



EARTH ENVIRONMENTAL
& GEOTECHNICAL
A Technics Group Company

GeoEnvironmental Site Investigation Report

Glossop Road

Charlesworth

On behalf of

Beck Homes

November 2025



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**GEOENVIRONMENTAL
SITE INVESTIGATION
REPORT**

GLOSSOP ROAD

CHARLESWORTH

Report Ref: A6549/25/SI

NOVEMBER 2025

Prepared on Behalf of:

Beck Homes

By:

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1.0 INTRODUCTION

1.1 Background

A site investigation has been commissioned by Beck Homes (the 'Client') to examine ground conditions for a proposed residential development at land off Glossop Road, Charlesworth.

1.2 Terms of Reference

The Client has commissioned Earth Environmental and Geotechnical Ltd (EEG) to undertake a site investigation in accordance with proposal A6549/25 dated 7th July 2025.

The objectives of this investigation are as follows:

- *Provide information on the work undertaken, including sampling location plan, borehole logs, chemical and geotechnical testing.*
- *Tier 1 (semi-quantitative) risk assessment will be undertaken. This will compare the concentrations of soil and ground gas contaminants identified against current and relevant published guidelines, in relation to identified receptors, such as existing or future end-users and site neighbours.*
- *Assessment of ground conditions for foundation and soakaway design.*
- *Classification of surplus soils for off-site disposal*

1.3 Report Scope

This report presents complete factual records of the site work carried out, the ground conditions encountered in the exploratory holes, and the in-situ and laboratory test results. All information collected has been used to provide an interpretation of the ground conditions, along with recommendations on geotechnical design and potential risks of ground contamination for the proposed development.

1.4 Limitations of the Study

The report is written in the context of an agreed scope of work and budget and should not be used in a different context. New information, improved practices, or changes in legislation may require a reinterpretation of the report in whole or in part. EEG reserves the right to amend either conclusions or recommendations in light of any further information that may become available. The report is provided for the client's sole use and is confidential to them.

Recommendations within this report are also based on exploratory records and examination of samples and, where applicable, laboratory tests. No liability can be accepted for conditions not revealed by the boreholes and trial pits, particularly at intervening locations. Whilst every effort is made to ensure the accuracy of the data supplied, all opinions expressed regarding the spatial distribution of strata between sampling locations are for guidance only, and no responsibility is accepted for their accuracy.

2.0 SITE LOCATION & DESCRIPTION

The approximate National Grid Reference for the centre of the site is SK 009933 (X: 400967, Y: 393339), with the closest postcode being SK13 5HG.

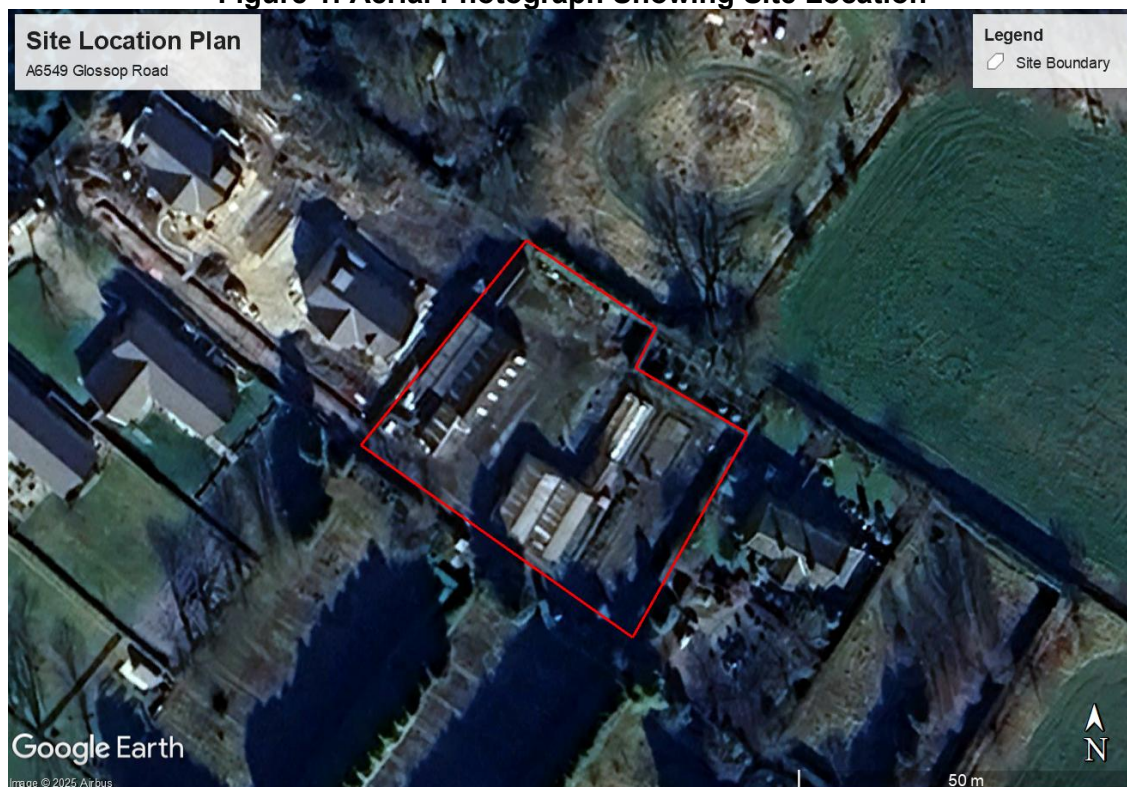
The site investigation area comprises a disused, vacant parcel of land formerly used as a plant nursery. The site is bounded by new residential developments to the west, an old residential building to the southeast, and disused land to the north and south.

The general area surrounding the site comprises residential dwellings and agricultural land in all directions.

Access to the site is gained via an access road off Glossop Road to the west of the site.

The site location is shown in the aerial photograph presented as Figure 1, below.

Figure 1: Aerial Photograph Showing Site Location



A general site photograph is presented in Figure 2 overleaf.

Figure 2: General Site Photograph



2.1 Proposed Development

The client has submitted proposed development plans, and it is understood that the client wishes to construct two residential dwellings on-site, with parking and soft landscaping.

The proposed development plan is illustrated in Figure 3, below.

Figure 3: Proposed Development Plan



3.0 SITE INVESTIGATION

3.1 Exploratory Fieldwork

The fieldwork was carried out by EEG on the 23rd July and 12th August 2025 and comprised:

- Five window sample boreholes (designated WS01 - WS05 inclusive) were each sunk to depths between 1.00m and 4.80m bgl. The boreholes were drilled with the intention of reaching 6.00m below ground level; however, all were terminated in very stiff clay or very dense sand. Window sampler boring was carried out using a small, track-mounted rig, which uses a chain-driven trip hammer to drive sampling tubes or penetrometers into the ground. These tools are coupled to the hammer anvil via solid drill rods. Sampling tubes comprise “windowless samplers,” which are plain sampler tubes in which a continuous disturbed sample is recovered within a semi-rigid plastic liner. To reduce friction in the borehole, progressively smaller sampling tubes are used as the borehole depth increases. Sampler diameters generally range from approximately 90mm to 50mm. Standard Penetration Tests (SPTs) were undertaken in the boreholes in accordance with BS EN ISO 22476-3. Groundwater observations were noted where possible. These observations pertain only to the time of the investigation and do not necessarily reflect seasonal fluctuations. Exploratory hole logs are included in Appendix 1.
- Two trial pits were excavated using a tracked hydraulic excavator to a maximum depth of 2.00m below ground level (bgl). These trial pits (SA01 & SA02) were excavated to conduct infiltration rate testing in accordance with BRE Digest 365 ⁽²⁰¹⁶⁾. Trial pits were backfilled immediately on completion of the testing. Trial pit logs are presented in Appendix 1, and soakaway testing results are presented in Appendix 5.

