



Ground Investigation Report

Ossett Lane, Dewsbury

Campbell Homes Limited

SHF.1888.002.GE.R.002.C



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Ground Investigation Report

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1.0 INTRODUCTION

1.1 Background

- 1.1.1 Enzygo Limited [Enzygo] has been commissioned to undertake a Ground Investigation [GI] and prepare a Ground Investigation Report [GIR] for a proposed residential development at Ossett Lane, Earlsheaton, Dewsbury WF12 8LR.

1.2 Proposed Development

- 1.2.1 The proposed residential development comprises five houses with associated hard and soft landscaping with a retaining wall to the southern boundary. The proposed development layout is shown on the Self Architects 'Concept Design' Drawing Number: 13125-SA-ZZ-DR-A201, dated January 2023.

1.3 Geotechnical Category

- 1.3.1 The development at Ossett Lane has been designated a Geotechnical Category 1 Project as defined by and in accordance with Eurocode 7 [BE EN 1997-1].

1.4 Objectives

- 1.4.1 The objectives of the study are as follows.
- Review existing information.
 - Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors.
 - Provide a factual and interpretative report relating to the desk study and site investigations. Provide a revised conceptual model and recommendations on any potential development issues regarding ground contamination and mitigation measures, where appropriate.
 - Summarise the interpretation of the GI and define suitable parameters for design.
 - Detail the design criteria to be adopted for each geotechnical element of the scheme.
 - Create a Geotechnical Risk Register.

1.5 EHO Comments

- 1.5.1 The local Kirklees Council Environmental Health Officer has made relevant comments based upon previous submission as referenced below.
- Kirklees Council, Planning Consultation, Application No. 2023/93470, dated 15th May 2024.
- 1.5.2 In summary the following comments were made regarding Condition 9 – Land contamination.
- 'A Ground Investigation Report, authored by Enzygo, dated September 2023 (ref: September 2023 Revision A) has been received in support of the application to discharge Condition 9.

- KC Environmental Health acknowledge the submission of the Phase 2 report. However, Condition 9 on previous permission 2021/91695 requires the submission of a Preliminary Risk Assessment (Phase I Desk Study Report). Whilst the submitted details make reference to 'Enzygo Ltd, Preliminary Risk Assessment, [SHF.1888.002.GE.R.001.C, dated March 2023]', this was only submitted to officers as part of this application on 26/04/2024.
- Notwithstanding this, it was noted by KC EH that the Enzygo Ltd, Preliminary Risk Assessment, [SHF.1888.002.GE.R.001.C, dated March 2023] was submitted under application 2023/90833. In KC EH comments on 2023/90833 associated with this outline permission, they reviewed this document and requested additional information. Although the investigation described herein has included asbestos analysis, it is still unclear why ground gases have not been considered as part of the preliminary conceptual model and the revised conceptual model presented within the Phase 2 document despite the proximity to infilled ground.
- An additional email was sent to officers on 09/04/2024, this was reviewed by KC EH however this still did not address the concerns raised by officers. The submitted information has not sufficiently risk assessed the site and given the proximity to infilled land, officers require a detailed report covering all the above matters before the condition can be discharged.

1.5.3 This updated GIR [Rev C] has been produced to cover the councils' comments above specifically relating to Condition 9 within section 5.3 of this report.

2.0 EXISTING INFORMATION

2.1 General

2.1.1 The existing information for the site is summarised below:

Enzygo Ltd, Preliminary Risk Assessment, [SHF.1888.002.GE.R.001.C, dated March 2023]

- Historical maps show the site has been developed with residential buildings with associated garages and garden space, since 1855.
- No superficial deposits have been identified across the site. The site underlain by the solid geology of the Thornhill Rock comprising Sandstone and Mudstone.
- The Preliminary Risk Assessment [PRA] indicates that basic Radon protection measures are required as it is estimated that between 3% - 5% of properties in this area could be affected.
- The site is considered to present a low to moderate potential contamination risk to both construction workers and future site occupants. This is based upon the presence of Made Ground associated with the construction of the current structures.
- The site does not lie within a high-risk development area according to the Coal Authority. Based on the Coal Mining Risk Assessment, it is considered that there could be a low potential risk from the shallow thin coal seams observed in the BGS borehole located to the west and south of site. These coal seams [Thin Coal & Lidget Coal] are anticipated to lie near horizontal however, with the influence from complex faulting that intersects the site and its' surrounding areas this may or may not lie beneath the site. This is discussed further in Section 6.0 of this report.

3.0 FIELD AND LABORATORY STUDIES

3.1 Geomorphological/Geological Mapping

- 3.1.1 No geological, geomorphological, or topographical surveys have been completed as part of this investigation.

3.2 Ground Investigation

- 3.2.1 A GI was undertaken based upon the findings of the PRA and development proposals. The locations of the exploratory holes are shown on the Enzygo 'Exploratory Hole Location Plan' [Drawing No: SHF1888002-ENZ-XX-XX-DR-Z-0002] dated September 2023, included within Appendix 1.

3.3 Site Works

- 3.3.1 A GI was undertaken by Enzygo on 14th and 15th August 2023. The works comprised one cable percussive boreholes [BH1] and three dynamically sampled windowless boreholes [WS1 to WS3] to identify underlying ground conditions.
- 3.3.2 Strength of soils were assessed using Standard Penetration Tests (SPT). The results of which are included on the borehole logs presented in Appendix 2.
- 3.3.3 Representative soil samples were collected for geotechnical and geochemical testing. All samples were collected using appropriate sampling equipment that was cleaned at each sampling location.

3.4 Drainage studies

- 3.4.1 No drainage studies were required as part of this investigation.

3.5 Geophysical Surveys

- 3.5.1 No geophysical surveys were required as part of this investigation.

3.6 Pile Tests

- 3.6.1 No pile testing was required as part of this investigation.

3.7 Other Fields Work

- 3.7.1 No other field works were required as part of this investigation.

3.8 Laboratory Investigation

- 3.8.1 Samples for geotechnical testing were sent to the laboratories of I2 Analytical Ltd, which is UKAS accredited, for the following analysis:
- Moisture Content.
 - Atterberg Limits Determinations.
 - Particle Size Distribution.
 - BRE SD1.

- 3.8.2 Samples for chemical analysis were sent to the laboratories of I2 Analytical Ltd, who are MCERTS accredited. Samples were tested for the CLEA metal suite, pH, sulphate, cyanide, phenols, speciated Polycyclic Aromatic Hydrocarbons (PAH), organic carbon, banded Total Petroleum Hydrocarbon (TPH) and asbestos screen.
- 3.8.3 The laboratory testing results are included within Appendix 3.

4.0 GROUND AND GROUNDWATER CONDITIONS

4.1 Summary of Ground and Groundwater Conditions

- 4.1.1 Ground and groundwater conditions have been assessed with the investigation typically identify the following strata.

Table 4.1.1 Ground and groundwater conditions

Strata	Summary Description	Thickness (m)
Made Ground	Black sandy gravelly Clay with frequent gravel sized fragments of wood, glass and pottery. Gravel contains sandstone, red brick and concrete.	0.20 to 0.50
Thornhill Rock	Loose to medium dense yellowish brown slightly silty clayey sandy angular to subangular fine to coarse Gravel of sandstone.	>4.80
	Soft to firm brown sandy slightly gravelly Clay. Gravel comprises mudstone and sandstone.	>4.00
Groundwater.	Groundwater was not encountered on site in any of the exploratory holes.	N/A

- 4.1.2 Details of the ground and groundwater conditions as encountered are given on the exploratory hole records included in Appendix 2 and are summarised in the sections below.

4.2 Made Ground

- 4.2.1 Made Ground was typically encountered within the areas of the demolition of the previous buildings on site to a maximum depth of 0.50m begl. Made Ground generally comprised black or brown sandy gravelly Clay with frequent gravel sized fragments of wood, glass and pottery. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, red brick and concrete.

