUCTION ACTIVITY AND INSPECTION

The following activities and inspections should be incorporated into the site works:

- Due to the variability of the soils at the site, it is recommended that sufficient allowance is made for the inspection of formations and subformations to foundations and pavement construction.
- Excavations where access is required should be subject to a risk assessment from a competent person and, where appropriate, mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97 should be utilised.
- It is considered that dewatering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required, and consideration should be given to provision of space for settling tanks or an attenuation pond.
- Where access to confined spaces is required, appropriate mitigation measures should be addressed within the construction stage health and safety plan. Particular account should be taken of the gas results.
- The presence of potential contamination and mitigation measures should be addressed as part of the construction stage health and safety plan and should include measures to design out the risks, reduce their impact and, finally, to include the use of personnel protective equipment (PPE).

5.17. DEVELOPED GEOTECHNICAL RISK REGISTER

POTENTIAL ABNORMAL CONSTRAINT	LOCATION ON SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Remediation of Contaminated Soils	N/A	N/A	No exceedances of the GAC have been identified to date; therefore, no mitigation measures are considered to be required.
Obstructions	N/A	N/A	Significant obstructions are not anticipated.
Drainage Invert Levels	All	100	Loose materials present at drainage invert levels – reinforced pipe bedding will be required.
Mature Trees	Periphery	20	Sporadic trees are present on-site and along the site boundaries.
Compressible Ground	South of site.	TBC	Soft to firm CLAY has been recorded at shallow depth in WS104 and WS105. Foundations in this location should be taken to the underlying stiff to very stiff clay in this location and as such a settlement assessment will not be required.
Volume Changes Potential Clay	N/A	N/A	The clay soils are classified as low volume change potential.
Concrete Design	All	100	Concrete classification of DS-1, AC-1s applicable across the site.
Services/Sensitive Structures	N/A	N/A	No sensitive services or structures have been identified.
Low Permeability Soils	All	100	Soakaway drainage is unlikely to be suitable due to the presence of low permeability cohesive deposits across the site.
Abnormal Foundation Solutions	Western boundary	TBC	Foundation depths within the conjectured influence of former, existing or proposed trees will need to be deepened to ensure that structural loading bears within the underlying target founding stratum, which cannot be subject to volumetric instability associated with fluctuation in moisture content.
Enabling Earthworks	All	100	All proposed earthworks will need to be designed by a suitably qualified geotechnical engineer. The earthworks design will incorporate a Geotechnical Specification for Earthworks that will define protocols to ensure no unacceptable future risk.

5.18. FURTHER WORKS

Based on the findings of the intrusive site investigation, the following additional works are recommended to be completed in due course:

- Foundations to be designed by suitably qualified Structural Engineer.
- Geotechnical Earthworks Specification
- Enabling Works Strategy.

END OF REPORT

APPENDIX I
LIMITATIONS

GENERAL

1. This report and any associated works (together comprising the "Services") were compiled and carried out by E3P for the client (as present in Section 1) under the E3P "Terms of Business" or with those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.

2. Unless explicitly agreed otherwise, in writing, this report has been prepared under E3P Standard Terms and Business as included within our proposal to the Client.

3. Project-specific appointment documents may be agreed upon at our discretion and a charge may be levied for both the time to review and finalise appointment documents and also for associated changes to the appointment terms. E3P reserves the right to amend the fee should any changes to the appointment terms create an increased risk to E3P.

4. The report needs to be considered in light of the proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEOENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

5. Coverage: This section covers reports with the following titles or combination of titles: Phase 1; Desktop Study; Geoenvironmental Assessment; Development Appraisal; Preliminary Environmental Risk Assessment; Constraints Report; Due Diligence Report; Geotechnical Development Review; Environmental Statement; Environmental Chapter; Baseline Environmental Assessment; Project Scope Summary Report (PSSR), Program Environmental Impact Report (PEIR), Geotechnical Development Risk Register; Agricultural Land Assessment; Mineral Safeguarding Assessment; Desk Top Coal Mining Risk Assessment; Hydrogeological Appraisal; Construction Environmental Management Plan; and Site Water Management Plan.

6. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walkover inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. E3P cannot be held responsible for any disclosures that are provided post-production of our report and will not automatically update our report.

7. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, E3P reserves the right to review such information and, if warranted, to modify the opinions accordingly.

8. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.

9. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and does not constitute or replace full and proper surveys completed by suitably qualified and experienced specialists in these fields.

10. E3P does not warrant work/data undertaken/provided by others.

INTRUSIVE INVESTIGATION REPORTS

11. Coverage: The following report titles (or combination) may cover this category of work: Geoenvironmental Site Investigation; Geotechnical Assessment; GIR (Ground Investigation Reports); Preliminary Environmental and Geotechnical Risk Assessment; Preliminary Summary; Coal Mining Risk Assessment, Ground Gas Addendum; and Geotechnical Risk Register.

12. The investigation has been undertaken to provide information concerning either:

    I. The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or

    II. Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.

13. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.

14. Unless otherwise specified in the scope of works, any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.

15. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.

16. For geotechnical investigations, the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.

17. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.

18. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

19. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, E3P has used reasonable skill and care to extrapolate conditions between these points based on assumptions to develop our interpretation and conclusions.

20. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation and at the time of the investigation.

21. Conditions can change between investigation points both spatially and over time and these interpretations should therefore be considered indicative. The assessment of extreme weather events and their impact on ground conditions is not within the scope of E3P's work.

22. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated with the risk assessment process have been outlined within the body or associated appendix of the report.

23. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.

24. Where soil contamination concentrations recorded as part of this investigation are used for commentary on the potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed and the waste classification and any subsequent disposal option agreed upon with licenced subcontractors and/or the relevant regulators.

25. The results of the asbestos testing are factually reported, and interpretation is given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and/or trace loose asbestos fibres within the soil matrix at the site.

26. If costs have been included in relation to additional site works, and/or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

27. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.

28. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIATION AND ENABLING WORK STRATEGY REPORTS

29. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected based on the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site-Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.

30. The outputs of the Detailed Quantitative Risk Assessments are based upon the manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.

31. Before adoption on-site, assessment criteria will need to be discussed and agreed upon with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of E3P. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

32. E3P does not accept liability for any subcontract work that has not been completed in strict accordance with an approved E3P Remediation and Enabling Works Strategy.

GEOTECHNICAL DESIGN REPORT (GDR)

33. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS AND BUILD PHASE MITIGATION)

34. These reports are factual and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of earthworks or remedial works.

35. The data is presented and will be compared with assessment criteria.

APPENDIX II
GLOSSARY

TERMS

ACM	Asbestos-containing material	**MMP**	Materials management plan
ADS	Acoustic design statement	**ND**	Not detected
AST	Above-ground storage tank	**NDP**	Nuclear density probe
BGS	British Geological Survey	**NMP**	Noise management plan
BSI	British Standards Institute	**NPSE**	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	**NR**	Not recorded
CA	Coal Authority	**PAH**	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	**PCB**	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	**PI**	Plasticity index
CIRIA	Construction Industry Research Association	**PID**	Photo ionisation detector
CLEA	Contaminated land exposure assessment	**POS**	Public open space
CML	Council of Mortgage Lenders	**PPE**	Personnel protective equipment
CoC	Contaminants of concern	**ProPG**	Professional practice guidance
CSM	Conceptual site model	**QA**	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	**SGV**	Soil guideline value
DWS	Drinking water standard	**SPH**	Separate-phase hydrocarbon
EA	Environment Agency	**SPT**	Standard penetration test
EQS	Environmental quality standard	**SVOC**	Semi-volatile organic compound
FFL	Finished floor level	**TPH**	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	**TPH CWG**	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	**UKWIR**	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	**UST**	Underground storage tank
HCV	Health criteria value	**VCC**	Vibro-concrete column

ICSM	Initial conceptual site model	**VOC**	Volatile organic compound
LEL	Lower explosive limit	**VRSC**	Vibro-replacement stone columns
LMRL	Lower method reporting limit	**VSC**	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	**WHO**	World Health Organisation
MCV	Moisture condition value	**WRAP**	Waste and Resources Action Programme
MIBK	Methyl isobutyl ketone	**WTE**	Water table elevation
m	Metres	**ppm**	Parts per million
km	Kilometres	**mg/m^3**	Milligram per metre cubed
% v/v	Percent volume in air	**m bgl**	Metres below ground level
mb	Millibars (atmospheric pressure)	**m bcl**	Metre below cover level
l/hr	Litres per hour	**mAOD**	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	**kN/m^2**	Kilonewtons per metre squared
ppb	Parts per billion	**µm**	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	**SSRT**	Site Specific Remediation Target
PSD	Particle Size Distribution	**DD**	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	**Mc**	Moisture Content
ρ	Bulk Density	**GPR**	Ground Penetrating Radar
NDP	Nuclear Density Probe	**FFL**	Finished Floor Level
LEL	Lower Explosive Limit	**UKWIR**	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	**LOD**	Limit of Detection

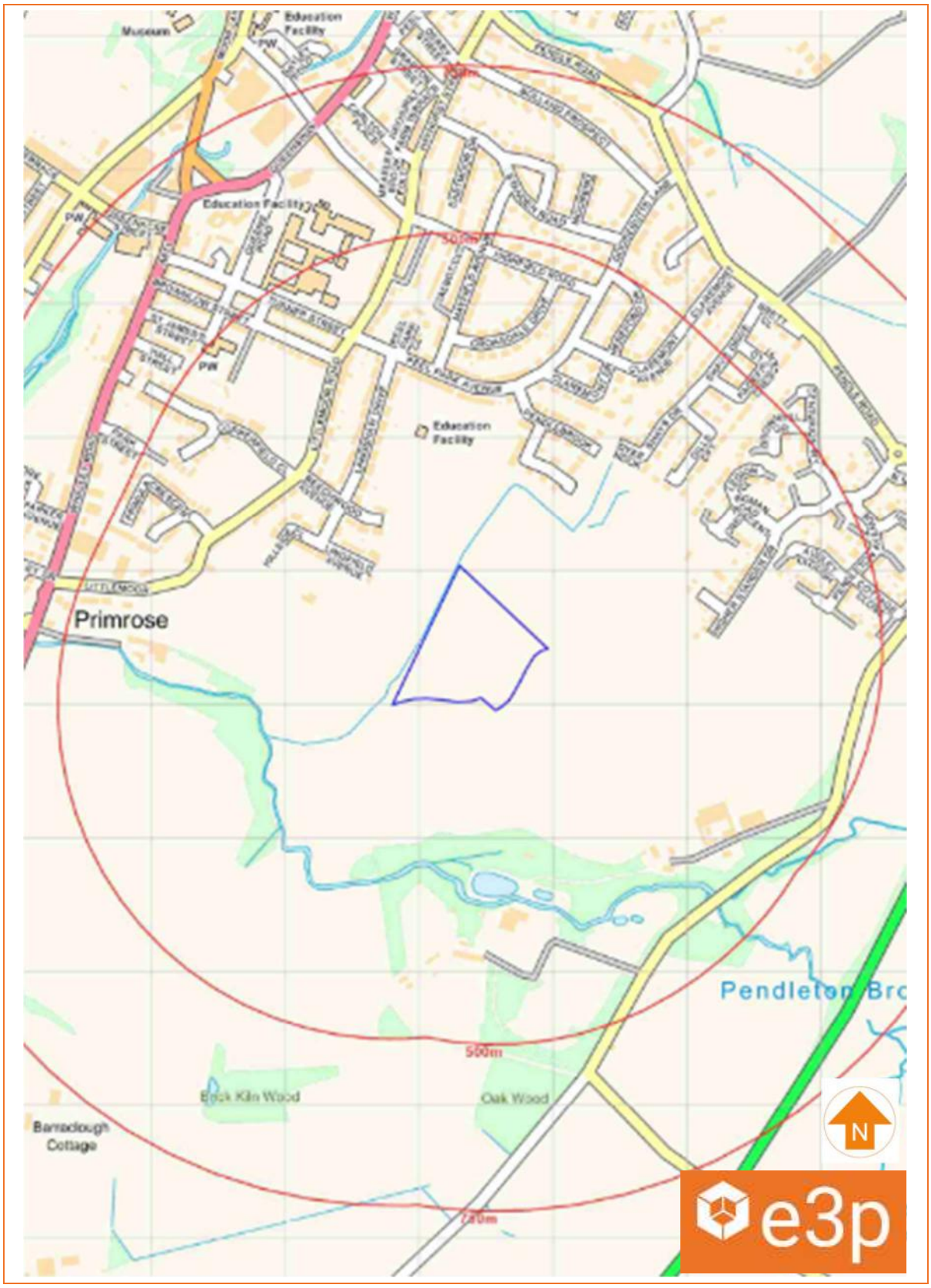
APPENDIX III
RISK CLASSIFICATION

RISK CLASSIFICATION

RISK	DEFINITION
Low	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property.
Low Moderate	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property with regard to the proposed use. However, minor issues may require further consideration in the event of future redevelopment of the Site.
Moderate	Some potential contaminated land liabilities/geotechnical constraints are likely to affect the property as a result of historical and/or current activities. The risks identified are unlikely to pose an immediate significant issue, but the purchaser/developer may wish to make further enquiries of the vendor or undertake further environmental improvements. Redevelopment of the Site will likely require further site investigation.
Moderate High	Some potentially significant contaminated land liabilities/geotechnical constraints have been identified at the property that requires further assessment, including intrusive ground investigations.
High	Significant potential contaminated land liabilities/geotechnical constraints have been identified at the property. Further assessment including intrusive ground investigation will be required to determine the level of risk and associated liability.