Exploratory hole locations were selected by EEG Ltd prior to the site works, based on the proposed development and to avoid known services.

Each exploratory location was scanned with a Cable Avoidance Tool (CAT) to locate unrecorded underground services, and the locations were repositioned if necessary.

On completion, samples recovered from the site were taken to specialist laboratories for chemical and geotechnical testing.

Soil samples were recovered in 250g glass amber jars and 1kg plastic tubs. If collection was not possible the same day, then samples were stored in the sample storage fridge at the EEG offices below 4°C.

Samples were tracked using the appropriate Chain of Custody forms provided by DETS.

It should be noted that hexavalent chromium soil is analysed using the USEPA-recommended method of alkaline leach. This method limits chromium(VI) reduction to chromium(III).

All site investigation work was supervised full-time by a representative of EEG. The logging of soils and rocks has been carried out in accordance with BS5930^(2015+A1:2020) except where superseded by the soil and rock description methodology in BS EN14688-1⁽²⁰⁰²⁾, BS EN 14688-2⁽²⁰⁰⁴⁾ and BS EN 14689-1⁽²⁰⁰³⁾.

All sampling locations were surveyed using a hand-held Trimble GeoXH GPS instrument that is capable of surveying to an accuracy of less than 10mm, depending on satellite coverage, proximity to trees and building structures.

The descriptive terminology, such as firm, etc., formerly used in older versions of BS5930 to describe strength now relates solely to consistency. Shear strength is now defined related to results obtained in the field (using a hand vane for example) or in the laboratory (from triaxial tests), as detailed in Table 2 (below).

Table 1: Shear Strength Definitions

Term based on measurement	Undrained Strength (c_u) definition in kN/m^2 (from BS EN ISO 14688-2: 2004, 5.3, Table 5)
Extremely Low Strength	<10
Very Low Strength	10 to 20
Low Strength	20 to 40
Medium Strength	40 to 75
High Strength	75 to 150
Very High Strength	150 to 300
Extremely High Strength	300 to 600

An Exploratory Hole Location Plan is presented as Figure 4, overleaf.

Figure 4: Exploratory Hole Location Plan



A summary of exploratory holes and tests undertaken during the investigation is presented in Table 3 below.

Table 2: Summary of Exploratory Holes Undertaken

Hole	Type*	Depth (m)	Date Started	Date Finished	Easting (m)	Northing (m)	Backfill Details**
WS01	WS	4.80	23/07/2025	23/07/2025	400964	393353	MW
WS02	WS	3.00	23/07/2025	23/07/2025	400971	393333	MW
WS03	WS	2.00	23/07/2025	23/07/2025	400994	393336	MW
WS04	WS	1.00	23/07/2025	23/07/2025	400980	393310	MW
WS05	WS	3.00	23/07/2025	23/07/2025	400955	393329	MW
SA01	TP	2.00	12/08/2025	12/08/2025	400971	393351	A
SA02	TP	1.90	12/08/2025	12/08/2025	400991	393330	A

*WS = Window Sample Borehole, TP = Trial Pit
**MW = Monitoring Well, A = Arisings

3.2 Laboratory Testing

3.2.1 Geotechnical Testing

A programme of laboratory testing was carried out on samples taken from the various strata to assist in classification and determine the engineering properties of the materials underlying the site. The tests were scheduled by EEG and carried out by Murray Rix. The test procedures used were generally in accordance with the methods described in BS 1377:1990. Details of the specific tests used in each case are given in Table 3, below:

Table 3: Summary of Laboratory Geotechnical Tests Undertaken

TEST	STANDARD	No.
Moisture Content	BS1377-2:2022, Cl. 4	7
Liquid Limit, Plastic Limit, Plasticity Index	BS1377-2:2022, Cl. 5.3/ 6	7
Particle size distribution (wet)	BS1377-2:2022, Cl. 10	2
Sulphate content of 2:1 soil: water extract	BS1377-3:2018 + A1:2021, Cl. 7.3	4
pH value	BS1377-3:2018 + A1:2021, Cl. 12	4

The results of the laboratory geotechnical tests are discussed in Section 6 and included in Appendix 2.

3.2.2 Environmental Testing

The environmental chemistry of the ground was investigated by specialist chemical analysis of selected samples, scheduled by EEG, and carried out by DETS, a UKAS and MCERTS accredited laboratory.

Chemical analyses were carried out on 7no. soil samples and were submitted for the following suite of determinants:

Asbestos Screen, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Phenol, Sulphate (SO₄), Sulphide, pH, Soil

Organic Matter, Speciated Petroleum Hydrocarbons (TPH) and Speciated Polyaromatic Hydrocarbons (PAH).

Full results of the laboratory contamination tests are discussed in Section 6 and included in Appendix 3.

4.0 GROUND CONDITIONS ENCOUNTERED

4.1 Soil Profile Encountered

BGS digital mapping indicates that the site is underlain by superficial Devensian Till deposits composed of clay.

The solid geology beneath the site is recorded as the Rough Rock Formation, comprising fine grained sandstones. The sequence of strata encountered beneath the site was as follows:

- **MADE GROUND** - was encountered in three exploratory hole locations between ground level and to a maximum depth of 0.90m bgl, comprising:
 - SAND, with variable quantities of gravel, red brick and sandstone.
- **SUPERFICIAL DEPOSITS** - were encountered in all exploratory hole locations, to a maximum depth of 4.80m bgl, comprising:
 - SAND, with variable quantities of clay, silt and gravel of mudstone and sandstone.
 - CLAY, with variable quantities of silt, sand and gravel of mudstone and sandstone.
 - GRAVEL of sandstone was locally encountered within SA02.

The depths of the various materials encountered in the exploratory holes are summarised in Table 4, below.

Table 4: Summary of Ground Conditions Encountered

Hole	Depth to Stratum (m bgl)				Groundwater Strike During Drilling (m)
	MADE GROUND	CLAY	SAND	GRAVEL	
WS01	GL – 0.80	0.80 – 4.80+	-	-	-
WS02	GL – 0.40	0.40 – 3.00+	-	-	2.70
WS03	GL – 0.20	1.00 – 2.00+	0.20 – 1.00	-	-
WS04	GL – 0.30	-	0.30 – 1.00+	-	-
WS05	GL – 0.90	0.90 – 2.90	2.90 – 3.00+	-	-
SA01	GL – 0.70	0.70 – 2.00	-	-	-
SA02	GL – 0.50	-	0.50 – 1.00	1.00 – 1.90+	-

4.2 Observable Indications of Contamination

No observable signs of visual or olfactory contamination were identified during the site investigation.

4.3 Obstructions

No man-made sub-surface obstructions were encountered during the site investigation.

4.4 Groundwater

Groundwater was encountered during the site investigation in WS02 at a depth of 2.70m bgl.

5.0 ENGINEERING PROPERTIES OF SOILS ENCOUNTERED

5.1 General

The following sections discuss the engineering properties of the strata encountered, based on results of in situ testing and laboratory testing obtained during this investigation.

The results of the laboratory geotechnical testing are summarised in Table 5, below.