4.3 Thornhill Rock

- 4.3.1 Thornhill Rock was encountered across the entire site beneath the Made Ground. This was recovered as a completely weathered horizon of typically granular material comprising yellowish brown slightly silty clayey sandy angular to subangular fine to coarse Gravel with brown sandy slightly gravelly Clay encountered within WS03, proven to a maximum depth of 5.00m begl at which depth the exploratory holes refused [upon assumed intact rock].
- 4.3.2 Upon refusal chiselling was undertaken in CP01 at a depth of 4.90m begl. The borehole was progressed 0.10m over a period of two hours.
- 4.3.3 Generally, the Thornhill Rock is encountered as a fine grained thickly bedded Sandstone but can be split with mudstone. Therefore, the descriptions above are as anticipated.
- 4.3.4 Atterberg testing and particle size distribution testing confirms engineering soil descriptions.

4.4 Visual and Olfactory Evidence of Contamination

- 4.4.1 No visual or olfactory evidence of contamination was encountered during the site works.

4.5 Groundwater

- 4.5.1 Groundwater was not encountered during the site works.

5.0 CONTAMINATION ASSESSMENT

5.1 General

5.1.1 A Tier I risk assessment has been undertaken using available and current screening values for human health. The risk assessment is undertaken based on the findings of the preliminary conceptual model presented in the previous PRA [Enzygo PRA, Ref: SHF.1888.002.GE.R.001.C, dated March 2023]. Based on the contamination testing and Tier I assessment, a revised Conceptual Model has been prepared, which is presented later in this section. Where significant risks are identified remedial measures are recommended.

5.1.2 The contamination assessment has been undertaken using information from the Enzygo GI.

5.2 Human Health

5.2.1 Assessment of the risks to human health has been undertaken by comparing the soil quality data with reference values obtained from the Contaminated Land Exposure Assessment (CLEA), Soil Guideline Values (SGV) and General Acceptance Criteria (GAC) published by LQM and derived in consultation with the Chartered Institute of Environmental Health. The LQM/CIEH S4ULs values are used, and summary tables of the reference values are included in Appendix 6.

5.2.2 Where an exceedance is identified the risk is assessed by considering the sensitivity of the proposed development and the potential pathway. The proposed use of the site is for residential housing with associated hardstanding and soft landscape areas. As such the GAC values for residential end use with plant uptake use are considered appropriate.

5.2.3 Exceedances were encountered within the locations of CP01, WS1 and WS3 and these are shown below.

Table 5.2.3 Soil quality analysis exceedances

Soil Sample Location and Depth	Determinant	Concentration	Threshold GAC Value
		(mg/kg)	(mg/kg)
CP01 – 0.10m begl	Dibenz(a,h)anthracene	0.3	0.24
WS1 – 0.10m begl	Benzo(b)fluoranthene	3.6	2.6
	Benzo(a)pyrene	2.9	2.2
	Dibenz(a,h)anthracene	0.38	0.24
	Lead	220	200
WS3 – 0.15m begl	Lead	210	200

5.2.4 Three soil samples of Made Ground [CP01, WS1 and WS3] have returned test results with exceedances of the Enzygo GAC values for residential end use with plant uptake, these exceedances were recorded for Polynuclear Aromatic Hydrocarbons (PAH's) from the samples obtained from CP01 and WS1, as well as an exceedance of Lead from the samples obtained from WS1 and WS3. Two soils samples of Made Ground [CP01 and WS1] have tested positive for asbestos [chrysotile], likely associated with the demolition of the historic buildings on site.

5.2.5 To remediate the impacted Made Ground, these soils should be excavated and removed from site. The areas required for removal will be detailed as part of the Remediation Method Statement [RMS]. As part of the works, validation samples will be taken from the base and sides of the excavations to ensure that remaining materials are suitable. Any areas that need to be

filled with imported or site won material should have appropriate chemical certificates to prove stability. The remediation works undertaken would be summarised as part of the Validation Reporting.

- 5.2.6 No further exceedances of any GAC values were found when comparing laboratory test results to a 'residential end use with plant uptake' assessment criteria.

5.3 Ground Gas

- 5.3.1 Kirklees Council EHO, identified that the submitted information has not sufficiently risk assessed the site and given the proximity to infilled land, therefore, a ground gas risk assessment has been undertaken to allow for the discharge of Condition 9.
- 5.3.2 Following BS 8485:2015+A1:2019 an initial assessment was undertaken and the results discussed in sections 5.3.3 – 5.3.6 below.
- 5.3.3 A preliminary ground gas risk assessment was undertaken as part of the Enzygo Ltd, 'Preliminary Risk Assessment', [SHF.1888.002.GE.R.001.C], dated March 2023. This report identified a low to moderate risk from ground gas due to the presence of Made Ground associated with potentially worked coal seams onsite and an infilled historical sandstone quarry located 67m northeast of the site.
- 5.3.4 On review of the ground conditions presented within Section 4, Made Ground was encountered onsite as reworked Thornhill Rock comprising Black/brown sandy gravelly Clay with frequent gravel sized fragments of wood, glass and pottery. Gravel contains sandstone, red brick and concrete and to a maximum depth of 0.50m begl. As part of the development works all Made Ground soils will be removed in order to achieve proposed site levels. Therefore, the Made Ground is no longer considered a source of ground gas risk.
- 5.3.5 As concluded with the CMRA detailed within Section 6, the Enzygo Ltd, 'Preliminary Risk Assessment', [SHF.1888.002.GE.R.001.C], dated March 2023 identified potential coal seams beneath the site to comprise the Thin Coal and Lidget Coal of 0.20m and 0.10m thicknesses respectively. Following the recent GI, no coal has been encountered beneath the site and Thornhill Rock has been proven to depths between 4.0m and 5.0m. No significant deep Made Ground associated with historic coal workings, or coal was identified on site. Therefore, it is considered that there would be negligible risk from ground gas.
- 5.3.6 The ceased backfilled Earls Heaton sandstone quarry located 67m northeast of site, was deemed to pose a low to moderate risk from ground gas to the proposed development within the Enzygo Ltd, 'Preliminary Risk Assessment', [SHF.1888.002.GE.R.001.C], dated March 2023. However, considering the quarry has been backfilled since 1992, and is unlikely to comprise any significant putrescible materials, ground gas generation is not considered to be a significant risk. Other contributing factors such as topography [site elevation] and ground conditions would indicate that there is no credible pathway. Google Earth imagery, last accessed 28th June 2024, indicates that the development site is approx. 5m below the historical sandstone quarry; and reported ground conditions/ BGS Online viewer, last accessed last accessed 28th June 2024, would indicate that the bedrock geology typically comprises sandstone [Thornhill Rock] with no superficial deposits. Therefore, it can be concluded that the preferential pathway for any potential ground gases would migrate up through the granular [permeable] solid geology into the atmosphere and not downhill towards the development site.

5.4 Risk Classification

5.4.1 Enzygo limited has utilised the available information, together with our experience to assess the likely risks to development from land quality issues. Definitions of the risk terms used are provided on the table overleaf.

Table 5.3.1 Risk Classification

Risk	Description
Dismissed	The risk has been dismissed.
Negligible	No contamination risk has been identified which is likely to affect development.
Low	No significant contaminated land risks have been encountered affecting development and a low risk that remediation will be required.
Low-Moderate	There are unlikely to be significant contaminated land issues associated with the site which will adversely affect its re-development. However, minor or localised contamination may be present requiring remediation. Remediation should be possible under a discovery strategy and with a call out service.
Moderate	Some potential contaminated land risks have been encountered or identified which may affect re- development. The risks identified are unlikely to affect the entire site or preclude development. Remediation is considered feasible as part of the development process and no further investigation is considered necessary.
Moderate-High	Some potentially significant contaminated land risks have been identified at the property that requires remediation. It is recommended that a separate remedial methodology is prepared supported by a site-specific risk assessment
High	Significant potential contaminated land risks have been identified and remediation is required supported by further intrusive ground investigation, risk assessment and remedial design.