APPENDIX IV
DRAWINGS

DRAWING 17-912-001 – Site Location Plan



P1	REVA	29.11.2024	CB	KK	KK	
Phase	Issue	Date	Drawn	Checked	PM	

Notes:

Client:
Trustees of the Standen Estate

Job No: 17-912

Date: 29.11.2024

Drawing No: 002

Scale: NTS

Job Title:
Higher Standen Drive

Drawing Title:
Proposed Development Plan

e3p
Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

Site Features

- Soft Standing
- Mature Trees
- Footpath
- Heras Fencing
- Gate
- Slope Direction

Notes:

Phase	Issue	Date	Drawn	Checked	PM
P1	REVA	29.11.2024	CB	KK	KK

Client: Trustees of the Standen Estate

Job No: 17-912

Date: 29.11.2024

Drawing No: 004

Scale: NTS

Job Title: Higher Standen Drive

Drawing Title: Site Features Plan

Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

Location Symbols

- Approximate Window Sample Probehole Location (E3P Locations 2024)
- Approximate Window Sample Probehole Location with Install (E3P Locations 2024)
- Approximate Trial Pit Location (E3P Locations 2024)

Notes:

P1	REVA	03.10.2024	TG	KK	KK
Phase	Issue	Date	Drawn	Checked	PM

Client: Trustees of the Standen Estate

Job No: 17-912

Date: 03.10.2024

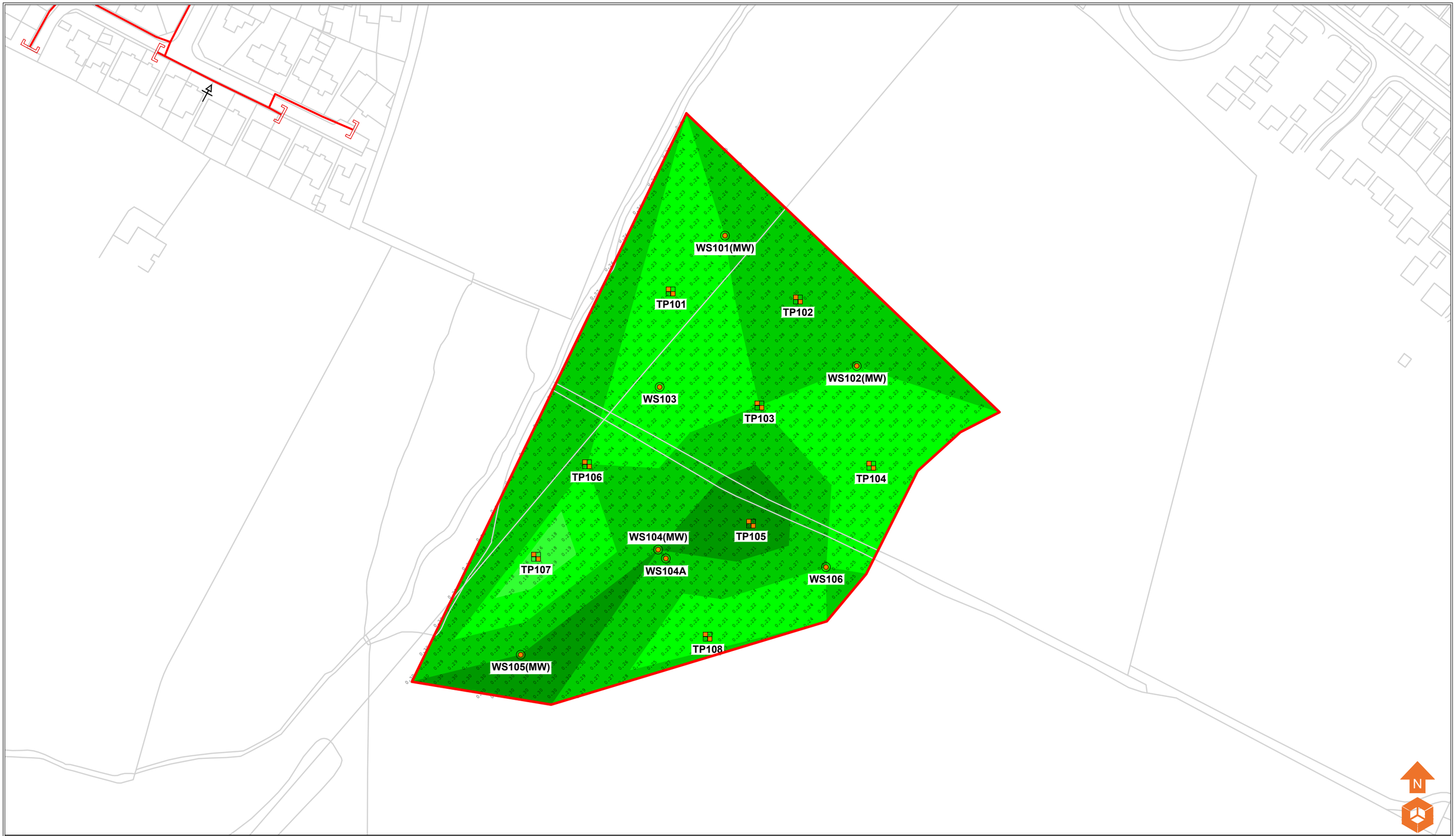
Drawing No: 006

Scale: NTS @ A3

Job Title: Higher Standen Drive, Standen

Drawing Title: Exploratory Hole Location Plan

Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk



Location Symbols

- Approximate Window Sample Probehole Location - E3P Locations October 2024
- Approximate Window Sample Probehole Location with Install - E3P Locations October 2024
- Approximate Trial Pit Location - E3P Locations October 2024

Topsoil Depth (m)

- Depth of Topsoil 0.20 - 0.24m
- Depth of Topsoil 0.25 - 0.29m
- Depth of Topsoil <0.30m

Notes:

Phase	Issue	Date	Drawn	Checked	PM
P1	REVA	25.11.2024	TG	KK	KK

Client: Trustees of the Standen Estate

Job No: 17-912

Date: 25.11.2024

Drawing No: 008

Scale: NTS

Job Title: Higher Standen Drive

Drawing Title: Depth Of Made Ground Plan

Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

APPENDIX V
PHOTOGRAPHS

PLATE 1 ARISINGS FROM WS102

PLATE 2 ARISINGS FROM WS102

PLATE 3 ARISINGS FROM WS103

PLATE 4 ARISINGS FROM WS106

APPENDIX VI
EXPLORATORY HOLE LOGS

Trial Pit Log

TrialPit No: TP101
Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374660.00 - 440750.00 Level:	Date 14/10/2024
Location: Clithero		Dimensions (m): 2.00 x 0.60 Depth 2.20	Scale 1:30
Client: Steven Abbott Associates LLP			Logged G. CALVERT

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.20			Brown slightly sandy CLAY with frequent rootlets. (Topsoil)
							Brown mottled grey slightly gravelly sandy CLAY. Gravel is fine to medium subangular to subrounded of sandstone and mudstone.
	1.20	ES		1.10			Brown slightly sandy gravelly CLAY. Gravel is fine to coarse angular to subrounded of mudstone and sandstone with frequent cobbles. Cobbles are subrounded of sandstone. (Friable).
	1.50	B					
				2.20			End of Pit at 2.20m

1
2
3
4

Remarks: 1. Complete.

Stability: STABLE

Trial Pit Log

TrialPit No: TP102
Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374714.00 - 440729.00 Level:	Date 14/10/2024
Location: Clithero		Dimensions (m): 2.00 x 0.60 Depth 2.30	Scale 1:30
Client: Steven Abbott Associates LLP			Logged G. CALVERT

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES					Brown slightly sandy CLAY with frequent rootlets. (Topsoil)
				0.30			
	0.50	ES					Brown slightly gravelly slightly sandy CLAY. Gravel is fine to medium angular to subrounded of sandstone and mudstone. (Becoming more gravelly circa 0.50m.)
				1.20			Grey mottled brown gravelly CLAY with occasional cobbles. Gravel is medium to coarse angular to subangular of mudstone. Cobbles are angular to subangular of mudstone.
				2.30			End of Pit at 2.30m

1
2
3
4

Remarks: 1. Complete.

Stability: STABLE

Trial Pit Log

TrialPit No: TP103
Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374693.00 - 440696.00 Level:	Date 14/10/2024
Location: Clithero		Dimensions (m): 2.00 x 0.60 Depth 2.20	Scale 1:30
Client: Steven Abbott Associates LLP			Logged G. CALVERT

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.25			Dark brown slightly sandy CLAY with frequent rootlets. (Topsoil)
	0.50	B					Brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular of sandstone and mudstone.
	1.50	ES		1.20			Grey slightly sandy gravelly CLAY with occasional cobbles. Gravel is medium to coarse angular to subangular of mudstone and sandstone.
				2.20			End of Pit at 2.20m

1
2
3
4

Remarks: 1. Complete. 2. Hard digging from 1.90 m bgl.

Stability: STABLE

Trial Pit Log

TrialPit No: TP104
Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374738.00 - 440660.00 Level:	Date 14/10/2024
Location: Clithero		Dimensions (m): 2.00 × 0.60 Depth 2.30	Scale 1:30
Client: Steven Abbott Associates LLP			Logged G. CALVERT

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.15	ES		0.20			Dark brown sandy CLAY with frequent rootlets. (Topsoil)
▼ 1.00	1.00	ES		0.90			Brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of sandstone and mudstone
				2.30			Grey slightly sandy gravelly CLAY with occasional cobbles. Gravel is medium to coarse subangular to subrounded of mudstone
							End of Pit at 2.30m

Remarks: 1. Complete. 2. Water strike encountered at 1.00 m bgl, reorded as seepage perched in clay.

Stability: STABLE

Trial Pit Log

TrialPit No: TP105
Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374687.00 - 440651.00 Level:	Date 14/10/2024
Location: Clithero		Dimensions (m): 2.00 x 0.60 Depth 2.00	Scale 1:30
Client: Steven Abbott Associates LLP			Logged G. CALVERT

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES					Dark brown sandy CLAY with frequent rootlets. (Topsoil)
				0.35			Brown slightly gravelly slightly sandy CLAY. Gravel is fine to medium subangular to subrounded of sandstone and mudstone.
				0.95			Grey slightly sandy gravelly CLAY with occasional cobbles. Gravel is medium to coarse angular to subangular of sandstone and mudstone. Cobbles are subangular of mudstone.
	1.60	ES					
				2.00			End of Pit at 2.00m

Remarks: 1. Complete. 2. Water strike encountered at 1.20 m bgl, recorded as seepage perched in clay.

Stability: STABLE

Trial Pit Log

TrialPit No: TP106
Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374624.00 - 440670.00 Level:	Date 14/10/2024
Location: Clithero		Dimensions (m): 2.00 x 0.60 Depth 2.00	Scale 1:30
Client: Steven Abbott Associates LLP			Logged G. CALVERT

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.25			Dark brown sandy CLAY with frequent rootlets. (Topsoil)
	0.50	D					Brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of sandstone and mudstone
	1.50	ES		1.30			Grey slightly sandy gravelly CLAY with occasional cobbles. Gravel is fine to coarse angular to subangular of mudstone. Cobbles are subangular of mudstone.
				2.00			End of Pit at 2.00m

1
2
3
4

Remarks: 1. Terminated due to instibility. 2.Unstable from 0.30 m bgl.