Table 5: Summary of Laboratory Geotechnical Test Results

Location	Depth (m)	Strata	CLASSIFICATION									CHEMICAL	
			Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Percentage Passing 425 μ (%)	Modified Plasticity Index (%)	PSD Gravel (%)	PSD Sand (%)	PSD Silt/Clay (%)	pH Value	Water Soluble Sulphate SO ₄ (mg/l)
WS01	1.50	CLAY	14.8	35	14	21	87	18.2	-	-	-	6.8	330
WS01	4.00	CLAY	16.5	36	13	23	84	19.3	-	-	-	-	-
WS02	1.10	CLAY	16.6	34	14	20	91	18.2	-	-	-	6.9	330
WS02	3.00	CLAY	13.4	37	13	24	94	22.5	-	-	-	-	-
WS03	2.00	CLAY	18.4	36	15	21	88	18.4	3	39	58	-	-
WS04	0.50	SAND	-	-	-	-	-	-	25	61	14	-	-
WS04	1.00	SAND	-	-	-	-	-	-	-	-	-	6.8	410
WS05	1.50	CLAY	13.5	38	14	24	84	20.4	-	-	-	7.3	230
WS05	2.50	CLAY	13.9	36	13	23	89	19.6	-	-	-	-	-

5.2 Made Ground

Made Ground was encountered in all boreholes between ground level and a maximum depth of 0.90m below ground level.

Due to the material encountered, no geotechnical testing was carried out in the Made Ground.

5.3 Superficial Deposits

As discussed in Section 5, superficial material was encountered as variable CLAY and SAND in all the exploratory hole locations. Localised GRAVEL was encountered within location SA02.

5.3.1 Clay

Clay was encountered in all exploratory hole locations, below the made ground at depths between 0.40m and 4.80m bgl.

SPT tests conducted in the cohesive material yielded SPT N values between 7 and 50, as shown on the SPT v Depth Plot in Figure 5 (Page 14). This result suggests that the cohesive material ranges from soft to very stiff.

Atterberg Limit tests were carried out on 7no. samples of the clay. The test results reported liquid limit values of 34% to 38% and plastic limit values of 13% to 15%, yielding a plasticity index of 20% to 24%. These results suggest that the clay has **low to medium plasticity**. Results are shown on the Plasticity Chart in Figure 6 (Page 15).

The **water-soluble sulphate** content of three clay samples ranged from 230 mg/L to 330 mg/L SO₄, with **pH values** of 6.8 to 7.3.

Recommended N values and derived design values for the cohesive soils are summarised in Table 7, below.

It is recommended that, for assessing ultimate bearing capacities where lower values are critical, the lower quartile N value be used. Based on the N Values in the table below, the equivalent shear strength values were between 40 and 260kN/m².

For design purposes, a plasticity index value of 24% is recommended, based on the upper quartile value of the results.

Table 6: Summary of Design Parameters (Cohesive)

Depth	SPT N Value Range	Design N Value*	Equivalent Shear Strength** (kN/m ²)	Coefficient of Volume Compressibility** (mv)
1.20	7 - 12	7.75	40 (Medium Strength)	0.25 (Medium Compressibility)
2.00	9 - 50	9.00	46(Medium Strength)	0.22 (Medium Compressibility)
3.00	20	20	104 (High Strength)	0.06 (Low Compressibility)
4.00	21	21	109(High Strength)	0.09 (Low Compressibility)
5.00	50	50	260 (Very High Strength)	0.04 (Very Low Compressibility)
*Based on lower quartile N value and correlations by Peck Hanson and Thornburn ⁽¹⁹⁷⁴⁾				
**Based on correlation by Stroud & Butler ⁽¹⁹⁷⁵⁾				

The **coefficient of volume compressibility (mv)** has been estimated using the following correlation by Stroud and Butler ⁽¹⁹⁷⁵⁾: for a clay with a plasticity index of 22%, $mv = 1 / (0.515 \times N \text{ value})$. This correlation yields a coefficient of volume compressibility value of 0.04 to 0.49 m²/MN, as shown in Table 7 above. The results suggest the clay has a **medium to very low compressibility**.

In accordance with NHBC Chapter 4.2 Building Near Trees ⁽²⁰⁰³⁾, soils can be classified in terms of volume change potential, using the relationship:

$$I'_p = I_p \times \frac{\% \text{ less than } 425\mu\text{m}}{100\%}$$

I'_p = modified plasticity index,
 I_p = plasticity index.

Based on the laboratory test results and Table 1 of NHBC Chapter 4.2, the above relationship indicates that the clay samples exhibit **low to medium volume change potential**.

The **Natural Moisture Content** (NMC) and **Liquid Limit** (LL) of the soil can be used to indicate soil desiccation. Specifically, when the NMC is less than 40% of the LL, the soil is inferred to be desiccated, as summarised in Table 7 below.

Table 7: Soil Desiccation Indicators in Clay

Location	Depth (m)	Liquid Limit (%)	40% Liquid Limit (%)	Natural Moisture Content (%)	Desiccation
WS01	1.50	35	14	14.8	No
WS01	4.00	36	14	16.5	No
WS02	1.10	34	14	16.6	No
WS02	3.00	37	15	13.4	Yes
WS03	2.00	36	14	18.4	No
WS05	1.50	38	15	13.5	Yes
WS05	2.50	36	14	13.9	Yes

The results in the above table show that three clay samples tested show evidence of desiccation (WS02 at 3.00m, and WS05 at 1.50m and 2.50m).

Figure 5: SPT v Depth Plot

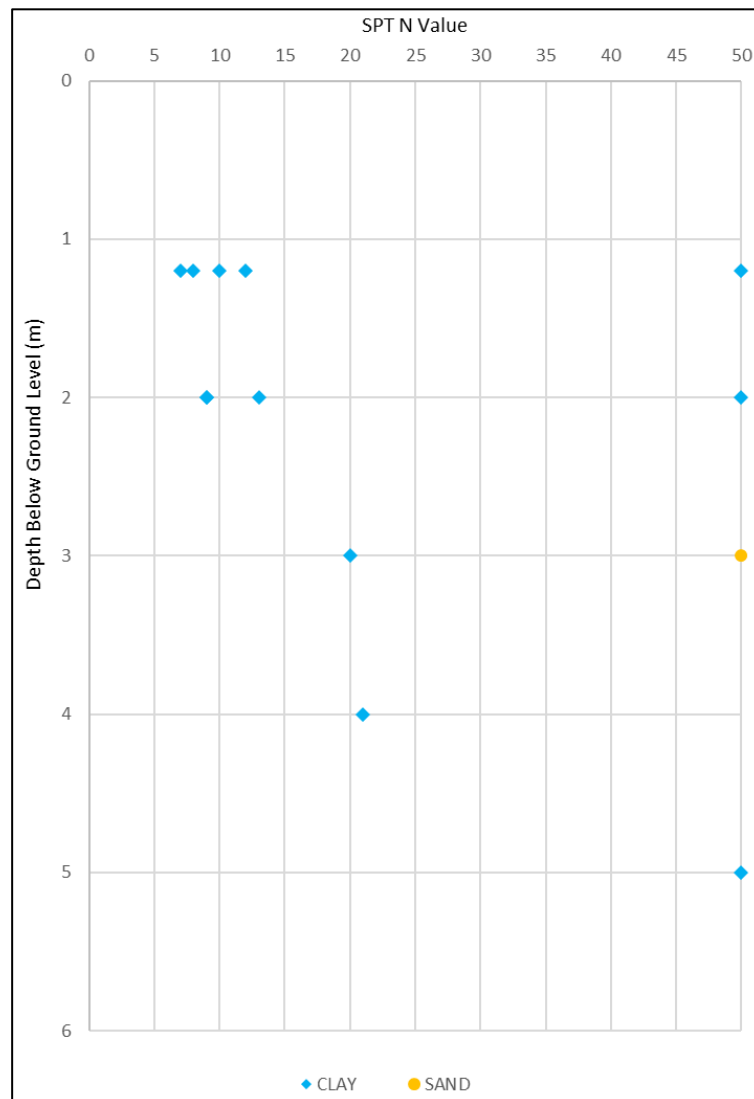
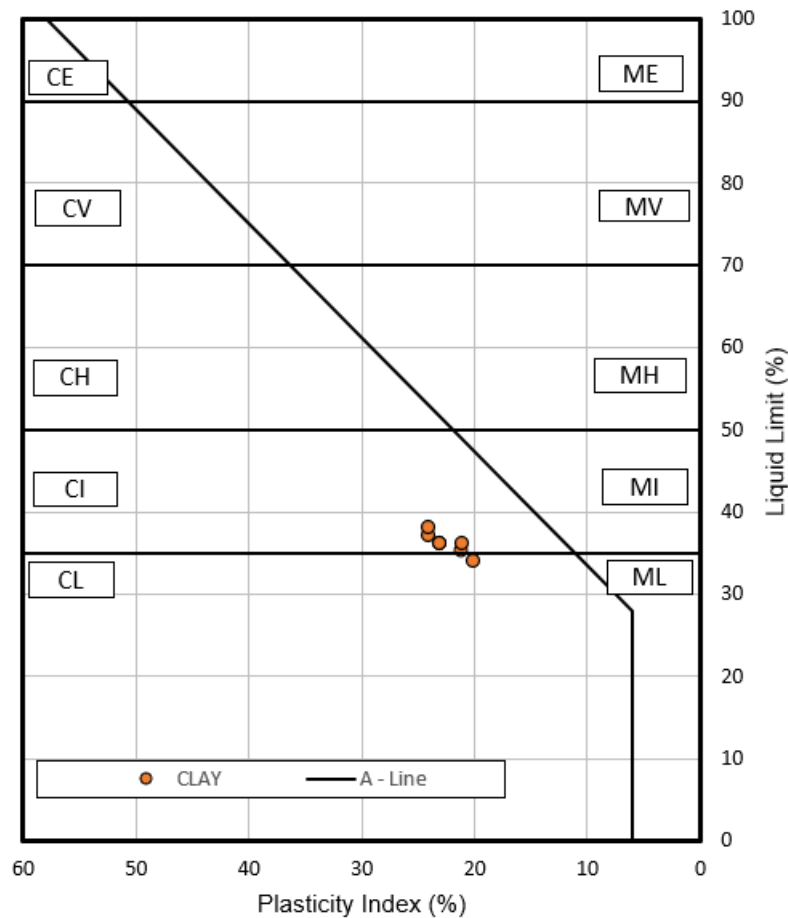