5.4.2 Where adverse risks from ground instability are identified these are discussed within the report.

5.5 Revised Conceptual Model

5.5.1 A revised Conceptual Model is presented below based on the findings of the ground investigation and the revised Conceptual Model is presented below:

Source contaminants	Location	Exposure Pathway	Potential Receptor	Risk/ Probability of Exposure	Details
Human Health					
Asbestos, metals and hydrocarbons from Made Ground	Unforeseen Contamination	Ingestion dermal and inhalation	Construction Workers	Negligible	Standard construction PPE should address risk under CDM 2015 Regulations. Discovery Strategy during construction
			Site users		
Polynuclear Aromatic Hydrocarbons [PAH], lead and asbestos	On-site sources	Ingestion dermal and inhalation	Construction Workers	Negligible	Localised nominal chemical exceedances of Polynuclear Aromatic Hydrocarbons [PAH], lead and asbestos identified within the shallow Made Ground onsite which is proposed to be remediated as part of the development works. Standard construction PPE will address risk under CDM 2015 Regulations.
			Site users		
Hydrocarbon and metals	Migration from off-site sources	Ingestion dermal and inhalation	Construction Workers	Dismissed	No sources identified.
			Site users		
Ground Gas	Potentially Infilled Ground	Asphyxiant, Toxic & Explosive	Construction Workers	Negligible	No significant sources or credible pathways have been identified.
			Site users		
Radon	Natural Soils	Inhalation	Construction Workers	Low	Basic radon protective measures are considered necessary.
			Site Users		
Groundwater					
Hydrocarbon and metals	Unforeseen Contamination	Vertical Migration	Groundwater	Negligible	Local, nominal chemical exceedances of PAH's, lead and asbestos identified within the shallow Made Ground onsite. Contamination has identified to be localised and will be remediated by removing source.
Surface Water					
Hydrocarbon and metals	Unforeseen Contamination	Horizontal Migration	River Network	Dismissed	Chemical exceedances of PAH's, lead and asbestos identified within the shallow Made Ground onsite. Contamination has identified to be localised and will be remediated removing source. The Chickenley Beck is located over 50m south of site therefore migration [pathway] is very unlikely .
Environmental Receptors					
Onsite contaminants		Ingestion dermal and inhalation	Ecology	Dismissed	No receptor
		Direct	Archaeology	Dismissed	No receptor
		Direct	Geology	Dismissed	No receptor
		Phytotoxic	Woodland	Dismissed	No receptor
		Phytotoxic	Crops	Dismissed	No receptor

Source contaminants	Location	Exposure Pathway	Potential Receptor	Risk/ Probability of Exposure	Details
		Ingestion dermal and inhalation	Livestock	Dismissed	No receptor
Building Services					
Onsite contaminants		Direct.	Historic Buildings	Dismissed	No receptor
		Direct	Proposed Buildings	Dismissed	No significant source.
		Permeate into pipework	Water Pipes	Low	To be checked with local water authority.

5.6 Remediation

General

- 5.6.1 The GI identified localised elevated concentrations of PAH's, lead, and asbestos on site in the Made Ground at CP01 [0.10m begl], WS1 [0.10m begl] and WS3 [0.15m begl]. Localised 'hot spot' removal of the source material is recommended at the site, as part of the development works.
- 5.6.2 The works required will be detailed within an RMS and work undertaken summarised within a Validation report.

Unforeseen Contamination

- 5.6.3 Regardless of the investigation works undertaken, there is a residual risk that unforeseen contamination might be encountered on site during the construction works. As such a discovery strategy is proposed.
- 5.6.4 If unforeseen contamination is encountered during construction works, for example, as suspected localised soils contamination outside the areas investigated, a geo-environmental consultant would be available on a 'call-out' basis to undertake an assessment. If 'unforeseen contamination' is encountered, the remedial strategy would be either to remove or cap the soils, as appropriate, subject to regulatory liaison and approval.

Asbestos Management

- 5.6.5 Asbestos has been detected in soils, as such a precautionary approach should be adopted with respect to the potential for asbestos, given the site's history and present use.
- 5.6.6 To protect workers, measures should be incorporated into the Contractor's Construction Stage Health and Safety Plan as required under the Construction Design and Management (CDM) Regulations to mitigate risk to construction works. Precautionary measures may include.
- Designing temporary works to minimise disturbance of the backfill material.
 - Separating material and disposal of soils containing asbestos.
 - Wetting down during excavation.
 - Sheeting of stockpiles where (if) asbestos is suspected.

- Testing of soils and off-site disposal of any soils found or suspected of containing asbestos.
- Preventing access to the construction site by members of the public.
- Use of good hygiene measures, including washing down of plant.
- Use of appropriate PPE, including face masks.

5.7 Conclusions

- 5.7.1 Localised nominal exceedances of the GAC values for a residential end use with plant up take were recorded within the Made Ground at CP01 [0.10m], WS1 [0.10m] and WS3 [0.15m]. Therefore, localised source removal at these locations has been recommended, as contamination is not suspected to be widespread.

6.0 COAL MINING

6.1 General

- 6.1.1 No historic underground workings have been identified within approximately 250m of the site. Furthermore, the site is not considered to lie within a development high risk area according to the BGS Interactive Online Viewer.
- 6.1.2 It has not been possible to identify if any coal seams underlie the site, based upon the available information, two coal seams have been identified (Thin Coal & Lidget Coal). The geology of the area surrounding the site comprises typically horizontal strata influenced by complex faulting systems. However, given the anticipated thickness of the identified coal seams [Thin Coal 0.20m and Lidget Coal 0.10m], and the existing GI information gathered it is unlikely that these would have been economical to abstract via underground means.
- 6.1.3 Following the recent GI, no coal has been encountered beneath the site and Thornhill Rock has been proven to depths between 4.0m and 5.0m. No significant deep Made Ground associated with historic coal workings, or coal was identified on site, therefore surface robbing is unlikely. Considering the thickness of the Thin Coal & Lidget Coal [up to 0.20m in thickness], it is anticipated that there is at least 10x coal seam thickness of Thornhill Rock above any potential coal seams.
- 6.1.4 Consequently, it is unlikely that the underground Coal mining would present a significant risk to the proposed development based upon the information reviewed.

7.0 CHARACTERISTIC MATERIAL PARAMETERS

7.1 Design Basis

7.1.1 The geotechnical design (including interpretation and determination of design parameters and ground model) is to be undertaken to British Standards. The design has been undertaken in accordance with the following design standards, publications and Code of Practice (CoP):

- British Standards Institute. BS6031:2009 – Code of Practice for Earthworks.
- Eurocode: Basis of Structural Design (BS EN 1990: 2002 + A1: 2005 incorporating corrigenda December 2008 and April 2010 plus UK National Annex).
- Eurocode 7: Geotechnical Design – Part 1 – General Rules (BS EN 1997-1:2004 inc. Corr No. 1 plus UK National Annex).
- BS8002, CoP for Earth Retaining Structures, 2015.

7.2 Choice of characteristic parameters

7.2.1 As a part of the interpretation, the parameters determined will be “characteristic” values (i.e. “a cautious estimate of the value affecting the occurrence of the [ultimate] limit state”). However, when analysing settlements i.e. serviceability limit state, in accordance with current UK guidance, “average” parameters can be utilised.

7.3 Made Ground

7.3.1 Made Ground will be removed as part of the development works, so have not been considered further as part of this assessment.

7.4 Thornhill Rock

7.4.1 Thornhill Rock was encountered across the entire site beneath the Made Ground. This was recovered as a completely weathered horizon of typically granular yellowish brown slightly silty clayey sandy angular to subangular fine to coarse Gravel [Weathered Sandstone] with a brown sandy slightly gravelly Clay [Weathered Mudstone] encountered within WS03, only.

Granular Thornhill Rock

7.4.2 The granular deposits of the Thornhill Rock were encountered within the western and central section of the site [WS1- WS2 & CP1].