Stability: UNSTABLE FROM 0.3

Trial Pit Log

TrialPit No: TP107
Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374602.00 - 440631.00 Level:	Date 14/10/2024
Location: Clithero		Dimensions (m): 2.00 × 0.60 Depth 2.15	Scale 1:30
Client: Steven Abbott Associates LLP			Logged G. CALVERT

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.15			Dark brown sandy CLAY with frequent rootlets. (Topsoil)
							Brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of sandstone and mudstone.
				1.00			
	1.20	ES					Firm grey slightly sandy slightly gravelly CLAY with occasional cobbles. Gravel is fine to coarse angular to subangular of mudstone. Cobbles are subangular of sandstone.
	1.50	B					
				2.15			End of Pit at 2.15m

Remarks: 1. Complete. 2. Unstable from ground level.

Stability: UNSTABLE FROM 0

Trial Pit Log

TrialPit No: TP108
Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374650.00 - 440585.00 Level:	Date 14/10/2024
Location: Clithero		Dimensions (m): 2.00 x 0.60 Depth 2.30	Scale 1:30
Client: Steven Abbott Associates LLP			Logged G. CALVERT

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.20			Brown sandy CLAY with frequent rootlets. (Topsoil)
	0.80	ES					Brown sandy CLAY.
	1.00	B					
1.50 ▼				1.20			Grey slightly sandy gravelly CLAY with occasional cobbles. Gravel is fine to coarse angular to subrounded of mudstone. Cobbles are subangular of mudstone.
				2.30			End of Pit at 2.30m

Remarks: 1. Complete. 2. Water strike encountered at 1.50 m bgl, recorded as seepage perched in clay.

Stability: STABLE

Borehole Log

Borehole No. **WS101**

Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374672.00 - 440759.00	Hole Type WS
Location: Clithero		Level:	Scale 1:50
Client: Steven Abbott Associates LLP		Dates: 14/10/2024 -	Logged By G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.25			Brown slightly sandy CLAY with frequent rootlets. (Topsoil)
	▼	0.80	ES					Stiff medium strength brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subangular of sandstone and mudstone. (Becoming more gravelly from circa 2.00m bgl).
		1.00	D					
		1.00		N=14 (2,3/4,4,3,3)				
		2.00	D					
		2.00		N=13 (3,3/2,3,4,4)				
		3.00	D		3.00			Very stiff very high strength grey gravelly sandy CLAY. Gravel is fine to medium subangular of sandstone. Complete hole collapse to 4m
		3.00		N=38 (8,8/7,8,11,12)				
	▼	4.00	D					
		4.00		N=42 (8,7/10,12,10,10)				
		5.00	D					
		5.00		N=42 (4,6/8,10,12,12)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Hole collapsed to 4.00m bgl. 3. Monitoring well installed. 4 Response zone 1.00-4.00m bgl. 5. Water strike encountered at 1.00 and 4.00m bgl.

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374735.00 - 440711.00	Hole Type WS
Location: Clithero		Level:	Scale 1:50
Client: Steven Abbott Associates LLP		Dates: 14/10/2024 -	Logged By G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.25			Dark brown slightly sandy CLAY with frequent rootlets. (Topsoil)
		1.00	D					Stiff medium strength brown slightly sandy CLAY. Very slightly gravelly. Gravel is fine angular to subrounded of sandstone and mudstone. (Becoming more gravelly from circa 2.10m). (Becoming very stiff high strength circa 2.00m.).
	▼	1.00		N=8 (1,1/2,2,2,2)				
		1.50	ES					
		2.00	D					
		2.00		N=18 (3,2/3,4,6,5)				
		3.00	D					
		3.00		N=48 (4,8/10,13,14,11)				
		4.00	D					
		4.00		50 (8,10/50 for 275mm)	4.43			End of borehole at 4.43 m
		5.00	D					

Remarks

1. Refused on cobble. 2. Monitoring well installed. 3. Response zone 1.00-4.00m bgl. 4. Water strike encountered at 1.30 m.

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374651.00 - 440702.00	Hole Type WS
Location: Clithero		Level:	Scale 1:50
Client: Steven Abbott Associates LLP		Dates: 14/10/2024 -	Logged By G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.20			Brown sandy CLAY with frequent rootlets. (Topsoil)
		1.00		N=9 (1,1/2,2,2,3)				Stiff medium strength brown sandy CLAY.
					1.40			Very stiff high strength grey slightly sandy gravelly CLAY. Gravel is fine to medium subangular to subrounded of mudstone and sandstone.
		2.00		N=17 (2,3/3,3,4,7)				
		3.00		N=23 (3,3/5,5,5,8)				
		4.00		50 (8,10/50 for 255mm)				
					4.41			End of borehole at 4.41 m

Remarks
1. Refused on cobble.

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374651.00 - 440636.00	Hole Type WS
Location: Clithero		Level:	Scale 1:50
Client: Steven Abbott Associates LLP		Dates: 14/10/2024 -	Logged By G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.30			Brown sandy CLAY with frequent rootlets. (Topsoil)
		0.50 - 1.00	U					Very stiff high strength brown sandy CLAY.
		1.00	D					
		1.00		N=16 (1,1/1,2,2,11)				
		1.30	ES					
		2.00	D		2.10			Very stiff very high strength grey slightly sandy gravelly CLAY. Gravel is fine to medium subangular to subrounded of mudstone and sandstone.
		2.00		50 (2,2/50 for 250mm)	2.40			End of borehole at 2.40 m

Remarks

1. Refused on cobble. 2. Monitoring well installed. 3. Response zone 1.00-2.00m bgl.

Borehole Log

Borehole No. **WS104 A**

Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374655.00 - 440633.00	Hole Type WS
Location: Clithero		Level:	Scale 1:50
Client: Steven Abbott Associates LLP		Dates: 14/10/2024 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.00		50 (1,6/50 for 245mm)				

Remarks
1. Refused on a cobble.

Borehole Log

Borehole No. **WS105**

Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374593.00 - 440595.00	Hole Type WS
Location: Clithero		Level:	Scale 1:50
Client: Steven Abbott Associates LLP		Dates: 14/10/2024 -	Logged By G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.30			Brown sandy CLAY with frequent rootlets. (Topsoil)
		0.50	ES					Brown sandy CLAY.
		1.00		N=6 (1,1/1,2,2,1)	1.00			Firm low strength grey slighlty sandy gravelly CLAY. Gravel is fine to medium subangular to subrounded of mudstone and sandstone.
		2.00		N=15 (2,2/3,4,4,4)	2.00			Firm low strength grey slightly sandy gravelly CLAY. Gravel is fine to medium subangular to subrounded of mudstone and sandstone. (Becoming stiff medium strength from circa 2.00 mbgl, then becoming very stiff high strength from circa 3.00m bgl, and then becoming stiff medium strength from circa 5.00m bgl.)
		3.00		N=27 (2,4/8,5,5,9)				
		4.00		N=38 (4,5/8,8,10,12)				
		5.00		N=18 (3,3/4,4,5,5)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed. 3. Response Zone 1.00-5.00m bgl.

Borehole Log

Borehole No. **WS106**

Sheet 1 of 1

Project Name: Higher Standen Drive	Project No. 17912	Co-ords: 374720.00 - 440630.00	Hole Type WS
Location: Clithero		Level:	Scale 1:50
Client: Steven Abbott Associates LLP		Dates: 14/10/2024 -	Logged By G. CALVERT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.25			Brown sandy CLAY with frequent rootlets. (Topsoil)
		0.50 - 1.00	U					Brown sandy CLAY.
		1.00	D					
		2.00	D		2.00			Grey slightly sandy gravelly CLAY. Gravel is fine to medium subangular to subrounded of mudstone and sandstone.
		2.00	ES					
		4.00	D		4.00			End of borehole at 4.00 m

Remarks
1. Refused on cobble.

APPENDIX VII
CHEMICAL TESTING RESULTS

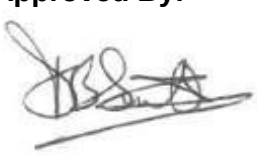
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	24-33374-1
Initial Date of Issue:	22-Oct-2024
Re-Issue Details:	
Client	E3P
Client Address:	Taylor Road Trafford Park Urmston Manchester M41 7JQ
Contact(s):	gcalvert@e3p.co.uk; kkierans@e3p.co.uk
Project	Higher Standen Drive

Quotation No.:	Q23-31421	**Date Received:**	16-Oct-2024
Order No.:	009751	**Date Instructed:**	16-Oct-2024
No. of Samples:	9		
Turnaround (Wkdays):	5	**Results Due:**	22-Oct-2024
Date Approved:	22-Oct-2024		

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Leachate

Project: Higher Standen Drive

Client: E3P				**Chemtest Job No.:**		24-33374	24-33374
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1880921	1880924
				Client Sample ID.:		TP101	TP105
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0.1	0.1
				Date Sampled:		14-Oct-2024	14-Oct-2024
				Time Sampled:		12:00	12:00
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**		
pH at 20C	U	1010	2:1		4.0	7.5	7.2
Cyanide (Total) Low-Level	N	1300	2:1	mg/l	0.0050	< 0.0050	< 0.0050
Arsenic (Dissolved)	U	1455	2:1	µg/l	0.20	1.1	1.6
Cadmium (Dissolved)	U	1455	2:1	µg/l	0.11	< 0.11	< 0.11
Chromium (Dissolved)	U	1455	2:1	µg/l	0.50	2.0	7.0
Copper (Dissolved)	U	1455	2:1	µg/l	0.50	6.2	6.4
Mercury (Dissolved)	U	1455	2:1	µg/l	0.05	< 0.05	< 0.05
Nickel (Dissolved)	U	1455	2:1	µg/l	0.50	1.8	4.7
Lead (Dissolved)	U	1455	2:1	µg/l	0.50	4.8	4.0
Selenium (Dissolved)	U	1455	2:1	µg/l	0.50	< 0.50	< 0.50
Zinc (Dissolved)	U	1455	2:1	µg/l	2.5	13	60
Chromium (Hexavalent)	U	1490	2:1	µg/l	20	< 20	< 20
C2 Aliphatic TPH >C5-C6	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aliphatic TPH >C6-C8	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aliphatic TPH >C8-C10	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aliphatic TPH >C10-C12	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aliphatic TPH >C12-C16	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aliphatic TPH >C16-C21	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aliphatic TPH >C21-C35	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aliphatic TPH >C35-C44	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	N	1675	2:1	µg/l	5.0	< 5.0	< 5.0
C2 Aromatic TPH >C5-C7	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aromatic TPH >C7-C8	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aromatic TPH >C8-C10	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aromatic TPH >C10-C12	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aromatic TPH >C12-C16	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aromatic TPH >C16-C21	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aromatic TPH >C21-C35	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Aromatic TPH >C35-C44	N	1675	2:1	µg/l	0.10	< 0.10	< 0.10
C2 Total Aromatic Hydrocarbons	N	1675	2:1	µg/l	5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	1675	2:1	µg/l	10	< 10	< 10
Benzene	U	1760	2:1	µg/l	1.0	< 1.0	< 1.0
Toluene	U	1760	2:1	µg/l	1.0	< 1.0	< 1.0
Ethylbenzene	U	1760	2:1	µg/l	1.0	< 1.0	< 1.0
m & p-Xylene	U	1760	2:1	µg/l	1.0	< 1.0	< 1.0
o-Xylene	U	1760	2:1	µg/l	1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	N	1760	2:1	µg/l	1.0	< 1.0	< 1.0
Naphthalene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Acenaphthylene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010

Results - Leachate

Project: Higher Standen Drive

Client: E3P				**Chemtest Job No.:**		24-33374	24-33374
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1880921	1880924
				Client Sample ID.:		TP101	TP105
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0.1	0.1
				Date Sampled:		14-Oct-2024	14-Oct-2024
				Time Sampled:		12:00	12:00
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**		
Acenaphthene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Fluorene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Phenanthrene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Anthracene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Fluoranthene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Pyrene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Chrysene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	1800	2:1	µg/l	0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	1800	2:1	µg/l	0.20	< 0.20	< 0.20
Total Phenols	U	1920	2:1	mg/l	0.030	< 0.030	< 0.030