Figure 6: Plasticity Chart



5.3.2 Sand

Sand was encountered in all exploratory hole locations apart from WS01, WS02 and SA01 at depths between 0.20m and 3.00m bgl.

SPT tests carried out in the sand with **N values** of 50, as shown on the SPT v Depth Plot in Figure 5, above. The results suggest the sand was very dense.

The **water-soluble sulphate** content of a sand sample was 410 mg/L SO₄, with a pH of 7.3.

Particle Size Distribution (PSD) tests were conducted on a single sand sample. The laboratory generally described the material as silty, gravelly SAND.

Recommended N values and derived design values for the granular soils are summarised in Table 8, below.

Table 8: Summary of Design Parameters

Depth	SPT N Value Range	Average N Value	Design N Value*	Equivalent Soil Density	Angle of Internal Friction (degrees)**
1.20	50	50	50	Very Dense	41.0
3.00	50	50	50	Very Dense	41.0
*Based on the lower quartile N value					
**Based on the correlation by Peck, Hanson and Thornburn (1974)					

It is recommended that, for assessing ultimate bearing capacities where lower values are critical, the lower quartile N value be used.

Based on the correlation by Peck, Hanson, and Thornburn (1974), this gives an angle of shearing resistance of 41.0 °.

For assessing settlements, average ground conditions provide a more realistic estimate of settlement, and the average N value should be used.

6.0 GEOTECHNICAL ASSESSMENT

6.1 Proposed Development

It is understood that the development consists of the erection of two 2-storey residential properties with associated garages and hard and soft landscaping.

Detailed information on structural loadings and the proposed foundation type was not available at the time this report was written.

6.2 Ground Conditions Encountered

The exploratory holes across the site encountered variable-made ground between ground level and a maximum depth of 0.90m below ground level (bgl).

Superficial deposits of clay and sand were encountered in all exploratory hole locations, at depths between 0.20m and 4.80m bgl.

Groundwater was encountered in WS02 at a depth of 2.70m bgl.

Bedrock was not encountered in any exploratory holes.

6.3 Foundation Considerations

Based on the ground conditions encountered, conventional shallow-depth foundations (strip/pad or trench fill) placed in the superficial deposits should be suitable for the site, provided the anticipated structural loadings are relatively low and the structure is tolerant of settlement.

Should the allowable bearing pressure and settlement prove unfavourable, then alternative foundation options will need to be considered, such as ground improvement and piles.

6.3.1 Conventional Shallow Depth Strip/Pad or Trench Fill Foundations

Strip/pad or trench fill foundations should be taken down below any made ground and placed in the natural superficial deposits. If any loose or soft material is encountered at the foundation level, it should be excavated and replaced with suitable granular fill or the foundation extended at least 150mm into suitable natural strata.

Foundations should be placed in materials with similar bearing and consolidation characteristics to avoid potential differential settlement. When foundations transition from cohesive to granular soils, nominal reinforcement should be incorporated to mitigate differential settlement. more extendedle 9 overleaf summarises the anticipated allowable bearing pressures for strip/pad foundations placed in superficial clay deposits. The bearing capacities are calculated based on Hansen's ⁽¹⁹⁷⁸⁾ method and assuming a factor of safety against bearing capacity failure of 3. For this calculation, groundwater has been considered to be at 2.36m below ground level (bgl), as no groundwater was encountered during the investigation.

Table 9: Summary of Allowable Bearing Pressures (Clay)

Foundation Strata	Design Value (Section 6)	Foundation Depth (m bgl)	Foundation Type	Foundation Size (m)	Allowable Bearing Pressure (kN/m ²)
CLAY	$c_u=40.38\text{kN/m}^2$	1.0	Strip	0.4	108
				0.9	99
			Pad	1.0 x 1.0	115
				2.0 x 2.0	104
	$c_u=40.38\text{kN/m}^2$	1.5	Strip	0.4	115
				0.9	107
			Pad	1.0 x 1.0	124
				2.0 x 2.0	113
	$c_u=46.89\text{kN/m}^2$	2.0	Strip	0.4	137
				0.9	129
			Pad	1.0 x 1.0	150
				2.0 x 2.0	138
	$c_u=46.89\text{kN/m}^2$	2.5	Strip	0.4	140
				0.9	134
			Pad	1.0 x 1.0	156
				2.0 x 2.0	145

Table 10 below summarises anticipated settlements of the above foundations in cohesive soils based on design values discussed in Section 6. Settlement in cohesive soils typically comprises a small amount of immediate settlement as loads are applied and a larger proportion of consolidation settlement, which occurs over a longer period.

As the proposed foundation loading is not known, a foundation loading of 75 kN/m² has been used for these calculations.

The foundation depth will need to be adjusted if it falls within the influence range of retained or recently felled trees/hedges. The clay soil has a low to medium potential for volume change.