7.4.3 A total of thirteen SPT N tests were undertaken within this deposit recording SPT N-values of between 4 and 50 or greater, averaging 27. This indicates the materials to be loose to dense, confirming the materials’ engineering descriptions.

7.4.4 For design purposes a characteristic angle of shearing resistance, (Φ'), of 35° based on a conservative SPT N-value of 27 and the material’s description should be used.

7.4.5 A unit weight of 20kN/m³ should be adopted for the weathered sandstone [gravel].

Cohesive Thornhill Rock

- 7.4.6 The cohesive deposits of the Thornhill Rock were encountered within the eastern section of the site [WS3].
- 7.4.7 A total of three samples of the Thornhill Rock were retained and tested for moisture content and Atterberg Limits. The moisture content of the Thornhill Rock generally ranged between 12% and 19%, with an average of 16%. The Plastic Limit (PL) of this material ranged between 18% and 27, with an average of 22%. The Liquid Limit (LL) ranged between 35% and 52%, with an average of 44%. The Plasticity Index (PI) ranged between 17% and 25%, with an average of 22%. The results indicate the material to typically be a clay of low to intermediate plasticity, and low to medium volume change potential.
- 7.4.8 A total of four SPT N tests were undertaken within these deposits recording SPT N-values of between 9 and 50 or greater, averaging 25.5.
- 7.4.9 Values of c_u derived from SPT N-values after Stroud (Tomlinson, 2001) ranged between 45kN/m^2 and 250kN/m^2 using a relationship of $5.0N=c_u$, based upon a PI of 22% a typical design values of 75kN/m^2 should be used.
- 7.4.10 Stroud established a relationship between SPT N-value and undrained shear strength, and modulus of compressibility (mv) based on factors derived from PI (Tomlinson, 2001). Based upon an estimated PI of 22% and a moderately conservative undrained shear strength of 75kN/m^2 an mv of $0.13\text{m}^2/\text{MN}$ has been calculated. This calculated value shall be adopted as a general conservative design value.
- 7.4.11 A unit weight of 19kN/m^3 should be adopted for the weathered mudstone [clay].

7.5 Buried Concrete

- 7.5.1 Eight samples Thornhill Rock have undergone sulfate and pH testing, indicating that soils have soluble sulphate concentrations of less than 0.5 g/l consistent with DS1 Conditions of BRE Special Digest 1 and as such buried concrete may be designed in accordance with ACEC Class AC-1s.

7.6 Summary of Geotechnical Parameters

7.6.1 Presented within Table 7.6.1 below is a summary of the characteristic geotechnical parameters defined within above.

Table 7.6.1: Summary of Geotechnical Parameters

Soil	Design Parameter	Design Value
Thornhill Rock (Cohesive)	Cu (kN/m ²)	75
	Effective internal angle of Shearing Resistance Φ' (°)	30
	c' (kPa)	0
	Unit Weight (kN/m ³)	19
	m _v (m ² /MN)	0.13
Thornhill Rock (Granular)	Effective internal angle of Shearing Resistance Φ' (°)	35
	Unit Weight (kN/m ³)	20

8.0 GEOTECHNICAL RISK REGISTER

8.1.1 It is considered that the scheme still meets the criteria of Geotechnical Category 1 of Eurocode 7 [B S EN 1997-1].

8.1.2 A review of the geotechnical risks associated with the scheme has been undertaken. A revised geotechnical risk register has been produced for the proposed scheme in order to identify remaining potential hazards, new hazards, the probability of the hazard occurring, impact and risk rating. It is a generalised risk register that covers the main risks.

Table 8.1.2: Risk Classification Table

Likelihood [L]		Severity [S]				
		1	2	3	4	5
		Minor	Moderate	Serious	Major	Catastrophic
1	Extremely unlikely	1	2	3	4	5
2	Unlikely	2	4	6	8	10
3	Likely	3	6	9	12	15
4	Extremely likely	4	8	12	16	20
5	Almost certain	5	10	15	20	25

The risk classification is the product of the likelihood and the severity.

Table 8.1.2a & 8.1.2b: Risk Assessment Criteria and Rating

Potential severity of harm occurring		
1	Minor	Minor damage or loss – [no human injury]
2	Moderate	Moderate damage or loss – [Slight injury or illness]
3	Serious	Substantial damage or loss – [serious injury or illness]
4	Major	Major damage or loss – [Fatal injury]
5	Catastrophic	Catastrophic loss or damage [Multiple fatalities]

Risk Classification [R]	
Low [1-8]	Ensure assumed control measures are maintained and reviewed as necessary.
Medium [9 – 19]	Additional control measures needed to reduce risk rating to a level that is equivalent to a test of 'reasonably required' for.
High [20 -25]	Activity not permitted. Hazard to be avoided or risk to be reduced to tolerable level.

8.1.3 The risk register provides control measures to be implemented [where relevant] and a 'post-design-control' Risk Rating.

$$\text{Risk rating (R)} = \text{Probability (P)} \times \text{Impact (I)}.$$

Table 8.1.2c: Geotechnical Risk Assessment

No	Hazard	Risk	Risk before control			Mitigation Measures	Risk after control		
			L	S	R		L	S	R
1	Unforeseen Ground Conditions	Damage to property	3	3	9	A targeted Ground Investigation was undertaken.	1	3	3
2	Coal Mining	Damage to property	2	4	8	Desk based PRA, GI, appropriate design parameters and mitigation.	1	4	4
3	Contaminated Ground	Risk to Human health during construction	3	3	9	Review historical land use & publicly available information to assess probability. A Ground Investigation was undertaken identifying chemical exceedances of PAH's, lead and asbestos within the shallow Made Ground onsite. Discovery strategy during the development. These will be remediated as part of the development works.	1	2	2
4	Ground Movement[s]	ULS or SLS failure of buildings and or infrastructure Failure or Retaining Structure on site.	3	3	9	Undertaken a targeted Ground Investigation and defined appropriate design parameters and methods to current UK guidance and standards. Monitoring of construction works. Quality assurance and good site supervision.	1	3	3
5	Excavation Collapse during construction.	Local Collapse	2	4	8	Suitable temporary supports if required.	1	4	8

NOTES:

1. A 'Hazard' is a condition or physical situation with a potential for an undesirable event.
2. A 'Risk' is an uncertain event or set of circumstances that should it occur would have an effect on achieving the projects objectives.
3. Mitigation Measures include:
 - Avoid the risk - by eliminating the uncertainty or using an alternative approach.
 - Mitigate the risk - by reducing the risk to an acceptable level by making it less likely that the risk event will occur.
 - Accept and manage the risk - by assuming the risk as reasonable given the cost or effect on time or quality and even life.

- 8.1.4 No significant additional geotechnical risks have been identified following the review of the GI.
- 8.1.5 All current identified risks can be mitigated through suitable design and construction.

9.0 ENGINEERING ASSESSMENT

- 9.1.1 It is proposed development is to comprise five residential houses and a retaining wall along the southern section of the site. The design process will be detailed within the Geotechnical Design Report [GDR].

Appendix 1 - Drawings



KEY:

- Site Boundary
- Cable Percussion Boreholes (CP)
- Window Sampler Borehole (WS)

Notes:

- Do not scale from this drawing.
- All dimensions are in meters unless stated otherwise.
- This drawing is to be read in conjunction with all relevant drawings and documents associated with this project.
- All existing and proposed dimensions, levels and locations to be checked and verified by the main contractor on site prior to the commencement of the works and any anomalies reported to the engineer.