Results - Soil

Project: Higher Standen Drive

Client: E3P				**Chemtest Job No.:**		24-33374	24-33374	24-33374	24-33374	24-33374	24-33374	24-33374	24-33374
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1880921	1880922	1880923	1880924	1880925	1880926	1880927	1880928
				Client Sample ID.:		TP101	TP101	TP102	TP105	TP105	TP106	WS102	WS105
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.1	1.2	0.5	0.1	0.6	1.5	0.1	0.1
				Date Sampled:		14-Oct-2024	14-Oct-2024	14-Oct-2024	14-Oct-2024	14-Oct-2024	14-Oct-2024	14-Oct-2024	14-Oct-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM			DURHAM			DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
ACM Type		U	2192		N/A	-			-			-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected			No Asbestos Detected			No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	25	9.9	15	29	18	19	44	24
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones and Roots	Stones	Stones	Stones and Roots	Stones	Stones	Stones and Roots	Stones and Roots
Soil Texture		N	2040		N/A	Loam	Clay	Clay	Loam	Clay	Sand	Loam	Loam
pH at 20C		M	2010		4.0	7.6	8.5	7.4	7.2	7.1	8.2	6.5	6.4
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	< 0.010	0.060	< 0.010	< 0.010	0.031	< 0.010	< 0.010	0.044
Total Sulphur		U	2175	%	0.010	0.050	0.070	0.010	0.040	0.030	0.030	0.080	0.080
Cyanide (Total)		M	2300	mg/kg	0.50	0.70	< 0.50	< 0.50	0.50	< 0.50	< 0.50	1.0	0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	2.8	4.6	2.5	2.8	3.6	3.6	3.6	4.0
Sulphate (Total)		U	2430	%	0.010	0.16	0.21	0.026	0.12	0.066	0.071	0.24	0.071
Arsenic		M	2455	mg/kg	0.5	9.8	9.8	12	9.7	11	10	8.7	8.7
Cadmium		M	2455	mg/kg	0.10	0.50	0.46	0.49	0.69	0.42	1.4	0.20	0.16
Chromium		M	2455	mg/kg	0.5	28	15	33	31	31	25	100	21
Copper		M	2455	mg/kg	0.50	19	15	22	18	15	23	27	20
Mercury		M	2455	mg/kg	0.05	0.08	< 0.05	< 0.05	0.05	< 0.05	< 0.05	0.08	< 0.05
Nickel		M	2455	mg/kg	0.50	17	27	45	25	38	50	19	18
Lead		M	2455	mg/kg	0.50	51	24	23	46	28	34	200	34
Selenium		M	2455	mg/kg	0.25	1.6	0.89	0.63	0.58	0.80	0.59	0.49	0.27
Zinc		M	2455	mg/kg	0.50	110	99	84	120	130	190	140	83
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter		M	2625	%	0.40	5.2	2.2	0.64	4.5	2.9	1.7	12	11
Total Organic Carbon		M	2625	%	0.20	3.0	1.3	0.37	2.6	1.7	0.96	6.7	6.2
TPH >C6-C8	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C8-C10	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C10-C12	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C12-C16	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C16-C21	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C21-C25	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C25-C35	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C35-C40	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total TPH >C6-C40	EH_1D_Total	U	2670	mg/kg	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Naphthalene		M	2800	mg/kg	0.10	< 0.10	1.2	< 0.10	0.27	0.35	< 0.10	0.84	< 0.10
Acenaphthylene		N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Results - Soil

Project: Higher Standen Drive

Client: E3P				**Chemtest Job No.:**		24-33374	24-33374	24-33374	24-33374	24-33374	24-33374	24-33374	24-33374
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1880921	1880922	1880923	1880924	1880925	1880926	1880927	1880928
				Client Sample ID.:		TP101	TP101	TP102	TP105	TP105	TP106	WS102	WS105
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.1	1.2	0.5	0.1	0.6	1.5	0.1	0.1
				Date Sampled:		14-Oct-2024	14-Oct-2024	14-Oct-2024	14-Oct-2024	14-Oct-2024	14-Oct-2024	14-Oct-2024	14-Oct-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM			DURHAM			DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
Fluorene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene		M	2800	mg/kg	0.10	< 0.10	0.15	< 0.10	0.16	0.13	< 0.10	0.13	0.46
Anthracene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.19
Fluoranthene		M	2800	mg/kg	0.10	0.14	0.16	< 0.10	0.19	0.11	< 0.10	0.13	0.92
Pyrene		M	2800	mg/kg	0.10	0.15	0.17	< 0.10	0.17	0.11	< 0.10	0.14	0.80
Benzo[a]anthracene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.43
Chrysene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.31
Benzo[b]fluoranthene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.47
Benzo[k]fluoranthene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.15
Benzo[a]pyrene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.41
Indeno(1,2,3-c,d)Pyrene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.28
Dibenz(a,h)Anthracene		N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.23
Total Of 16 PAH's		N	2800	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	4.7
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Results - Soil

Project: Higher Standen Drive

Client: E3P				**Chemtest Job No.:**		24-33374
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1880929
				Client Sample ID.:		WS105
				Sample Type:		SOIL
				Top Depth (m):		0.5
				Date Sampled:		14-Oct-2024
				Time Sampled:		12:00
				Asbestos Lab:		
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
ACM Type		U	2192		N/A	
Asbestos Identification		U	2192		N/A	
Moisture		N	2030	%	0.020	18
Soil Colour		N	2040		N/A	Brown
Other Material		N	2040		N/A	Stones
Soil Texture		N	2040		N/A	Clay
pH at 20C		M	2010		4.0	7.0
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	< 0.010
Total Sulphur		U	2175	%	0.010	0.010
Cyanide (Total)		M	2300	mg/kg	0.50	< 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	3.4
Sulphate (Total)		U	2430	%	0.010	0.032
Arsenic		M	2455	mg/kg	0.5	15
Cadmium		M	2455	mg/kg	0.10	0.86
Chromium		M	2455	mg/kg	0.5	35
Copper		M	2455	mg/kg	0.50	34
Mercury		M	2455	mg/kg	0.05	< 0.05
Nickel		M	2455	mg/kg	0.50	64
Lead		M	2455	mg/kg	0.50	63
Selenium		M	2455	mg/kg	0.25	1.1
Zinc		M	2455	mg/kg	0.50	230
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50
Organic Matter		M	2625	%	0.40	1.1
Total Organic Carbon		M	2625	%	0.20	0.61
TPH >C6-C8	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0
TPH >C8-C10	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0
TPH >C10-C12	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0
TPH >C12-C16	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0
TPH >C16-C21	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0
TPH >C21-C25	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0
TPH >C25-C35	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0
TPH >C35-C40	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0
Total TPH >C6-C40	EH_1D_Total	U	2670	mg/kg	10	< 10
Naphthalene		M	2800	mg/kg	0.10	< 0.10
Acenaphthylene		N	2800	mg/kg	0.10	< 0.10
Acenaphthene		M	2800	mg/kg	0.10	< 0.10

Results - Soil

Project: Higher Standen Drive

Client: E3P				**Chemtest Job No.:**		24-33374
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1880929
				Client Sample ID.:		WS105
				Sample Type:		SOIL
				Top Depth (m):		0.5
				Date Sampled:		14-Oct-2024
				Time Sampled:		12:00
				Asbestos Lab:		
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
Fluorene		M	2800	mg/kg	0.10	< 0.10
Phenanthrene		M	2800	mg/kg	0.10	< 0.10
Anthracene		M	2800	mg/kg	0.10	< 0.10
Fluoranthene		M	2800	mg/kg	0.10	< 0.10
Pyrene		M	2800	mg/kg	0.10	< 0.10
Benzo[a]anthracene		M	2800	mg/kg	0.10	< 0.10
Chrysene		M	2800	mg/kg	0.10	< 0.10
Benzo[b]fluoranthene		M	2800	mg/kg	0.10	< 0.10
Benzo[k]fluoranthene		M	2800	mg/kg	0.10	< 0.10
Benzo[a]pyrene		M	2800	mg/kg	0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2800	mg/kg	0.10	< 0.10
Dibenz(a,h)Anthracene		N	2800	mg/kg	0.10	< 0.10
Benzo[g,h,i]perylene		M	2800	mg/kg	0.10	< 0.10
Total Of 16 PAH's		N	2800	mg/kg	2.0	< 2.0
Total Phenols		M	2920	mg/kg	0.10	< 0.10

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1010	pH Value of Waters	pH at 20°C	pH Meter	
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.	
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).	RE PW PL SW DW FW
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Pentane extraction / GCxGC FID detection	
1760	Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260)	Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds.	
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection	
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.	
2010	pH Value of Soils	pH at 20°C	pH Meter	
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <30°C.	
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930	
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES	
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID	
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge	
650	Characterisation of Waste (Leaching WAC)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge	

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
Uncertainty of measurement for the determinands tested are available upon request .
None of the results in this report have been recovery corrected.
All results are expressed on a dry weight basis.

The following tests were analysed on samples 'as received' and the results subsequently corrected to a dry weight basis EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°C prior to analysis.
All Asbestos testing is performed at the indicated laboratory .
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1.

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt.
All water samples will be retained for 14 days from the date of receipt.
Charges may apply to extended sample storage.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

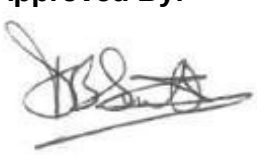
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	24-34761-1
Initial Date of Issue:	01-Nov-2024
Re-Issue Details:	
Client	E3P
Client Address:	Taylor Road Trafford Park Urmston Manchester M41 7JQ
Contact(s):	kkierans@e3p.co.uk; gcalvert@e3p.co.uk
Project	17-912 Higher Standen

Quotation No.:	Q23-31421	**Date Received:**	25-Oct-2024
Order No.:	9846	**Date Instructed:**	25-Oct-2024
No. of Samples:	2		
Turnaround (Wkdays):	5	**Results Due:**	31-Oct-2024
Date Approved:	01-Nov-2024		

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Water

Project: 17-912 Higher Standen

Client: E3P				**Chemtest Job No.:**		24-34761	24-34761
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1886016	1886017
Order No.: 9846				Client Sample Ref.:		WS101	WS102
				Client Sample ID.:		WS101	WS102
				Sample Location:		WS101	WS102
				Sample Type:		WATER	WATER
				Sample Sub Type:			
				Date Sampled:		24-Oct-2024	24-Oct-2024
				Time Sampled:		12:00	12:00
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
pH at 20C		U	1010		4.0	7.5	7.6
Cyanide (Total) Low-Level		N	1300	mg/l	0.0050	< 0.0050	< 0.0050
Arsenic (Dissolved)		U	1455	µg/l	0.20	0.69	0.36
Cadmium (Dissolved)		U	1455	µg/l	0.11	< 0.11	0.16
Chromium (Dissolved)		U	1455	µg/l	0.50	6.4	2.9
Copper (Dissolved)		U	1455	µg/l	0.50	3.2	5.4
Manganese (Dissolved)		U	1455	µg/l	0.50	360	100
Nickel (Dissolved)		U	1455	µg/l	0.50	4.6	2.8
Lead (Dissolved)		U	1455	µg/l	0.50	1.3	1.2
Selenium (Dissolved)		U	1455	µg/l	0.50	< 0.50	< 0.50
Zinc (Dissolved)		U	1455	µg/l	2.5	55	53
Mercury Low Level		U	1460	µg/l	0.010	< 0.010	< 0.010
Chromium (Hexavalent)		U	1490	µg/l	20	< 20	< 20
Aliphatic TPH >C5-C6	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C12-C16	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C16-C21	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C21-C35	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C35-C44	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	EH_2D_AL_#1	N	1675	µg/l	5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C12-C16	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C16-C21	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C21-C35	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C35-C44	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10
Total Aromatic Hydrocarbons	EH_2D_AR_#1	N	1675	µg/l	5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	EH_2D_Total_#1	N	1675	µg/l	10	< 10	< 10
Dichlorodifluoromethane		U	1760	µg/l	1.0	< 1.0	< 1.0
Chloromethane		U	1760	µg/l	1.0	< 1.0	< 1.0
Vinyl Chloride		N	1760	µg/l	1.0	< 1.0	< 1.0
Bromomethane		U	1760	µg/l	5	< 5	< 5
Chloroethane		U	1760	µg/l	2.0	< 2.0	< 2.0