Table 10: Summary of Anticipated Settlement (Clay)

Foundation Depth (m bgl)	Foundation Strata	Foundation Type	Foundation Size (m)	Foundation Loading (kN/m ²)	Settlement (mm)		
					At Centre	At Corner	Average
1.00	CLAY	Strip	0.4	75	-	-	9
			0.9	75	-	-	14
		Pad	1.0 x 1.0	75	19	5	14
			2.0 x 2.0	75	27	7	20
1.5	CLAY	Strip	0.4	75	-	-	8
			0.9	75	-	-	12
		Pad	1.0 x 1.0	75	17	4	12
			2.0 x 2.0	75	22	6	17
2.00	CLAY	Strip	0.4	75	-	-	6
			0.9	75	-	-	10
		Pad	1.0 x 1.0	75	13	3	10
			2.0 x 2.0	75	17	4	13
2.50	CLAY	Strip	0.4	75	-	-	5
			0.9	75	-	-	7
		Pad	1.0 x 1.0	75	10	2	7
			2.0 x 2.0	75	13	3	10

Table 11 below summarises the anticipated allowable bearing pressures for strip/pad foundations placed in superficial sand deposits. The bearing capacities are calculated based on Hansen's (1978) method and assuming a factor of safety against bearing capacity failure of 3. For this calculation, groundwater has been considered to be at 2.36m below ground level (bgl), as no groundwater was encountered during the investigation.

Table 11: Summary of Allowable Bearing Pressures (Sand)

Foundation Strata	Design Value (Section 6)	Foundation Depth (m bgl)	Foundation Type	Foundation Size (m)	Allowable Bearing Pressure (kN/m ²)
SAND	$\phi = 41.0^\circ$	1.0	Strip	0.4	668
				0.9	961
			Pad	1.0 x 1.0	1134
				2.0 x 2.0	1241
	$\phi = 41.0^\circ$	1.5	Strip	0.4	961
				0.9	1068
			Pad	1.0 x 1.0	1666
				2.0 x 2.0	1712

Table 12 below summarises anticipated settlements of the above foundations in granular soils based on design values discussed in Section 6. Settlement in granular soils typically comprises a small amount of immediate settlement as loads are applied and a larger proportion of consolidation settlement, which occurs over a more extended period.

As the proposed foundation loading is not known, a foundation loading of 75 kN/m² has been used for these calculations.

Table 12: Summary of Anticipated Settlement (Sand)

Foundation Depth (m bgl)	Foundation Strata	Foundation Type	Foundation Size (m)	Foundation Loading (kN/m ²)	Settlement (mm)		
					Upper Limit	Lower Limit	Best Guess
1.00	SAND	Strip	0.4	75	1	0	0
			0.9	75	1	0	1
		Pad	1.0 x 1.0	75	1	0	0
			2.0 x 2.0	75	2	0	1
1.5	SAND	Strip	0.4	75	1	0	0
			0.9	75	1	0	1
		Pad	1.0 x 1.0	75	1	0	0
			2.0 x 2.0	75	2	0	1

Floor slabs should be designed as suspended if Made Ground of 600mm thickness or greater is present. Made ground is not considered an appropriate bearing stratum due to its variable nature. Floor slabs may be designed as ground bearing, where Made Ground is excavated and replaced with suitable granular fill.

A suitably qualified engineer should inspect all foundation excavations to confirm that the foundation strata are suitable and uniform along the length of the foundation, and capable of carrying the anticipated structural loadings. If foundations cross from granular to cohesive soils, nominal reinforcement should be incorporated.

6.4 Pavement Design

The exploratory boreholes generally encountered Made Ground at a subgrade level. Based on the recommendations for design CBR values provided in Interim Advice Note 73/06, Revision 1 (2009), a conservative design CBR value of 1% should be adopted in areas where Made Ground is encountered at the subgrade level.

Consideration should be given to potential differences in ground conditions near the surface, which could result in pavements being constructed on variable-made ground. In this context, a flexible pavement design may be required.

Consideration should also be given to the use of geotextiles to reduce capping thickness. For example, biaxial geogrids such as Tensar SSLA20 and SSLA30 are often used to minimise capping thickness. Advice from a suitable contractor should be sought on the most appropriate type of geotextile for the ground conditions encountered at this site. For guidance, the following table compares granular layer thickness with and without a geotextile, in accordance with HA25/94 Part 2.

It should be noted that the type of construction will depend on the proposed finished pavement levels across the site, and it is recommended that the pavement design be reviewed once these levels are known. In this context, it is essential that further in situ CBR testing is carried out once formation levels are known to confirm design CBR values.

Table 13: Comparison of Capping Thickness with and without Geotextile

CBR	Unreinforced			Reinforced with Tensar Geogrid				
	Sub-base	Capping	Total	Sub-base	Capping	No. of grids	Total	Thickness saving
0.5%	Design not suitable			200mm	400mm	2	600mm	-
1.0%	150mm	600mm	750mm	400mm	0	1	400mm	350mm
1.5%	150mm	600mm	750mm	310mm	0	1	310mm	440mm
2.0%	150mm	600mm	750mm	260mm	0	1	260mm	490mm
3.0%	150mm	350mm	500mm	210mm	0	1	210mm	290mm
4.0%	150mm	300mm	450mm	175mm	0	1	175mm	275mm
5.0%	150mm	250mm	400mm	160mm	0	1	160mm	240mm
These figures are suitable for light access roads and car parks, based on 1000 standard axles. For heavily loaded pavements, it is advisable to consult a specialist contractor.								

A suitably experienced engineer or inspector should examine all formation excavations to check for soft or unsuitable material, which should be removed and replaced with compacted granular fill. Additionally, to ensure good compaction and remove unevenness, the formation should be compacted using equipment suitable for the ground conditions encountered. Careful inspection of this work will also help identify any soft spots at or just below the formation level.

6.5 Chemical Attack on Buried Concrete

Chemical tests (see Appendices) show low levels of water-soluble sulphates and generally neutral or slightly alkaline conditions. Based on these conditions, it is recommended that for concrete placed in natural strata, the Design Sulphate Class for the site, as defined in BRE Special Digest 1⁽²⁰⁰⁵⁾, be taken as DS-1, and the Aggressive Chemical Environment for Concrete (ACEC) site classification be taken as AC-1s. The recommendations in BRE Special Digest 1 should be followed for concrete foundations and ground-bearing floor slabs.

6.6 Soil Infiltration Testing

Soil infiltration testing was conducted in 2no. trial pits (SA01 & SA02) in accordance with BRE Digest 365 (2016).

Each soakaway pit was excavated into the natural strata. The trial pits were rapidly filled with water using a towed bowser, and the water level was monitored over time.

Table 14 below summarises the infiltration test results for each location.

Table 14: Summary of Soil Infiltration Testing

Location	Test No.	Test Depth (m bgl)	Test Duration (secs)	Fall in Water Level (m)	Soil Infiltration Rate (metres/second)
SA01	Test 1	0.745 – 0.755	10800	0.05	Too slow to calculate
SA02	Test 1	0.740 – 1.080	10800	0.34	Too slow to calculate

It is considered that the use of soakaways at the site is not feasible, and alternative methods for surface water drainage should be investigated.

Full results are presented in Appendix 5.

6.7 Suitability of Excavated Materials

Acceptability criteria and testing methods, as well as compaction/placement methods, will depend on the type of contract and specification used for the construction of the proposed development. It is recommended that a suitably qualified engineer review the earthworks specifications once the relevant preliminary screening assessment using the Waste Acceptance Criteria (WAC) has been completed, provided the structural fill is not contaminated. It does not contain excessive amounts of clay, and the moisture content is controlled during placement. The control of moisture content will be necessary, as the cohesive content of this should be adopted to ensure stability, particularly where personnel are required to enter the temporary Works

Formations will be susceptible to damage from both weather and trafficking, and should be protected immediately upon exposure, particularly in areas where construction plant will access the site.

Excavations in Made Ground are likely to be unstable and should be battered back to an angle of 1 in 2, or a system of close sheeting and shoring should be adopted to ensure stability, particularly where personnel are required to enter the excavations. All excavations should be adequately supported where personnel are required to enter the area.