P01	07.09.23	Issued for comment / approval	LB	RF	RF
Rev	Date	Description	DRA	CHK	APP

Project
Ossett Lane, Dewsbury

Client
Campbell homes Limited

Drawing Title
Exploratory Hole Location Plan

Scale 1:500 @ A3	Date 07.09.23	Status Preliminary
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DWG No. SHF1888002-ENZ-XX-XX-DR-Z-0002	Revision P01
--	------------------------



BRISTOL 01454 269 237	MANCHESTER 0161 413 6444	SHEFFIELD 0114 321 5151
CARDIFF 02920 023 700	www.enzygo.com hello@enzygo.com	CAMBRIDGE 01799 542 473

2No. HOUSE TYPE-A
5-Bed, 6 person 2½ storey detached dwelling
GIA (excluding garage): 146.5 sq.m (1,576 sq. ft)

Two parking spaces per dwelling including integrated single garage.

DRAFT

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copyright. It cannot be reproduced in any form without
express consent of the company. Written dimensions to be
checked on site and discrepancies are to be reported prior to
commencing work. Figured dimensions only are to be taken
from this drawing. Do not scale. If in doubt ask.

4 More
London Riverside
London
SE1 2JU
0207 462 7979
seufdesigns.co.uk

Quayside House
Furnival Road
Sheffield,
S4 7FA
0114 226 0255

18 Piccadilly
Manchester
M2 2HF



OSSETT LANE

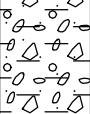
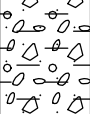
SITE LAYOUT PLAN

Appendix 2 - Exploratory Hole Logs



Enzygo Ltd
Tel: 01454 269237
Fax: 01454 269760
Web: www.enzygo.com

Site Ossett Lane, Dewsbury				WS 1
Job No SHF.1888.002	Dates Start 15-08-23 Finish 15-08-23	Ground Level (m)	Co-Ordinates	
Client Campbell Homes Ltd				Sheet 1 of 1

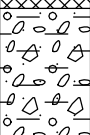
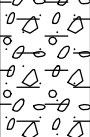
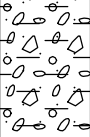
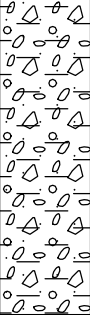
Well	Water Levels	Samples & In Situ Testing			Depth (m)	Level (mAD)	Legend	Stratum Description	
		Depth (m)	No/Type	Results					
		0.00 - 1.00	SPT	N= 5	0.20			MADE GROUND: Black sandy gravelly CLAY with frequent gravel sized fragments of wood, glass and pottery. Sand is fine to coarse. Gravel is fine to coarse angular to subangular of sandstone, red brick and concrete	0
		1.00 - 2.00	1ES 2B					Loose to medium dense yellowish brown slightly silty slightly clayey sandy angular to subangular fine to coarse GRAVEL of Sandstone. Sand is fine to coarse. [Thornhill Rock]	1
		2.00 - 2.45	SPT	N= 11					2
		3.00 - 3.45	SPT	N= 12					3
		3.50	3D						
		4.00 - 4.45	SPT	N= 50/25mm	4.45				4
					{5.00}			Borehole completed at 4.45m.	5

General Remarks

1. Hand excavated inspection pit from ground level to 1.00m begl.
2. D - Disturbed Sample; ES - Environmental Sample; B - Bulk Sample.
3. Densities and soil consistencies are based on insitu tests.
4. No visual or olfactory evidence of contamination observed.
5. Groundwater was not encountered.
6. SPT - Standard Penetration Test; N - Number of blows.
7. Backfilled with arisings.

Groundwater	Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)
All dimensions in metres Scale 1:31.25				
				Logged By RF

Site Ossett Lane, Dewsbury				WS 2
Job No SHF.1888.002	Dates Start 15-08-23 Finish 15-08-23	Ground Level (m)	Co-Ordinates	
Client Campbell Homes Ltd				Sheet 1 of 1

Well	Water Levels	Samples & In Situ Testing			Depth (m)	Level (mAD)	Legend	Stratum Description	
		Depth (m)	No/Type	Results					
					0.40			MADE GROUND: Black sandy gravelly CLAY with frequent gravel sized fragments of wood, glass and pottery. Sand is fine to coarse. Gravel is fine to coarse angular to subangular of sandstone, red brick and concrete.	0
		1.00 - 1.45 1.00	SPT 1ES	N= 4				Loose to medium dense yellowish brown slightly silty clayey sandy angular to subangular fine to coarse GRAVEL of Sandstone. Sand is fine to coarse. [Thornhill Rock]	1
		1.50	3D						
		2.00 - 2.45 2.00 - 3.00	SPT 2B	N= 14					2
		3.00 - 3.45	SPT	N= 16					3
		3.50	4D						
		4.00 - 4.45	SPT	N= 50/25mm	4.45				4
					{5.00}			Borehole completed at 4.45m.	5

General Remarks

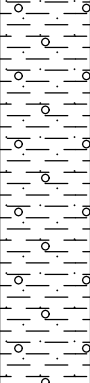
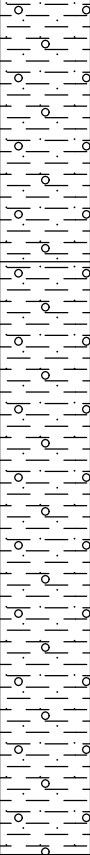
1. Hand excavated inspection pit from ground level to 1.00m begl.
2. D - Disturbed Sample; ES - Environmental Sample; B - Bulk Sample.
3. Densities and soil consistencies are based on insitu tests.
4. No visual or olfactory evidence of contamination observed.
5. Groundwater was not encountered.
6. SPT - Standard Penetration Test; N - Number of blows.
7. Backfilled with arisings.

Groundwater	Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)
All dimensions in metres Scale 1:31.25				
				Logged By RF



Enzygo Ltd
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Web: www.enzygo.com

Site Ossett Lane, Dewsbury				WS 3
Job No SHF.1888.002	Dates Start 15-08-23 Finish 15-08-23	Ground Level (m)	Co-Ordinates	
Client Campbell Homes Ltd				Sheet 1 of 1

Well	Water Levels	Samples & In Situ Testing			Depth (m)	Level (mAD)	Legend	Stratum Description	
		Depth (m)	No/Type	Results					
		0.15	1ES		0.35			MADE GROUND: Brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium angular of sandstone.	0
		0.50	2ES					Soft to firm brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mudstone and sandstone. [Thornhill Rock]	
		1.00 - 1.45 1.00 - 2.00	SPT 3B	N= 9	2.00				1
		1.50	4D						
		2.00 - 2.45	SPT	N= 13				Firm brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mudstone and sandstone. [Thornhill Rock]	2
		3.00 - 3.45	SPT	N= 30					3
		3.50 3.60 - 4.00	5D 6B						
		4.00 - 4.45	SPT	N= 50/25mm	4.45				4
					{5.00}			Borehole completed at 4.45m.	5

General Remarks

1. Hand excavated inspection pit from ground level to 1.00m begl.
2. D - Disturbed Sample; ES - Environmental Sample; B - Bulk Sample.
3. Densities and soil consistencies are based on insitu tests.
4. No visual or olfactory evidence of contamination observed.
5. Groundwater was not encountered.
6. SPT - Standard Penetration Test; N - Number of blows.
7. Backfilled with arisings

Groundwater

Date

Strike Depth
(m)

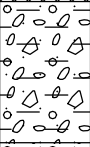
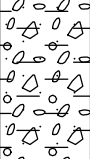
Casing Depth
(m)

Depth After
Observation
(m)

All dimensions in metres
Scale 1:31.25

Logged By
RF

Site Ossett Lane, Dewsbury				CP 01
Job No SHF.1888.002	Dates Start 14-08-23 Finish 14-08-23	Ground Level (m)	Co-Ordinates	
Client Campbell Homes Ltd				Sheet 1 of 1