Results - Water

Project: 17-912 Higher Standen

Client: E3P				**Chemtest Job No.:**		24-34761	24-34761
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1886016	1886017
Order No.: 9846				Client Sample Ref.:		WS101	WS102
				Client Sample ID.:		WS101	WS102
				Sample Location:		WS101	WS102
				Sample Type:		WATER	WATER
				Sample Sub Type:			
				Date Sampled:		24-Oct-2024	24-Oct-2024
				Time Sampled:		12:00	12:00
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
Trichlorofluoromethane		U	1760	µg/l	1.0	< 1.0	< 1.0
1,1-Dichloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0
Trans 1,2-Dichloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0
1,1-Dichloroethane		U	1760	µg/l	1.0	< 1.0	< 1.0
cis 1,2-Dichloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0
Bromochloromethane		U	1760	µg/l	5	< 5	< 5
Trichloromethane		U	1760	µg/l	1.0	< 1.0	< 1.0
1,1,1-Trichloroethane		U	1760	µg/l	1.0	< 1.0	< 1.0
Tetrachloromethane		U	1760	µg/l	1.0	< 1.0	< 1.0
1,1-Dichloropropene		U	1760	µg/l	1.0	< 1.0	< 1.0
Benzene		U	1760	µg/l	1.0	< 1.0	< 1.0
1,2-Dichloroethane		U	1760	µg/l	2.0	< 2.0	< 2.0
Trichloroethene		N	1760	µg/l	1.0	< 1.0	< 1.0
1,2-Dichloropropane		U	1760	µg/l	1.0	< 1.0	< 1.0
Dibromomethane		U	1760	µg/l	10	< 10	< 10
Bromodichloromethane		U	1760	µg/l	5	< 5	< 5
cis-1,3-Dichloropropene		N	1760	µg/l	10	< 10	< 10
Toluene		U	1760	µg/l	1.0	3.1	< 1.0
Trans-1,3-Dichloropropene		N	1760	µg/l	10	< 10	< 10
1,1,2-Trichloroethane		U	1760	µg/l	10	< 10	< 10
Tetrachloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0
1,3-Dichloropropane		U	1760	µg/l	2.0	< 2.0	< 2.0
Dibromochloromethane		U	1760	µg/l	10	< 10	< 10
1,2-Dibromoethane		U	1760	µg/l	5	< 5	< 5
Chlorobenzene		N	1760	µg/l	1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane		U	1760	µg/l	2.0	< 2.0	< 2.0
Ethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0
m & p-Xylene		U	1760	µg/l	1.0	< 1.0	< 1.0
o-Xylene		U	1760	µg/l	1.0	< 1.0	< 1.0
Styrene		U	1760	µg/l	1.0	< 1.0	< 1.0
Tribromomethane		U	1760	µg/l	1.0	< 1.0	< 1.0
Isopropylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0
Bromobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0
1,2,3-Trichloropropane		N	1760	µg/l	50	< 50	< 50
N-Propylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0
2-Chlorotoluene		U	1760	µg/l	1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0

Results - Water

Project: 17-912 Higher Standen

Client: E3P				**Chemtest Job No.:**		24-34761	24-34761
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1886016	1886017
Order No.: 9846				Client Sample Ref.:		WS101	WS102
				Client Sample ID.:		WS101	WS102
				Sample Location:		WS101	WS102
				Sample Type:		WATER	WATER
				Sample Sub Type:			
				Date Sampled:		24-Oct-2024	24-Oct-2024
				Time Sampled:		12:00	12:00
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
4-Chlorotoluene		U	1760	µg/l	1.0	< 1.0	< 1.0
Tert-Butylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0
Sec-Butylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0
1,3-Dichlorobenzene		N	1760	µg/l	1.0	< 1.0	< 1.0
4-Isopropyltoluene		U	1760	µg/l	1.0	< 1.0	< 1.0
1,4-Dichlorobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0
N-Butylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0
1,2-Dichlorobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane		U	1760	µg/l	50	< 50	< 50
1,2,4-Trichlorobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0
Hexachlorobutadiene		U	1760	µg/l	1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene		U	1760	µg/l	2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether		N	1760	µg/l	1.0	< 1.0	< 1.0
N-Nitrosodimethylamine		N	1790	µg/l	0.50	< 0.50	< 0.50
Phenol		N	1790	µg/l	0.50	< 0.50	< 0.50
2-Chlorophenol		N	1790	µg/l	0.50	< 0.50	< 0.50
Bis-(2-Chloroethyl)Ether		N	1790	µg/l	0.50	< 0.50	< 0.50
1,3-Dichlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50
1,4-Dichlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50
1,2-Dichlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50
2-Methylphenol (o-Cresol)		N	1790	µg/l	0.50	< 0.50	< 0.50
Bis(2-Chloroisopropyl)Ether		N	1790	µg/l	0.50	< 0.50	< 0.50
Hexachloroethane		N	1790	µg/l	0.50	< 0.50	< 0.50
N-Nitrosodi-n-propylamine		N	1790	µg/l	0.50	< 0.50	< 0.50
4-Methylphenol		N	1790	µg/l	0.50	< 0.50	< 0.50
Nitrobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50
Isophorone		N	1790	µg/l	0.50	< 0.50	< 0.50
2-Nitrophenol		N	1790	µg/l	0.50	< 0.50	< 0.50
2,4-Dimethylphenol		N	1790	µg/l	0.50	< 0.50	< 0.50
Bis(2-Chloroethoxy)Methane		N	1790	µg/l	0.50	< 0.50	< 0.50
2,4-Dichlorophenol		N	1790	µg/l	0.50	< 0.50	< 0.50
1,2,4-Trichlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50
Naphthalene		N	1790	µg/l	0.50	< 0.50	< 0.50
4-Chloroaniline		N	1790	µg/l	0.50	< 0.50	< 0.50
Hexachlorobutadiene		N	1790	µg/l	0.50	< 0.50	< 0.50
4-Chloro-3-Methylphenol		N	1790	µg/l	0.50	< 0.50	< 0.50

Results - Water

Project: 17-912 Higher Standen

Client: E3P				**Chemtest Job No.:**		24-34761	24-34761
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1886016	1886017
Order No.: 9846				Client Sample Ref.:		WS101	WS102
				Client Sample ID.:		WS101	WS102
				Sample Location:		WS101	WS102
				Sample Type:		WATER	WATER
				Sample Sub Type:			
				Date Sampled:		24-Oct-2024	24-Oct-2024
				Time Sampled:		12:00	12:00
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
2-Methylnaphthalene		N	1790	µg/l	0.50	< 0.50	< 0.50
2,4,6-Trichlorophenol		N	1790	µg/l	0.50	< 0.50	< 0.50
2,4,5-Trichlorophenol		N	1790	µg/l	0.50	< 0.50	< 0.50
2-Chloronaphthalene		N	1790	µg/l	0.50	< 0.50	< 0.50
2-Nitroaniline		N	1790	µg/l	0.50	< 0.50	< 0.50
Acenaphthylene		N	1790	µg/l	0.50	< 0.50	< 0.50
Dimethylphthalate		N	1790	µg/l	0.50	< 0.50	< 0.50
2,6-Dinitrotoluene		N	1790	µg/l	0.50	< 0.50	< 0.50
Acenaphthene		N	1790	µg/l	0.50	< 0.50	< 0.50
3-Nitroaniline		N	1790	µg/l	0.50	< 0.50	< 0.50
Dibenzofuran		N	1790	µg/l	0.50	< 0.50	< 0.50
4-Chlorophenylphenylether		N	1790	µg/l	0.50	< 0.50	< 0.50
2,4-Dinitrotoluene		N	1790	µg/l	0.50	< 0.50	< 0.50
Fluorene		N	1790	µg/l	0.50	< 0.50	< 0.50
Diethyl Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50
4-Nitroaniline		N	1790	µg/l	0.50	< 0.50	< 0.50
2-Methyl-4,6-Dinitrophenol		N	1790	µg/l	0.50	< 0.50	< 0.50
Azobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50
4-Bromophenylphenyl Ether		N	1790	µg/l	0.50	< 0.50	< 0.50
Hexachlorobenzene		N	1790	µg/l	0.50	< 0.50	< 0.50
Phenanthrene		N	1790	µg/l	0.50	< 0.50	< 0.50
Anthracene		N	1790	µg/l	0.50	< 0.50	< 0.50
Carbazole		N	1790	µg/l	0.50	< 0.50	< 0.50
Di-N-Butyl Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50
Fluoranthene		N	1790	µg/l	0.50	< 0.50	< 0.50
Pyrene		N	1790	µg/l	0.50	< 0.50	< 0.50
Butylbenzyl Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50
Benzo[a]anthracene		N	1790	µg/l	0.50	< 0.50	< 0.50
Chrysene		N	1790	µg/l	0.50	< 0.50	< 0.50
Bis(2-Ethylhexyl)Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50
Di-N-Octyl Phthalate		N	1790	µg/l	0.50	< 0.50	< 0.50
Benzo[b]fluoranthene		N	1790	µg/l	0.50	< 0.50	< 0.50
Benzo[k]fluoranthene		N	1790	µg/l	0.50	< 0.50	< 0.50
Benzo[a]pyrene		N	1790	µg/l	0.50	< 0.50	< 0.50
Indeno(1,2,3-c,d)Pyrene		N	1790	µg/l	0.50	< 0.50	< 0.50
Dibenz(a,h)Anthracene		N	1790	µg/l	0.50	< 0.50	< 0.50
Benzo[g,h,i]perylene		N	1790	µg/l	0.50	< 0.50	< 0.50

Results - Water

Project: 17-912 Higher Standen

Client: E3P				**Chemtest Job No.:**		24-34761	24-34761
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1886016	1886017
Order No.: 9846				Client Sample Ref.:		WS101	WS102
				Client Sample ID.:		WS101	WS102
				Sample Location:		WS101	WS102
				Sample Type:		WATER	WATER
				Sample Sub Type:			
				Date Sampled:		24-Oct-2024	24-Oct-2024
				Time Sampled:		12:00	12:00
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
4-Nitrophenol		N	1790	µg/l	0.50	< 0.50	< 0.50
Total Phenols		U	1920	mg/l	0.030	< 0.030	< 0.030

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1010	pH Value of Waters	pH at 20°C	pH Meter	RE PW TE TS PL DW GW
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.	
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).	RE PW PL SW DW GW
1460	Mercury low-level in Waters by AFS	Mercury	Atomic Fluorescence Spectrometry, with collimated UV source, wavelength 253.7 nm.	PL GW
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	PL GW
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Pentane extraction / GCxGC FID detection	
1760	Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260)	Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds.	PL GW
1790	Semi-Volatile Organic Compounds (SVOCs) in Waters by GC-MS	Semi-volatile organic compounds	Solvent extraction / GCMS detection	
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.	PL GW

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
Uncertainty of measurement for the determinands tested are available upon request .
None of the results in this report have been recovery corrected.
All results are expressed on a dry weight basis.

The following tests were analysed on samples 'as received' and the results subsequently corrected to a dry weight basis EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°C prior to analysis.
All Asbestos testing is performed at the indicated laboratory .
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1.

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt.
All water samples will be retained for 14 days from the date of receipt.
Charges may apply to extended sample storage.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

APPENDIX VIII
GEOTECHNICAL TESTING RESULTS

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client e3p

Address Taylor Road
Trafford Park
Urmston
Manchester
M41 7JQ

Contract Higher Standen Drive

Job Number MRN 24005/284
Date of Issue 08 November 2024

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.

5 The results included within the report are representative of the samples submitted for analysis.

6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.