Groundwater seepages could be encountered near the surface within excavations, particularly during the wetter months of the year. Pumping of excavations from a suitably located sump is likely to be required to keep excavations dry.

7.0 SOIL CONTAMINATION RISK ASSESSMENT

7.1 Tier I Human Health Soil Risk Assessment – Groundworkers During Development

To assess the risk of soil contamination to construction and ground workers during development, guidelines from the HSE Document 'Protection of workers and the general public during development of contaminated land' ⁽¹⁹⁹¹⁾ are used. The document assesses soil contamination test results and classifies the site as being uncontaminated or contaminated with varying degrees of contamination from 'slight' to 'unusually heavy.' The guideline values and laboratory test results are summarised in the following table:

Table 15: Summary of Guideline Values for Protection of Workers and the General Public During the Development of Contaminated Land

Contaminant	Typical Values* for:					Test Results	Class
	Uncontaminated Soils	Slight Contamination	Contaminated	Heavy Contamination	Unusually Heavy Contamination		
	Class A	Class B	Class C	Class D	Class E		
pH (acid)	6 - 7	5 - 6	4 - 5	2 - 4	<2	6.4 – 6.5	A
pH (alkaline)	7 - 8	8 - 9	9 - 10	10 - 12	12	7.9 – 8.4	A – B
Arsenic	0 - 30	30 - 50	50 - 100	100 - 500	500	3 – 17	A
Cadmium	0 - 1	1 - 3	3 - 10	10 - 50	50	<0.2 – 1.2	A – B
Chromium	0 - 100	100 - 200	200 - 500	500 - 2500	2500	13 - 210	A – C
Copper	0 - 100	100 - 200	200 - 500	500 - 2500	2500	8 – 87	A
Lead	0 - 500	500 - 1000	1000 - 2000	2000 – 1%	1.0%	9 – 304	A
Mercury	0 - 1	1 - 3	3 - 10	10 - 50	50	< 1	A
Nickel	0 - 20	20 - 50	50 - 200	200 - 1000	1000	11 – 38	A – B
Zinc	0 - 250	250 - 500	500 - 1000	1000 - 5000	5000	38 – 180	A
Boron	0 - 2	2 - 5	5 - 50	50 - 250	250	< 1	A
Selenium	0 - 1	1 - 3	3 - 10	10 - 50	50	< 2	A
Barium	0-500	500-1000	1000-2000	2000-1.0%	1.0%	32.2 – 328	A
Beryllium	0 - 5	5 - 10	10 - 20	20 - 50	50	< 0.5 – 2.9	A
Vanadium	0 - 100	100 - 200	200 - 500	500 - 2500	2500	19 – 72	A
Sulphate	0 - 2000	2000 - 5000	5000 – 1%	1% - 5%	5.05%	< 200 - 1354	A
Sulphide	0 - 10	10 - 20	20 - 100	100 - 500	500	< 5	A
Cyanide (free)	0 - 1	1 - 5	5 - 50	50 - 100	100	< 1	A
Phenol	0 - 2	2 - 5	5 - 50	50 - 250	250	< 2	A

Based on the above results, the soils are generally classified as uncontaminated; however, the pH ranges from uncontaminated to heavily contaminated. Therefore, there is a **LOW** potential risk from soil contamination to construction workers, ground workers and members of the public during construction.

7.2 Tier I Human Health Soil Risk Assessment – Future Site Users

The following section provides a Human Health Soil Assessment for future site users. Based on the proposed development type, the following section compares the results of contamination analyses with those of a residential development as specified by Defra/LQM/CIEH. As part of the contamination assessment, the chemical results obtained by EEG have been screened against accepted compliance criteria, namely:

- Defra C4SL Health Criteria Values (March 2014), where available; and
- Tier 1 assessment values - based on LQM/CIEH Suitable 4 Use Levels ⁽²⁰¹⁵⁾ (S4ULs).

The contaminated land guidance has recently changed the risk evaluation from 'minimal' (SGVs) to 'low' (referred to as Lowest Level of Toxicological Concern (LLTCs)). The policy companion document and supporting letter from DEFRA state that C4SLs could be used under the planning regime as well as within Part 2A.

Based on these comments EEG considers the justifications and assumptions used to generate 'low' risk are suitable for the planning regime.

Where no C4SLs have been generated, EEG will use the LQM S4ULs. Similar assumptions and land use to C4SLs have been used. However, toxicological information has been based on 'minimal risk' as per previous guidelines and assumptions. If contaminants are not present as C4SLs or S4ULs, then EEG will use CL: AIRE GACs. These follow the 'minimal' risk principle and more stringent exposure parameters and will be conservative.

EEG considers the main risk drivers for PAHs to be benzo(a)pyrene (B(a)P) and naphthalene. This is due to B(a)P possibly being a carcinogen, the most toxic of the PAHs, and naphthalene being the most volatile and soluble. The new C4SLs indicate B(a)P as a surrogate marker for carcinogenic PAHs, since the risk from other non-carcinogenic PAHs is considered negligible. Naphthalene will be tested under the Waste Acceptance Criteria (WAC) preliminary screening assessment; all results have been compared with residential end-use criteria. The soil chemical testing results are summarised in Table 16, overleaf.

Table 16: Soil Results Comparison with C4SL/S4UL Values

Determinand	C4SL/S4UL Levels Resi w/ HP SOM 6% (mg/kg)	WS01 0.20m MG	WS01 0.60m MG	WS02 0.10m MG	WS03 1.00m SAND	WS04 0.20m MG	WS05 0.10m MG	WS05 0.80m MGH	No of Exceedances
Metals									
Arsenic	37	17	7	8	3	12	9	6	0
Beryllium	1.7	0.8	< 0.5	1.6	< 0.5	0.7	2.9	1.2	1
Boron	290	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0
Cadmium	22	0.6	0.8	0.5	< 0.2	0.3	1.2	0.6	0
Chromium	910	210	13	31	16	15	26	90	0
Chromium VI	21	< 2	< 2	< 2	< 2	< 2	< 2	< 2	0
Copper	2400	87	21	40	8	25	71	44	0
Lead	200	87	304	53	9	55	41	47	1
Inorganic Mercury	40	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0
Nickel	130	24	14	26	11	13	38	25	0
Selenium	250	< 2	< 2	< 2	< 2	< 2	< 2	< 2	0
Vanadium	410	72	19	38	22	26	54	41	0
Zinc	3700	88	180	104	38	59	148	147	0
Petroleum Hydrocarbons									
Benzene	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0
Toluene	130	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0
Ethylbenzene	47	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0
o-xylenes	60	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0
m-xylenes	59	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0
p-xylenes	56	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0
Aliphatic EC >5-6	42	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0
Aliphatic EC >6-8	100	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0
Aliphatic EC >8-10	27	< 2	< 2	< 2	< 2	3	< 2	< 2	0
Aliphatic EC >10-12	130	< 2	< 2	< 2	< 2	< 2	< 2	< 2	0
Aliphatic EC >12-16	1100	< 3	11	< 3	< 3	< 3	< 3	6	0
Aliphatic EC >16-21	65000	13	319	3	< 3	< 3	< 3	33	0
Aliphatic EC >21-35	65000	321	1815	12	< 10	< 10	< 10	217	0
Aromatic EC >5-7	70	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0
Aromatic EC >7-8	130	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0
Aromatic EC >8-10	34	< 2	< 2	< 2	< 2	< 2	< 2	< 2	0
Aromatic EC >10-12	74	< 2	< 2	< 2	< 2	< 2	< 2	< 2	0
Aromatic EC >12-16	140	< 2	2	4	< 2	< 2	< 2	56	0
Aromatic EC >16-21	260	21	119	45	< 3	< 3	10	727	0
Aromatic EC >21-35	1100	549	984	146	< 10	< 10	43	1409	0
Polycyclic Aromatic Hydrocarbons									
Naphthalene	2.3	0.16	< 0.1	< 0.1	< 0.1	0.3	0.13	0.9	0
Acenaphthylene	170	< 0.1	< 0.1	0.11	< 0.1	< 0.1	< 0.1	0.7	0
Acenaphthene	210	< 0.1	< 0.1	0.36	< 0.1	< 0.1	< 0.1	10.5	0
Fluorene	170	< 0.1	< 0.1	0.33	< 0.1	< 0.1	< 0.1	7.96	0
Phenanthrene	95	0.88	0.43	3.03	< 0.1	0.21	0.53	93.5	0
Anthracene	2400	0.26	< 0.1	1.18	< 0.1	< 0.1	0.16	23.4	0
Fluoranthene	280	2.39	0.38	7.21	< 0.1	0.16	2.64	165	0
Pyrene	620	2.24	0.47	6.39	< 0.1	0.13	2.72	157	0
Benzo(a)anthracene	7.2	1.37	< 0.1	3.56	< 0.1	< 0.1	1.64	68.2	1
Chrysene	15	1.75	0.99	2.97	< 0.1	< 0.1	1.7	54.3	1
Benzo(a)pyrene	5	2.7	< 0.1	4.13	< 0.1	< 0.1	2.85	78.1	1
Benzo(b)fluoranthene	2.6	2.8	< 0.1	4.41	< 0.1	< 0.1	2.72	90.8	2
Benzo(k)fluoranthene	77	1.07	< 0.1	1.25	< 0.1	< 0.1	1.17	31	0
Indeno(1,2,3-cd) pyrene	27	1.37	< 0.1	2.51	< 0.1	< 0.1	1.84	48.3	1
Dibenzo (a, h) anthracene	0.24	< 0.1	< 0.1	0.56	< 0.1	< 0.1	0.45	5.74	3
Benzo(ghi)perylene	320	1.43	< 0.1	2.42	< 0.1	< 0.1	1.7	41.3	0
Phenols									
Phenol	120	< 2	< 2	< 2	< 2	< 2	< 2	< 2	0