Well	Water Levels	Samples & In Situ Testing			Depth (m)	Level (mAD)	Legend	Stratum Description	
		Depth (m)	No/Type	Results					
		0.10	1ES		0.50			MADE GROUND: Black sandy gravelly CLAY with frequent gravel sized fragments of wood, glass and pottery. Sand is fine to coarse. Gravel is fine to coarse angular to subangular of sandstone, red brick and concrete.	0
		0.30	2D						
		1.00 - 1.45	SPT	N= 14	1.20			Medium dense yellowish brown slightly silty clayey sandy angular to subangular fine to coarse GRAVEL of Sandstone. Sand is fine to coarse. [Thornhill Rock]	1
		1.00	3ES						
		1.20	4D						
		1.50	5ES					Medium dense to dense yellowish brown slightly silty slightly clayey sandy angular to subangular fine to coarse GRAVEL of Sandstone. Sand is fine to coarse. [Thornhill Rock]	
		1.80 - 2.50	6B		2				
		2.00 - 2.45	SPT	N= 21					
		2.60	7D						
		2.70 - 2.70	8B		3				
		3.00 - 3.45	SPT	N= 37					
		3.80	9D						
		4.00 - 4.45	SPT	N= 50	4				
		4.00 - 4.80	10B						
		5.00 - 5.45	SPT	N= 50/70mm	5.00				
		5.00	11D					Borehole completed at 5.00m.	5
					{6.00}				6

General Remarks

1. Hand excavated inspection pit from ground level to 1.00m begl.
2. D - Disturbed Sample; ES - Environmental Sample; B - Bulk Sample.
3. Densities and soil consistencies are based on insitu tests.
4. No visual or olfactory evidence of contamination observed.
5. Groundwater was not encountered.
6. SPT - Standard Penetration Test; N - Number of blows.
7. Backfilled with arisings.

Groundwater	Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)
All dimensions in metres Scale 1:37.5				
				Logged By RF

Appendix 3 - Chemical Testing Results

Reuben Fisher
Enzygo Geoenvironmental Ltd
Ducie House, Ducie Street,
M1 2JW

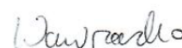
i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

e: Reuben.Fisher@enzygo.com

Analytical Report Number : 23-51454

Project / Site name:	Ossett Lane, Dewsbury	Samples received on:	16/08/2023
Your job number:	SHF.1888.002	Samples instructed on/ Analysis started on:	16/08/2023
Your order number:	SHF.1888.002	Analysis completed by:	23/08/2023
Report Issue Number:	1	Report issued on:	23/08/2023
Samples Analysed:	7 soil samples		



Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 23-51454
Project / Site name: Ossett Lane, Dewsbury
Your Order No: SHF.1888.002

Lab Sample Number				2783564	2783565	2783566	2783567	2783568
Sample Reference				CP01	CP01	CP01	WS1	WS2
Sample Number				1	3	5	1	1
Depth (m)				0.10	1.00	1.50	0.10	1.00
Date Sampled				27/07/2023	27/07/2023	27/07/2023	27/07/2023	27/07/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	67	31	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	9	14	9.6	15	13
Total mass of sample received	kg	0.001	NONE	1	1.1	1.2	1.1	1.2

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile- Loose Fibres	-	-	Chrysotile- Loose Fibres	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	Not-detected	Detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	SPU	SPU	SPU	SPU	SPU

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.12	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	0.19	< 0.05	< 0.05	0.26	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.05	< 0.05	< 0.05	0.12	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.15	< 0.05	< 0.05	0.29	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	2	< 0.05	< 0.05	3.4	< 0.05
Anthracene	mg/kg	0.05	MCERTS	0.52	< 0.05	< 0.05	0.83	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	4.4	< 0.05	< 0.05	6.2	< 0.05
Pyrene	mg/kg	0.05	MCERTS	3.8	< 0.05	< 0.05	5.4	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.4	< 0.05	< 0.05	3.3	< 0.05
Chrysene	mg/kg	0.05	MCERTS	2.1	< 0.05	< 0.05	3.1	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	2.5	< 0.05	< 0.05	3.6	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1.1	< 0.05	< 0.05	1.2	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.1	< 0.05	< 0.05	2.9	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1	< 0.05	< 0.05	1.3	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.3	< 0.05	< 0.05	0.38	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.96	< 0.05	< 0.05	1.4	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	23.6	< 0.80	< 0.80	33.8	< 0.80
-----------------------------	-------	-----	-----------	------	--------	--------	------	--------

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	11	6	23	7.3
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	< 0.2	< 0.2	1	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18	24	14	20	15
Copper (aqua regia extractable)	mg/kg	1	MCERTS	27	26	11	48	22
Lead (aqua regia extractable)	mg/kg	1	MCERTS	100	14	15	220	23
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	36	20	24	20
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	76	61	64	130	63

Monoaromatics & Oxygenates

Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

Analytical Report Number: 23-51454
 Project / Site name: Ossett Lane, Dewsbury
 Your Order No: SHF.1888.002

Lab Sample Number	2783564	2783565	2783566	2783567	2783568
Sample Reference	CP01	CP01	CP01	WS1	WS2
Sample Number	1	3	5	1	1
Depth (m)	0.10	1.00	1.50	0.10	1.00
Date Sampled	27/07/2023	27/07/2023	27/07/2023	27/07/2023	27/07/2023
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	< 8.0	9	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	< 8.0	75	52	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	< 10	< 10	85	57	< 10

TPH-CWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TPH-CWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	< 10	< 10	17	16	< 10
TPH-CWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	12	< 10	58	55	< 10
TPH-CWG - Aromatic (EC5 - EC35) _{EH_CU+HS_1D_AR}	mg/kg	10	NONE	19	< 10	77	73	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-51454
Project / Site name: Ossett Lane, Dewsbury
Your Order No: SHF.1888.002

Lab Sample Number				2783569	2783570
Sample Reference				WS3	WS3
Sample Number				1	2
Depth (m)				0.15	0.50
Date Sampled				27/07/2023	27/07/2023
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	17	13
Total mass of sample received	kg	0.001	NONE	1	0.7

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	SPU	SPU

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.16	0.06
Acenaphthylene	mg/kg	0.05	MCERTS	0.08	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.22	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.18	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	1.8	0.14
Anthracene	mg/kg	0.05	MCERTS	0.25	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	2.9	0.21
Pyrene	mg/kg	0.05	MCERTS	2.4	0.19
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.4	0.11
Chrysene	mg/kg	0.05	MCERTS	1.4	0.14
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	1.7	0.1
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.57	0.06
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.1	0.09
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.65	0.06
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.18	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.72	0.07

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	15.8	1.23
-----------------------------	-------	-----	-----------	------	------

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	34	23
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	29	23
Copper (aqua regia extractable)	mg/kg	1	MCERTS	95	58
Lead (aqua regia extractable)	mg/kg	1	MCERTS	210	57
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.4	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	26	24
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	140	94

Monoaromatics & Oxygenates

Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0
o-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0

Analytical Report Number: 23-51454
 Project / Site name: Ossett Lane, Dewsbury
 Your Order No: SHF.1888.002

Lab Sample Number				2783569	2783570
Sample Reference				WS3	WS3
Sample Number				1	2
Depth (m)				0.15	0.50
Date Sampled				27/07/2023	27/07/2023
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Petroleum Hydrocarbons					
TPH-CWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.1	NONE	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.1	NONE	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.1	NONE	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.1	NONE	< 0.10	< 0.10
TPH-CWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.1	NONE	< 0.10	< 0.10
TPH-CWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.1	NONE	< 0.10	< 0.10
TPH-CWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	11	< 10
TPH-CWG - Aromatic (EC5 - EC35) _{EH_CU+HS_1D_AR}	mg/kg	10	NONE	15	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 23-51454

Project / Site name: Ossett Lane, Dewsbury

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2783564	CP01	1	0.1	Brown sandy clay with brick and stones.
2783565	CP01	3	1	Brown clay and sand with gravel and stones.
2783566	CP01	5	1.5	Brown clay and sand.
2783567	WS1	1	0.1	Brown clay and sand with gravel and vegetation.
2783568	WS2	1	1	Brown clay and sand.
2783569	WS3	1	0.15	Brown loam and sand with gravel and vegetation.
2783570	WS3	2	0.5	Brown clay and sand with gravel and vegetation.