M U R R A Y R I X

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892-4:2016

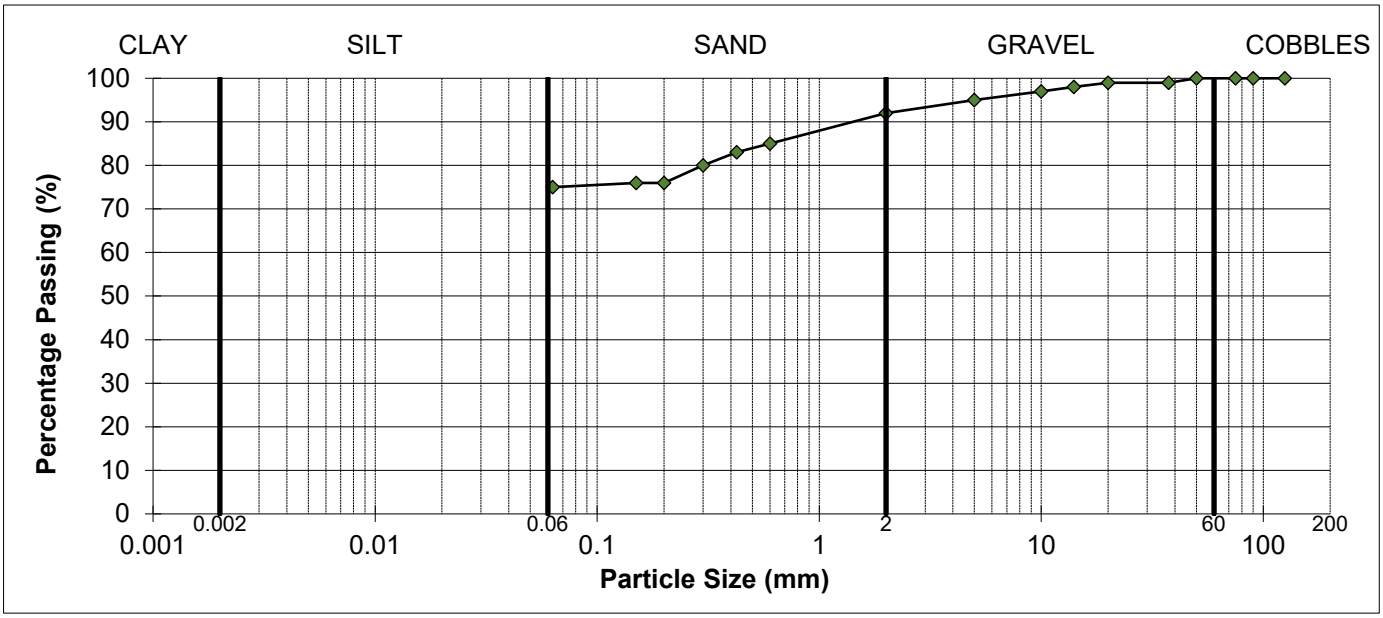
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	e3p
SITE	Higher Standen Drive
JOB NUMBER	MRN 24005/284

SAMPLE LABEL	TP103-0.5	DATE SAMPLED	14-Oct-24
LAB SAMPLE No	575301	DATE RECEIVED	16-Oct-24
DATE TESTED	18-Oct-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100	100	5	95	
90	100		2	92	80-100
75	100		0.6	85	
50	100		0.425	83	
37.5	99		0.3	80	
20	99		0.2	76	
14	98		0.15	76	
10	97		0.063	75	15-100



SOIL FRACTIONS			
COBBLES	0%	SAND	17%
GRAVEL	8%	SILT / CLAY	75%

As received water content	22.2%

REMARKS
Sample complies with the advised grading specification for a 2A/2B material (SHW, Feb 2017)

SIGNED

NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 08-Nov-24

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

DRY DENSITY/WATER CONTENT RELATIONSHIP 4.5kg RAMMER
BS 1377-2:2022 Cl.11
PARTICLE DENSITY METHOD BS 1377-2:2022 Cl.9.2

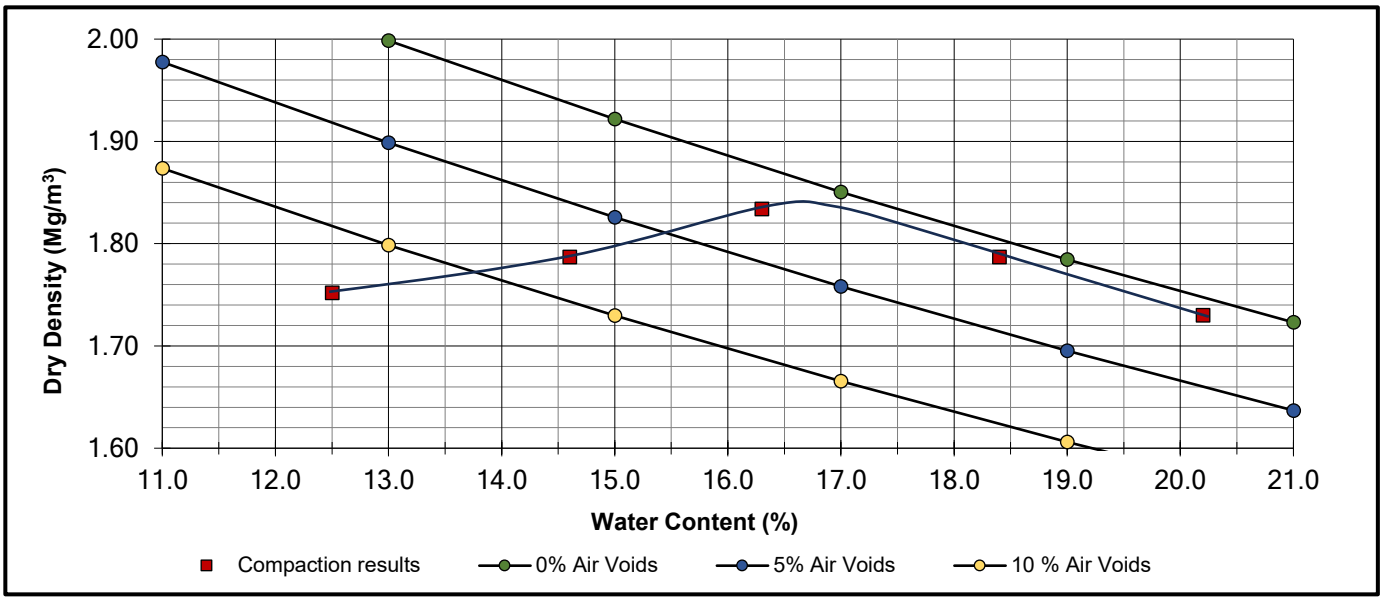
CLIENT	e3p
SITE	Higher Standen Drive
JOB NUMBER	MRN 24005/284

SAMPLE LABEL	TP103-0.5	DATE SAMPLED	14-Oct-24
SAMPLE NUMBER	575301	DATE RECEIVED	16-Oct-24
DATE TESTED	18-Oct-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried / Separate Batches

RETAINED 37.5mm	1 %	GRADING ZONE	Zone 4
RETAINED 20mm	1 %	PARTICLE DENSITY	2.70 Mg/m3 (Assumed)

POINT NUMBER	WATER CONTENT (%)	DRY DENSITY (Mg/m^3)
1	12.5	1.752
2	14.6	1.787
3	16.3	1.834
4	18.4	1.787
5	20.2	1.730



OPTIMUM WATER CONTENT	**17**	(%)
MAXIMUM DRY DENSITY	**1.84**	(Mg/m^3)

REMARKS

NAME O.P. Davies BA (Hons) SIGNED DATE 08-Nov-24
(Director / Head of Laboratory)

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TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892-4:2016

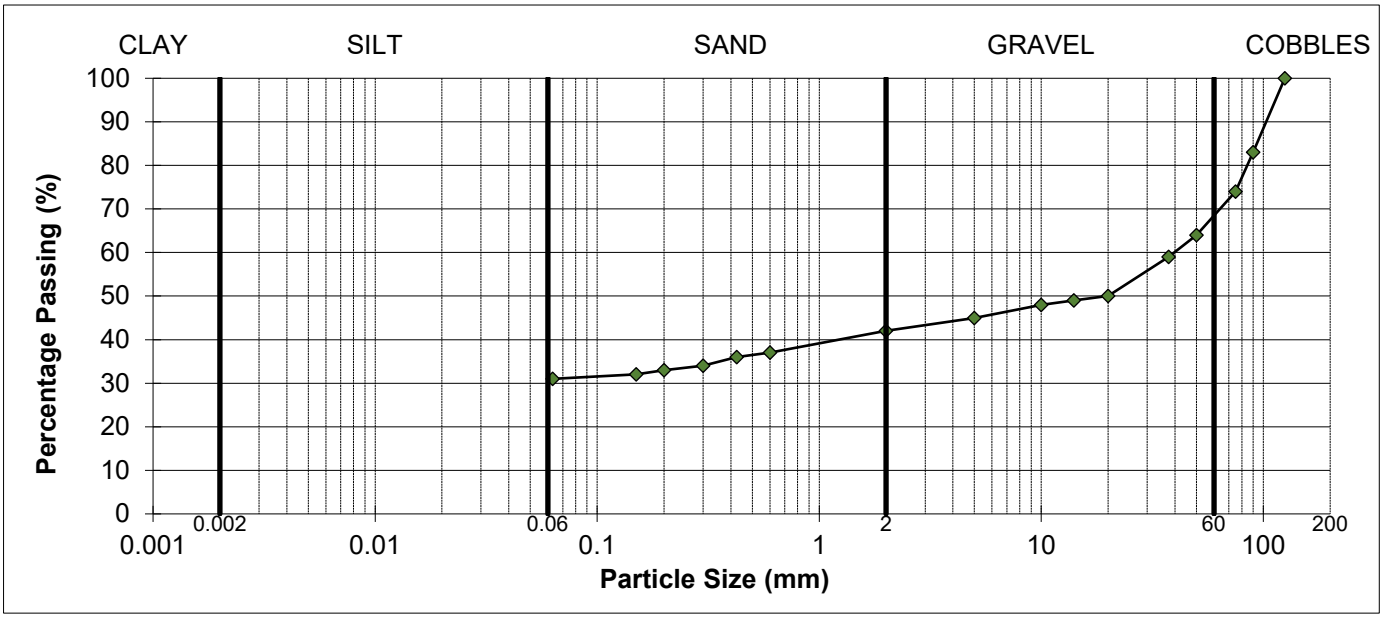
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	e3p
SITE	Higher Standen Drive
JOB NUMBER	MRN 24005/284

SAMPLE LABEL	TP107-1.50	DATE SAMPLED	14-Oct-24
LAB SAMPLE No	575302	DATE RECEIVED	16-Oct-24
DATE TESTED	18-Oct-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy very gravelly CLAY
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100	100	5	45	
90	83		2	42	15-80
75	74		0.6	37	
50	64		0.425	36	
37.5	59		0.3	34	
20	50		0.2	33	
14	49		0.15	32	
10	48		0.063	31	15-80



SOIL FRACTIONS			
COBBLES	31%	SAND	11%
GRAVEL	27%	SILT / CLAY	31%

As received water content	8.8%

REMARKS
Sample complies with the advised grading specification for a 2C material (SHW, Feb 2017)

SIGNED

NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 08-Nov-24

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
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UKAS TESTING 1580