Based on the above table, 11no. contaminant concentrations were found to exceed the screening criteria relevant to a residential with plant uptake end use.

Asbestos fibres were identified in WS01 at 0.60m and WS05 at 0.80m. Amosite was present in WS01, and Chrysotile was present in WS05, both in fibre bundle form.

7.3 Soil Waste Assessment

An assessment of the disposal characteristics of the soil, in accordance with Environment Agency guidance WM3.1, June 2018 edition, "Guidance on the classification and assessment of waste," has been carried out on soils recovered from the site using HazWasteOnline.

The results are summarised in Table 17 below and presented in full in Appendix 4.

Table 17: Waste Classification of Soils

Location	Depth (m bgl)	WM3.1 Classification	WAC Testing Classification	Comments
WS01	0.20	Non-Hazardous	Hazardous	Elevated Total Organic Carbon Elevated Loss on Ignition
WS01	0.60	Hazardous	-	Hydrocarbons
WS02	0.10	Non-Hazardous	-	-
WS03	1.00	Non-Hazardous	-	-
WS04	0.20	Non-Hazardous	-	-
WS05	0.10	Non-Hazardous	-	-
WS05	0.80	Hazardous	-	Hydrocarbons

The above table shows that 5no. of the 7no. tested samples collected from the site have been classified as Non-Hazardous, and 2no. samples (WS01 at 0.60m and WS05 at 0.80m) have been classified as **Hazardous** in accordance with WM3.1.

One of the soil samples, WS01 0.2m, has been submitted for Waste Acceptance Criteria (WAC) testing. This shows elevated TOC and LOI due to the soil being topsoil, not due to any contamination.

For Waste Acceptance Criteria (WAC) testing, EEGL has compared solid waste and leachate values with the guideline values in the Landfill Regulations. The following table summarises the results of the solid waste analysis and leachate testing, together with limit values for Non-Hazardous waste and Hazardous waste as described in the Landfill Regulations.

Table 18: Summary of WAC Test Results

Determinand	Landfill Regulations Limits (mg/kg unless otherwise indicated)			WS01 0.20m (mg/kg)
	Inert Waste	Stable Non- Reactive non-hazardous waste	Hazardous Waste	
TOC (%)	3%	5%	6%	11.4
Loss on ignition (%)	-	-	10%	13.40
BTEX (mg/kg)	6	-	-	< 0.05
Sum of PCBs (mg/kg)	1	-	-	< 0.1
Mineral Oil (mg/kg)	500	-	-	416
Total PAH (mg/kg)	100	-	-	18.4
pH (units)	-	< 6	-	8.4
Acid Neutralisation Capacity (mol/kg)	-	<i>To be evaluated</i>		1.8
Arsenic	0.5	2	25	0.026
Barium	20	100	300	0.384
Cadmium	0.04	1	5	< 0.002
Chromium	0.5	10	70	0.024
Copper	2	50	100	0.099
Mercury	0.01	0.2	2	0.0014
Molybdenum	0.5	10	30	0.016
Nickel	0.4	10	40	0.0051
Lead	0.5	10	50	0.010
Antimony	0.06	0.7	5	< 0.002
Selenium	0.1	0.5	7	0.0057
Zinc	4	50	200	0.09
Chloride	800	15000	25000	42
Fluoride	10	150	500	7.1
Sulphate	1000	20000	50000	37
Total Dissolved Solids	4000	60000	100000	708
Phenol Index	1	-	-	< 0.5
DOC	500	800	1000	144

8.0 GROUND GAS AND RADON GAS CONTAMINATION RISK ASSESSMENT

8.1 Radon Gas

The site is located within a Radon-Affected Area, where between 1% and 3% of properties are affected, as defined by the Health Protection Agency. Therefore, basic radon protection measures are not necessary.

8.2 Analyses of Monitoring Results

The potential risk associated with gases generated in the ground (whether from natural or artificial sources) depends on the gas's concentration and its flow rate to the surface.

These factors are assessed by monitoring the gas installations in the boreholes.

The variable nature of gas generation and the effect of barometric pressure on gas flow mean that the volume of gas potentially reaching the ground surface is usually inconsistent over time.

Four monitoring visits were conducted between August 5, 2025, and September 3, 2025. The results recorded methane (CH₄) levels of between 0.0% and 0.2% v/v, with carbon dioxide (CO₂) levels ranging from 0.0% to 6.2% v/v. Oxygen concentrations of between 8.5% and 18.7% v/v were also recorded.

Groundwater levels varied during the monitoring period, ranging from 2.36m bgl to 2.72m bgl.

Flow rates ranged from -0.4 to 0.0 litres/hour during the monitoring period. For assessment purposes, a flow rate of 0.1 litres/hour has been used, as this is the instrument's limit of detection.

Atmospheric pressure was recorded between 994 and 1002 mb.

Complete results of the monitoring are presented in Appendix 6.

Table 19, overleaf, adapted from Table 1 of the technical paper "Risk and Reliability in Gas Protection Design" by Card et al. (2019), provides a summary of current UK practice regarding appropriate gas protection measures based on a Gas Screening Value (GSV).

A GSV for the site has been obtained by multiplying the maximum gas concentration by the steady flow rate of 0.1 l/h adopted for assessment purposes.

- Carbon dioxide: Steady flow rate = 0.01l/hr, max concentration = 6.2%
- Methane: Steady flow rate = 0.1 l/hr, max concentration = 0.2%.