Analytical Report Number : 23-51454

Project / Site name: Ossett Lane, Dewsbury

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

Analytical Report Number : 23-51454

Project / Site name: Ossett Lane, Dewsbury

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Sample Deviation Report



Analytical Report Number : 23-51454

Project / Site name: Ossett Lane, Dewsbury

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis. Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
CP01	1	S	2783564	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
CP01	3	S	2783565	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
CP01	5	S	2783566	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
WS1	1	S	2783567	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
WS2	1	S	2783568	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
WS3	1	S	2783569	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
WS3	2	S	2783570	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c

Appendix 4 - Geotechnical Testing Results



TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Client: Enzygo Geoenvironmental Ltd
Client Address: Ducie House, Ducie Street,, M1 2JW

Contact: Reuben Fisher
Site Address: Ossett Lane, Dewsbury

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference: SHF.1888.002

Job Number: 23-51213-1

Date Sampled: 26/07/2023

Date Received: 16/08/2023

Date Tested: 22/08/2023

Sampled By: Not Given

Test Results:

Laboratory Reference: 2782378

Hole No.: WS2

Sample Reference: D4

Sample Description: Brown gravelly sandy CLAY

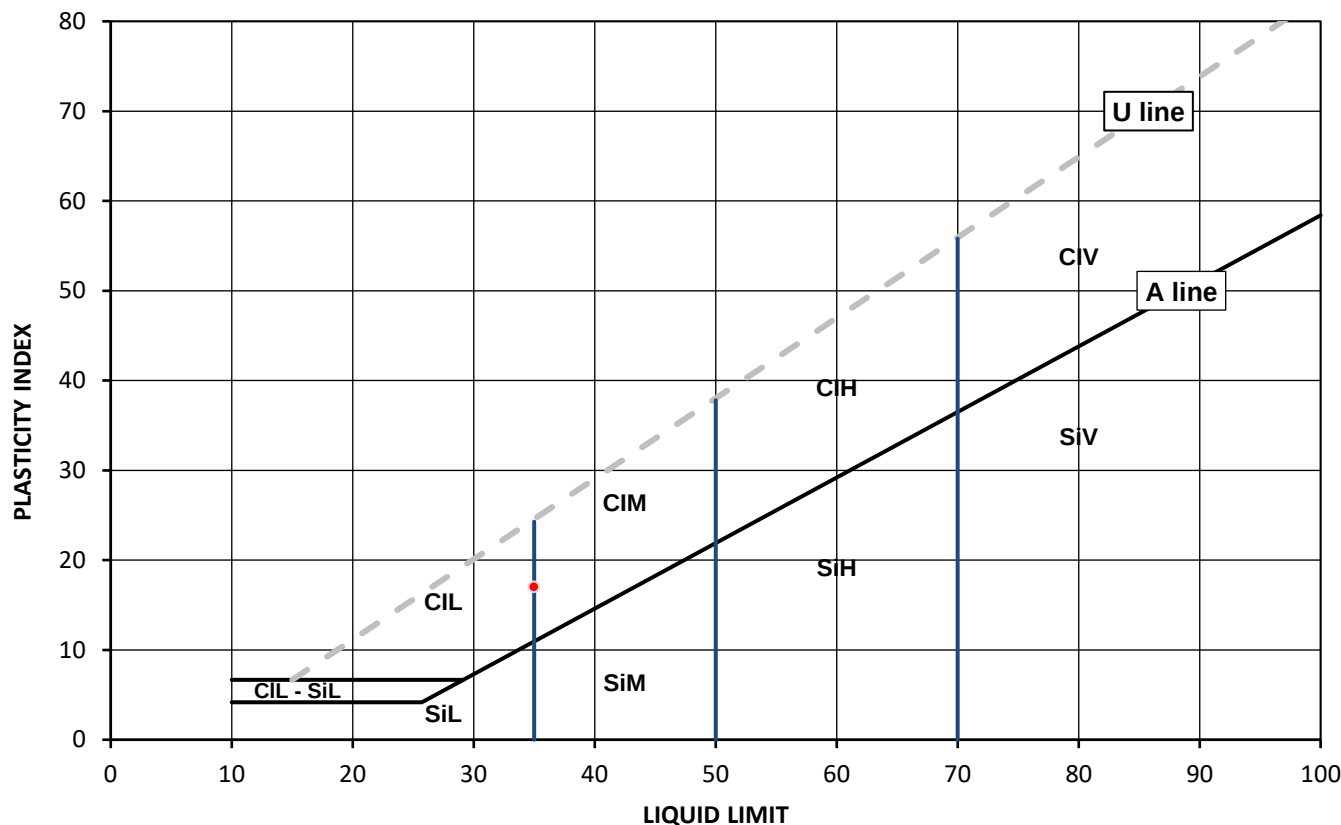
Depth Top [m]: 3.50

Depth Base [m]: Not Given

Sample Type: D

Sample Preparation: Tested after washing to remove >425 µm

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
12	35	18	17	60



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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4041

Client: Enzygo Geoenvironmental Ltd
Client Address: Ducie House, Ducie Street,, M1 2JW