TEST CERTIFICATE

DRY DENSITY/WATER CONTENT RELATIONSHIP 4.5kg RAMMER
BS 1377-2:2022 Cl.11
PARTICLE DENSITY METHOD BS 1377-2:2022 Cl.9.2

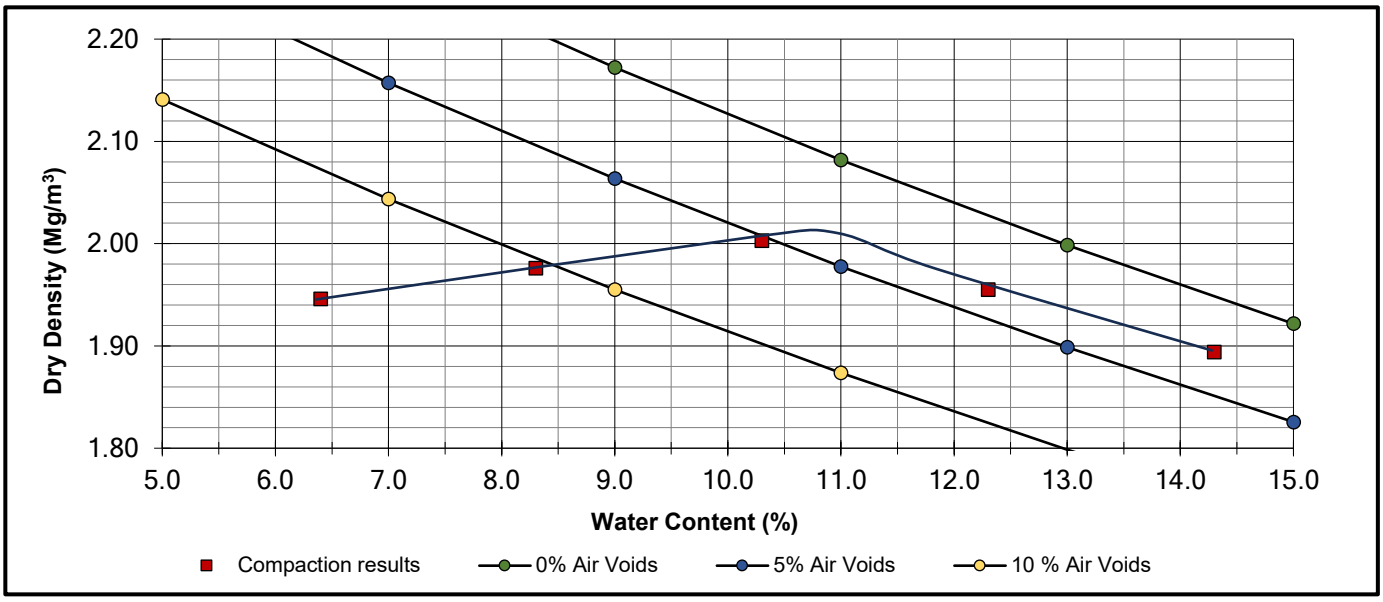
CLIENT	e3p
SITE	Higher Standen Drive
JOB NUMBER	MRN 24005/284

SAMPLE LABEL	TP107-1.50	DATE SAMPLED	14-Oct-24
SAMPLE NUMBER	575302	DATE RECEIVED	16-Oct-24
DATE TESTED	18-Oct-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy very gravelly CLAY
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried / Separate Batches

RETAINED 37.5mm	41 %	GRADING ZONE	Zone X
RETAINED 20mm	50 %	PARTICLE DENSITY	2.70 Mg/m3 (Assumed)

POINT NUMBER	WATER CONTENT (%)	DRY DENSITY (Mg/m^3)
1	6.4	1.946
2	8.3	1.976
3	10.3	2.003
4	12.3	1.955
5	14.3	1.894



OPTIMUM WATER CONTENT	**11**	(%)
MAXIMUM DRY DENSITY	**2.01**	(Mg/m^3)

REMARKS

NAME O.P. Davies BA (Hons) SIGNED DATE 08-Nov-24
(Director / Head of Laboratory)

M U R R A Y R I X

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892-4:2016

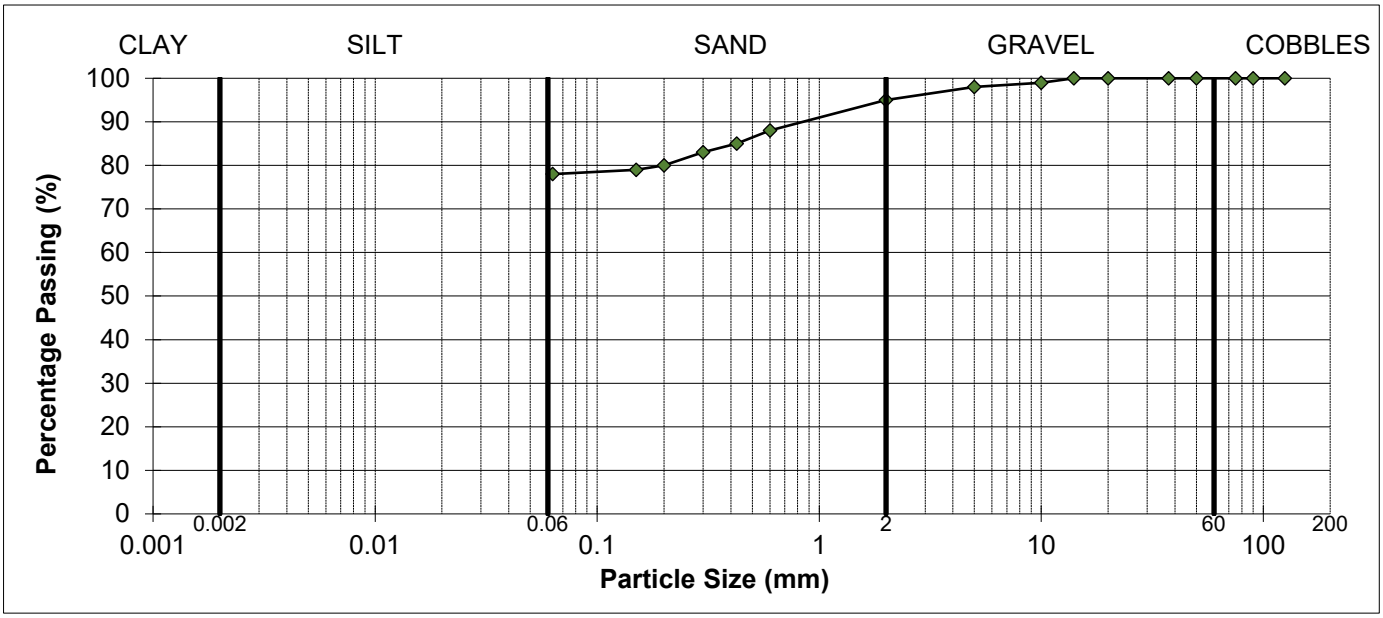
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	e3p
SITE	Higher Standen Drive
JOB NUMBER	MRN 24005/284

SAMPLE LABEL	TP108 -1.00	DATE SAMPLED	14-Oct-24
LAB SAMPLE No	575303	DATE RECEIVED	16-Oct-24
DATE TESTED	18-Oct-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slighty gravelly CLAY
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100	100	5	98	
90	100		2	95	80-100
75	100		0.6	88	
50	100		0.425	85	
37.5	100		0.3	83	
20	100		0.2	80	
14	100		0.15	79	
10	99		0.063	78	15-100



SOIL FRACTIONS			
COBBLES	0%	SAND	17%
GRAVEL	5%	SILT / CLAY	78%

As received water content	26.3%

REMARKS

Sample complies with the advised grading specification for a 2A/2B material (SHW, Feb 2017)

SIGNED

NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 08-Nov-24

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DUKINFIELD, CHESHIRE SK16 4QX
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UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

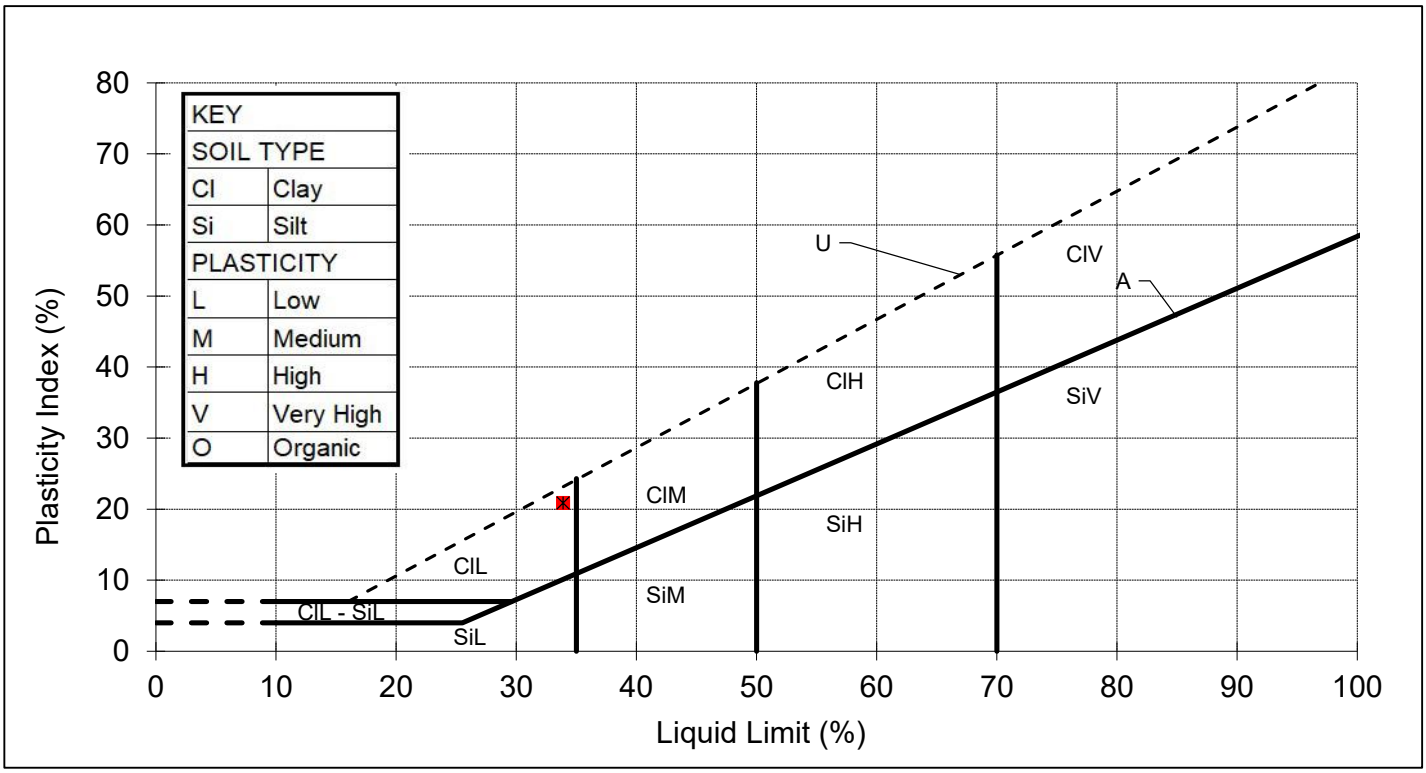
CLIENT	e3p
SITE	Higher Standen Drive
JOB NUMBER	MRN 24005/284

SAMPLE LABEL	WS101 1.00-1.45	DATE SAMPLED	14-Oct-24
SAMPLE No.	575305	DATE RECEIVED	16-Oct-24
DATE TESTED	18-Oct-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	18.6	33.2	1.023	
Determination 2 (avg)	18.4	33.1		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
15.2	34	13	21	86



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 08-Nov-24

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

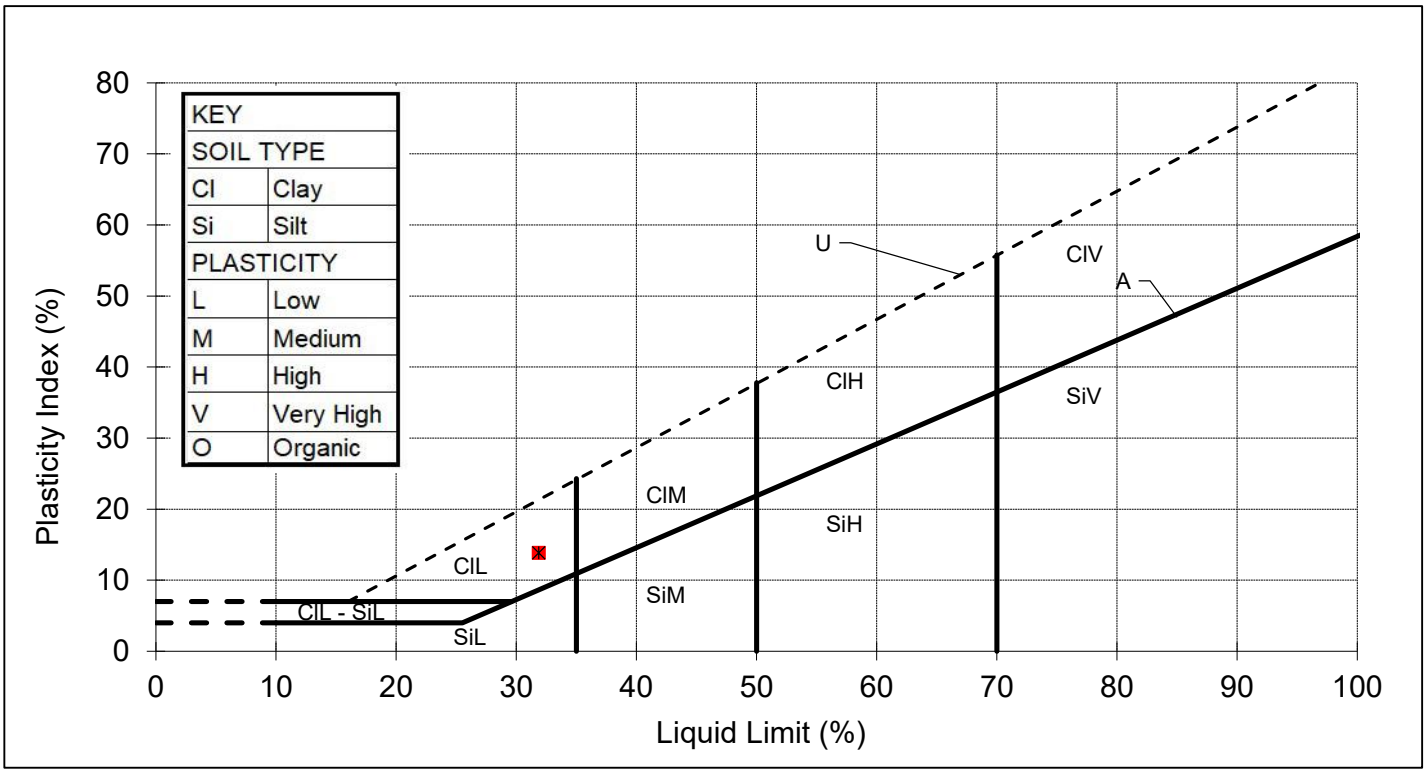
CLIENT	e3p
SITE	Higher Standen Drive
JOB NUMBER	MRN 24005/284