Based on the above figures, the GSV is calculated as:

- **Carbon Dioxide** : $GSV = (0.1 \times 6.2) / 100 = 0.0062 \text{ litres/hour}$
- **Methane**: $GSV = (0.1 \times 0.2) / 100 = 0.0002 \text{ litres/hour}$

The CIRIA guidance document notes that '...the GSV is a guideline value and not an absolute threshold'.

The above results suggest that the site can be assigned a Characteristic Situation 1, i.e., 'Very Low Risk', in accordance with Table 19, due to the absence of flow and low concentrations of methane and carbon dioxide.

Table 19: Characteristic Situation (Wilson et al, 2006/2007 modified from Wilson and Card, 1999)

<i>Characteristic Situation</i>	<i>Risk Classification</i>	<i>Gas Screening Value CH₄ or CO₂ (l/hr)</i>	<i>Additional Factors</i>	<i>Typical source of generation</i>
1	Very Low	<0.07	Typically, < 1% methane Typically, < 5% carbon dioxide	Typically made ground
2	Low	<0.7	Borehole air flow rate to not exceed 70L/hr; otherwise, consider increasing to Characteristic Situation 3	Typically made ground
3	Moderate	<3.5		Old landfill, inert waste, flooded mine workings.
4	Moderate to High	<15	Quantitative risk assessment	Mine workings are susceptible to flooding, and the completed landfill
5	High Risk	<70		Mineworking is unflooded and inactive, with shallow workings near the surface.
6	Very High Risk	>70		Recent landfill site

9.0 CONCLUSIONS & RECOMMENDATIONS

9.1 Soil Contamination

There is a **LOW** potential risk from soil contamination to construction workers and ground workers during development.

Based on the results of the chemical testing, 11no. contaminant concentrations were found to exceed the screening criteria relevant to a residential setting with plant uptake as the end use.

Therefore, the risk to future end-users is considered moderate; hence, further remedial action is deemed necessary.

This would be in the form of a remediation strategy, which would most likely recommend a 600mm clean cover system in rear garden areas and a 300mm clean cover system in front garden areas.

9.2 Asbestos

Asbestos fibres were identified in WS01 at 0.60m and WS05 at 0.80m. Amosite was present in WS01, and chrysotile was present in WS05, both in fibre bundle form.

9.3 Radon & Ground Gas

Radon and ground gas mitigation measures are not required for the development.

9.4 Soil Disposal

Soils should be disposed of at a suitable site that is registered to handle the levels of contamination encountered. Two tested soil samples have been classified as Hazardous for off-site disposal in accordance with Environment Agency guidance WM3.1. In contrast, the rest have been classified as non-hazardous.

Further Waste Acceptance Criteria (WAC) testing conducted on one of the tested samples provides a classification that exceeds the criteria for disposal as inert, stable, non-reactive waste. The material surrounding the tested location (WS01 at 0.20m bgl) should therefore be accepted as Hazardous waste in a Hazardous landfill.

Consultation with local landfills/ waste sites is recommended before removing material off-site.

9.5 Foundations

Based on the ground conditions encountered, conventional shallow strip/pad or trench fill foundations placed in the superficial deposits should be suitable for the site, provided the anticipated structural loadings are relatively low and the structure is tolerant of settlement.

It is recommended that foundations be placed 1.00m below ground level, taking into account the calculated allowable bearing pressures and anticipated settlements of the clay and sand deposits.

Foundations within the zone of influence of retained trees and hedges will need to be adjusted for a soil with low to medium volume change potential.

It is recommended that for foundations and ground floor slabs in contact with the made ground, the Design Sulphate Class should be taken as DS-1, and the Aggressive Chemical Environment for Concrete (ACEC) site classification should be taken as AC-1.

9.6 Pavement Design

Based on the site investigation findings, the soil type at the subgrade level was typically made ground. Based on the recommendations for design CBR values provided in Interim advice note 73/06, Revision 1 (2009).

A conservative design CBR value of 1% should be adopted in areas where made ground is encountered at the subgrade level.

9.7 Soakaways

Soil infiltration testing has proved that, where testing has been undertaken, solutions are not feasible.

9.8 Risk to Buried (Water) Services

It is generally considered that standard materials are suitable for new water pipes. Further advice should be sought from the local water company.

Guidance on buried potable water pipes is contained in the UK Water Industry Research Report 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' Ref 10/WM/03/21 (January 2011).

9.9 Site Personnel

As with all construction sites, personnel working on the site during the construction period should be encouraged to maintain a high standard of personal hygiene, and on-site washing facilities should be available.

9.10 Other Matters

Due diligence is required during the construction period, and should any further evidence of contamination be found, appropriate investigation and/or action should be taken. The significance of any contamination not discovered by this investigation is outside the scope of this report.

APPENDIX 1

EXPLORATORY HOLE LOGS

APPENDIX 2

SOIL GEOTECHNICAL TESTING RESULTS

APPENDIX 3

SOIL CHEMICAL TESTING RESULTS

APPENDIX 4

SOIL WASTE ASSESSMENT

APPENDIX 5

SOIL INFILTRATION TESTING RESULTS

APPENDIX 6

MONITORING RESULTS

APPENDIX 7

REPORT LIMITATIONS

REPORT LIMITATIONS

This contract was completed by Earth Environmental & Geotechnical Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget, and staff resources allocated to the project.

Other than that, expressly contained in the above paragraph, Earth Environmental & Geotechnical Ltd provides no other representation or warranty whether express or implied, is made in relation to the services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of Earth Environmental & Geotechnical Ltd.

If a third party relies on this report, it does so wholly at its own and sole risk and Earth Environmental & Geotechnical Ltd disclaims any liability to such parties.

It is Earth Environmental & Geotechnical Ltd understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was an important factor in determining the scope and level of the services. Should the purpose for which the report is used, or the proposed use of the site change, this report will no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without Earth Environmental & Geotechnical Ltd review and advice shall be at the client's sole and own risk.

The report was written in 2025 and should be read in light of any subsequent changes in legislation, statutory requirements, and industry best practices. Ground conditions can also change over time and further investigations, or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of Earth Environmental & Geotechnical Ltd. In the absence of such written advice of Earth Environmental & Geotechnical Ltd, reliance on the report in the future shall be at the client's own and sole risk. Should Earth Environmental & Geotechnical Ltd be requested to review the report in the future, Earth Environmental & Geotechnical Ltd shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between Earth Environmental & Geotechnical Ltd and the client.

The observations and conclusions described in this report are based solely upon the services that were provided pursuant to the agreement between the client and Earth Environmental & Geotechnical Ltd. Earth Environmental & Geotechnical Ltd has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report.

Earth Environmental & Geotechnical Ltd is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, Earth Environmental & Geotechnical Ltd did not seek to evaluate the presence on or off the site of electromagnetic fields, lead paint, radon gas or other radioactive materials.

The services are based upon Earth Environmental & Geotechnical Ltd observations of existing physical conditions at the site gained from a walkover survey of the site together with Earth Environmental & Geotechnical Ltd interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst Earth Environmental & Geotechnical Ltd have no reason to doubt the accuracy and that it has been provided in full of those it was requested from, the items relied on have not been verified.

No responsibility can be accepted for errors within third party items presented in this report. Further Earth Environmental & Geotechnical Ltd was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the services. Earth Environmental & Geotechnical Ltd is not liable for any inaccurate information, misrepresentation of data or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to Earth Environmental & Geotechnical Ltd and including the doing of any independent investigation of the information provided to Earth Environmental & Geotechnical Ltd save as otherwise provided in the terms of the contract between the client and Earth Environmental & Geotechnical Ltd.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and Earth Environmental & Geotechnical Ltd] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

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.