SAMPLE LABEL	WS102 2.00-2.45	DATE SAMPLED	14-Oct-24
SAMPLE No.	575306	DATE RECEIVED	16-Oct-24
DATE TESTED	18-Oct-24	SAMPLED BY	Client

MATERIAL	Grey brown silty slightly sandy CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	21.9	32.9	0.973	
Determination 2 (avg)	21.8	32.6		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
26.0	32	18	14	99



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 08-Nov-24

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

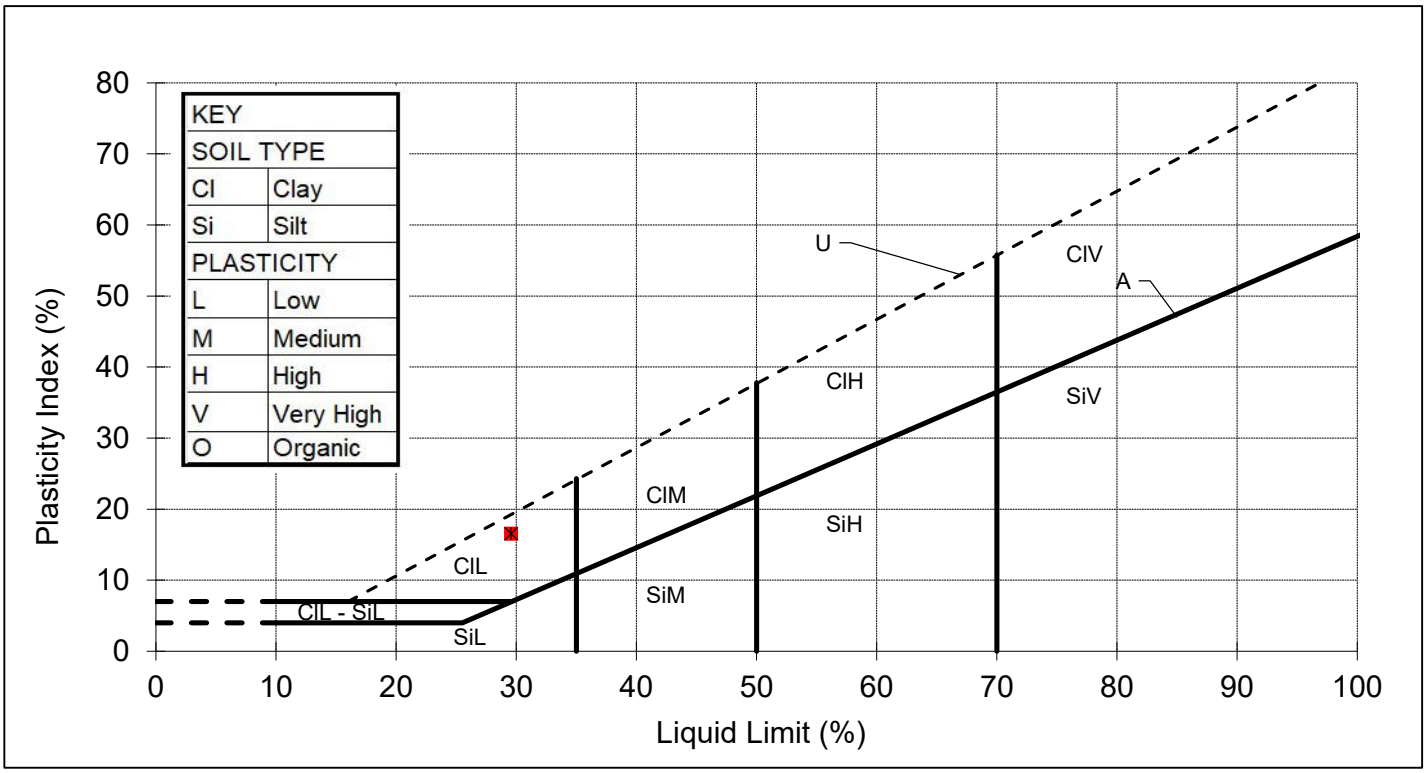
CLIENT	e3p
SITE	Higher Standen Drive
JOB NUMBER	MRN 24005/284

SAMPLE LABEL	WS106 1.00-1.45	DATE SAMPLED	14-Oct-24
SAMPLE No.	575307	DATE RECEIVED	16-Oct-24
DATE TESTED	18-Oct-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	20.0	29.6	1.000	
Determination 2 (avg)	20.0	29.5		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
14.0	30	13	17	90



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Director / Head of Laboratory) DATE 08-Nov-24

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

BS EN ISO 17892-8:2018

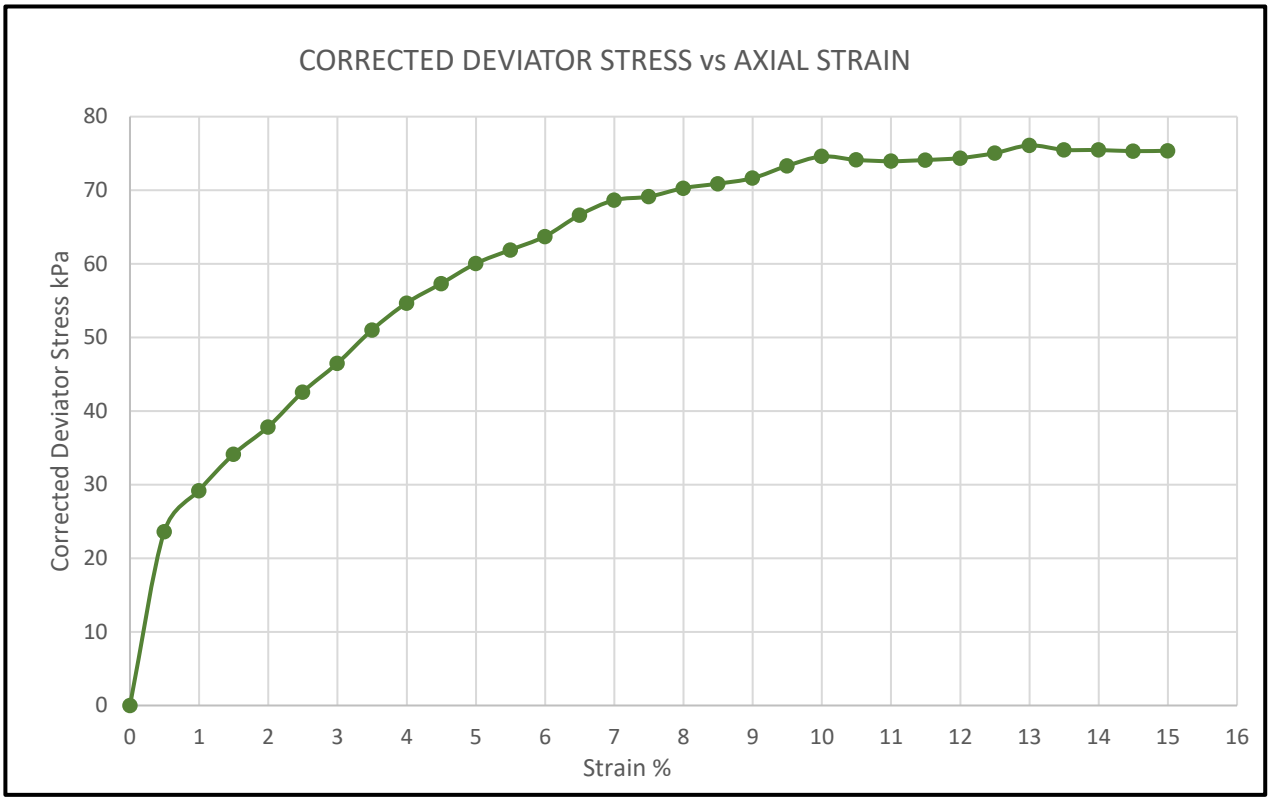
CLIENT	e3p
SITE	Higher Standen Drive
JOB NUMBER	MRN 24005/284

SAMPLE LABEL	WS104- 0.50-1.00	**DATE SAMPLED**	14-Oct-24
LAB SAMPLE No.	575304	**DATE RECEIVED**	16-Oct-24
DATE TESTED	29-Oct-24	**SAMPLED BY**	Client
MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample		

INITIAL CONDITIONS

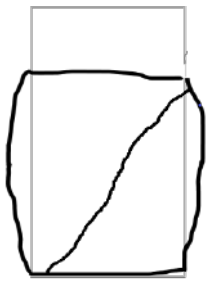
Specimen Location

Sample Length (mm)	450	Specimen depth from top of Sample (mm)	70
Sample Orientation	Vertical	Specimen Condition	Undisturbed
Specimen Length (mm)	164	Specimen Water Content (%)	13.5
Specimen Diameter (mm)	86	Specimen Bulk Density (Mg/m3)	2.13
Membrane Thickness (mm)	0.4	Specimen Dry Density (Mg/m3)	1.88
Membrane Correction	3.39		



TEST TYPE
SINGLE STAGE

SKETCH OF SPECIMEN AT FAILURE



COMBINED

Cell Pressure (kPa)	Failure Strain (%)	Rate of Strain (%/min)	Corrected Deviator Stress (kPa)	Shear Strength Cu (kPa)
20	13.0	2.0	76	38

Remarks/Abnormalities

Name O.P. Davies BA (Hons)
(Director / Head of Laboratory)

Signed 

Date 08 November 2024

APPENDIX IX
ORIGIN OF CHEMICAL ASSESSMENT CRITERIA

CONSTITUENT	ORIGIN OF RISK ASSESSMENT VALUE
Arsenic	2014 LQM/CIEH S4ULs
Cadmium	2014 LQM/CIEH S4ULs
Chromium	2014 LQM/CIEH S4ULs
Lead	2014 LQM/CIEH S4ULs
Mercury	2014 LQM/CIEH S4ULs – methylmercury
Nickel	2014 LQM/CIEH S4ULs
Selenium	2014 LQM/CIEH S4ULs
Copper	2014 LQM/CIEH S4ULs
Zinc	2014 LQM/CIEH S4ULs
Cyanide – Total	2014 LQM/CIEH S4ULs
Phenols – Total	2014 LQM/CIEH S4ULs
Naphthalene	General assessment criteria (GAC) developed by CIEH/LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM.
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene	
Chrysene	
Benzo(b/k)Fluoranthene (iii)	
Benzo(a)Pyrene	
Indeno(123-cd)Pyrene	
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C_5-C_6 (aliphatic)	
TPH C_6-C_8 (aliphatic)	
TPH C_8-C_{10} (aliphatic)	
TPH C_{10}-C_{12} (aliphatic)	
TPH C_{12}-C_{16} (aromatic)	
TPH C_{16}-C_{21} (aromatic)	
TPH C_{21}-C_{35} (aromatic)	