Client Reference: SHF.1888.002

Job Number: 23-51213-1

Date Sampled: 27/07/2023

Date Received: 16/08/2023

Date Tested: 22/08/2023

Sampled By: Not Given

Contact: Reuben Fisher
Site Address: Ossett Lane, Dewsbury

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 2782380

Hole No.: WS3

Sample Reference: D5

Sample Description: Brownish grey sandy CLAY

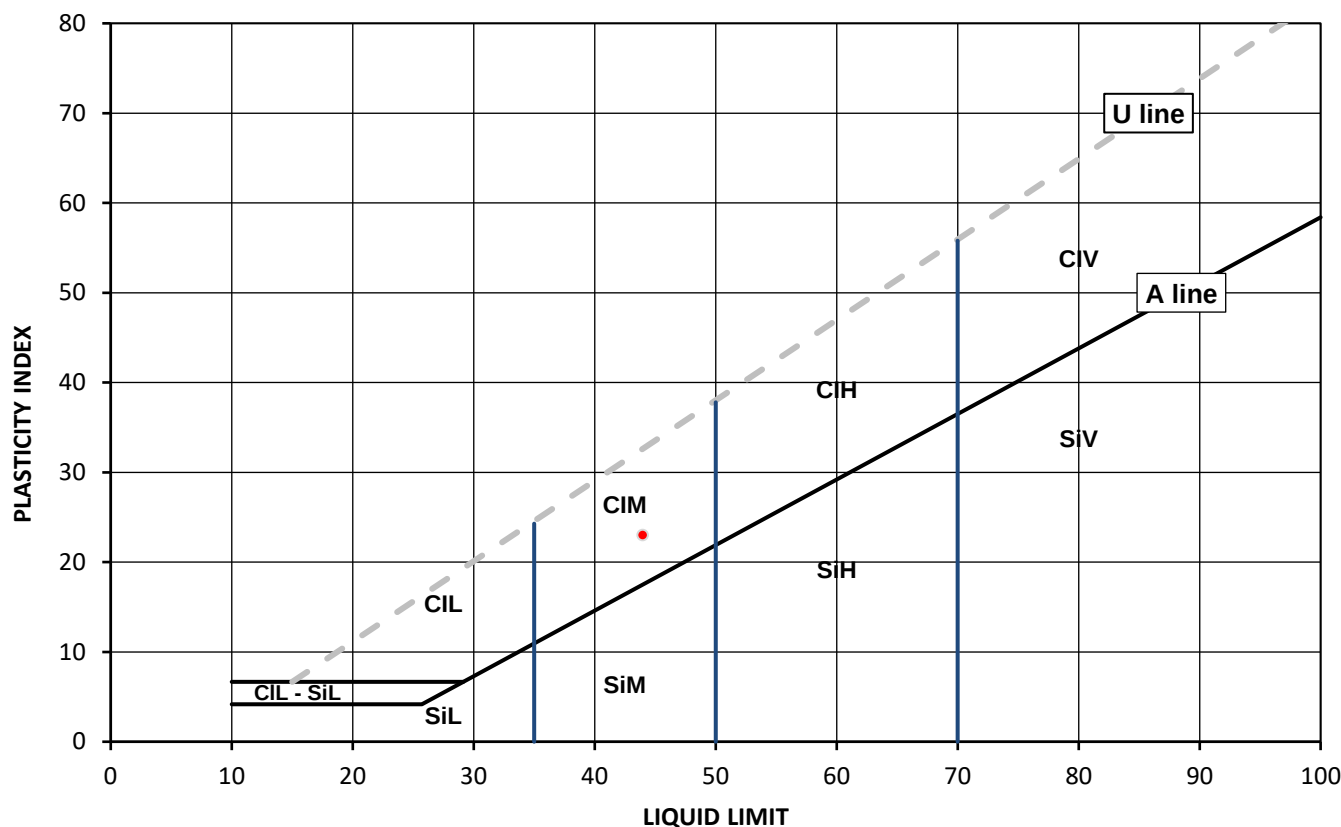
Depth Top [m]: 3.50

Depth Base [m]: Not Given

Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
16	44	21	23	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Client: Enzygo Geoenvironmental Ltd
Client Address: Ducie House, Ducie Street,, M1 2JW

Contact: Reuben Fisher
Site Address: Ossett Lane, Dewsbury

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference: SHF.1888.002

Job Number: 23-51213-1

Date Sampled: 27/07/2023

Date Received: 16/08/2023

Date Tested: 24/08/2023

Sampled By: Not Given

Test Results:

Laboratory Reference: 2782381

Hole No.: WS3

Sample Reference: B6

Sample Description: Brown slightly sandy CLAY

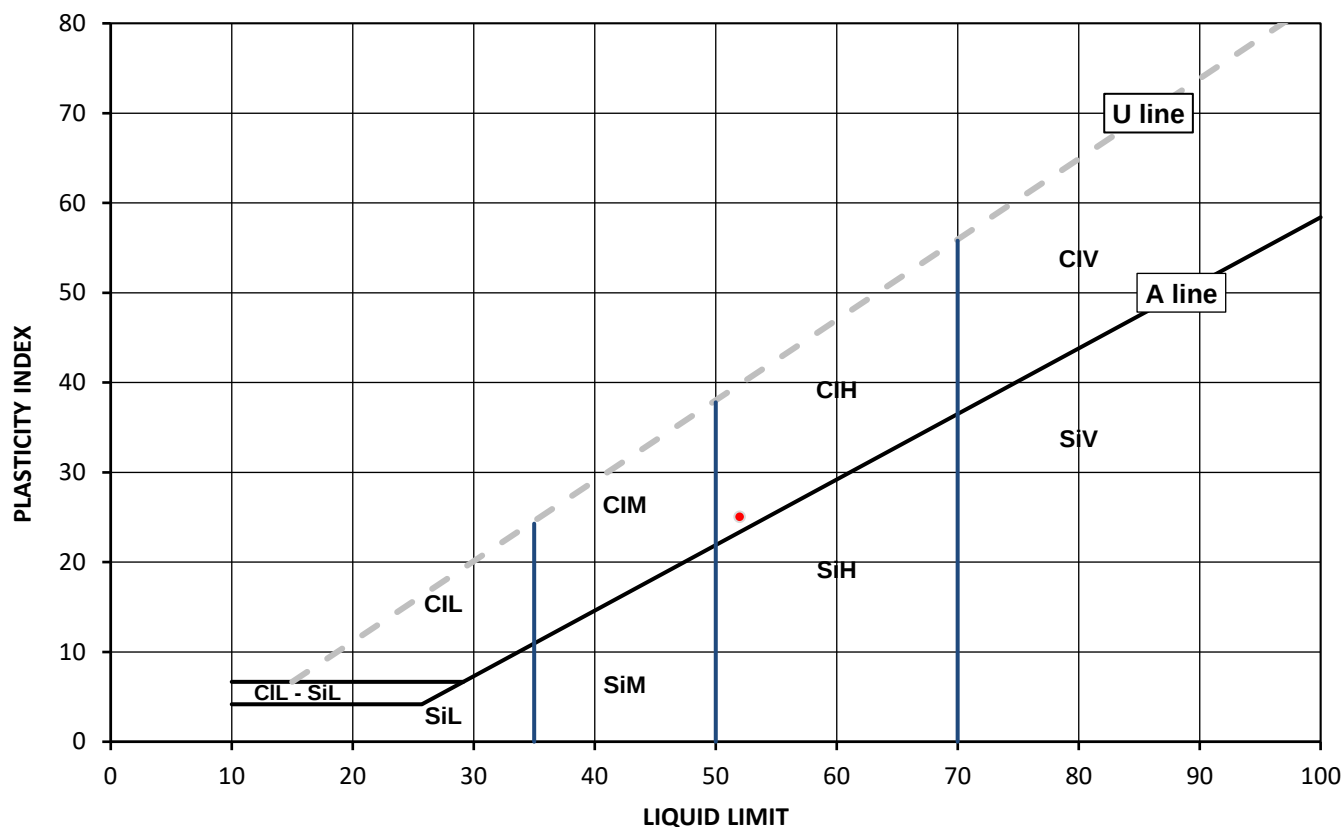
Depth Top [m]: 3.50

Depth Base [m]: 4.00

Sample Type: B

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
19	52	27	25	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Client: Enzygo Geoenvironmental Ltd

Client Address: Ducie House, Ducie Street,, M1 2JW

Contact: Reuben Fisher

Site Address: Ossett Lane, Dewsbury

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Water Content by BS 1377-2:1990: Clause 3.2
Atterberg by BS 1377-2: 1990:
Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5

Client Reference: SHF.1888.002

Job Number: 23-51213-1

Date Sampled: 26/07 - 27/07/2023

Date Received: 16/08/2023

Date Tested: 22/08 - 24/08/2023

Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [W] %	Water Content BS EN ISO 17892-1 [W] %	Atterberg				Density			Total Porosity# %		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	WL	Wp	Ip	bulk	dry	PD			
			m	m															
2782378	WS2	D4	3.50	Not Given	D	Brown gravelly sandy CLAY	Atterberg 1 Point	12		60	35	18	17						
2782380	WS3	D5	3.50	Not Given	D	Brownish grey sandy CLAY	Atterberg 1 Point	16		100	44	21	23						
2782381	WS3	B6	3.50	4.00	B	Brown slightly sandy CLAY	Atterberg 1 Point	19		100	52	27	25						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Client: Enzygo Geoenvironmental Ltd

Client Address: Ducie House, Ducie Street,, M1 2JW

Contact: Reuben Fisher

Site Address: Ossett Lane, Dewsbury

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference: SHF.1888.002

Job Number: 23-51213-1

Date Sampled: 26/07 - 27/07/2023

Date Received: 16/08/2023

Date Tested: 22/08 - 24/08/2023

Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type							
2782378	WS2	D4	3.50	Not Given	D	Brown gravelly sandy CLAY		12	Sample was quartered, oven dried at 108.1 °C			
2782380	WS3	D5	3.50	Not Given	D	Brownish grey sandy CLAY		16	Sample was quartered, oven dried at 108.1 °C			
2782381	WS3	B6	3.50	4.00	B	Brown slightly sandy CLAY		19	Sample was quartered, oven dried at 108.2 °C			

Comments:

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Signed:

Katarzyna Koziel

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd



TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Client: Enzygo Geoenvironmental Ltd
Client Address: Ducie House, Ducie Street,, M1 2JW

Client Reference: SHF.1888.002

Job Number: 23-51213-1

Date Sampled: 27/07/2023

Date Received: 16/08/2023

Date Tested: 23/08/2023

Sampled By: Not Given

Contact: Reuben Fisher
Site Address: Ossett Lane, Dewsbury

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 2782373

Hole No.: CP01

Sample Reference: B6

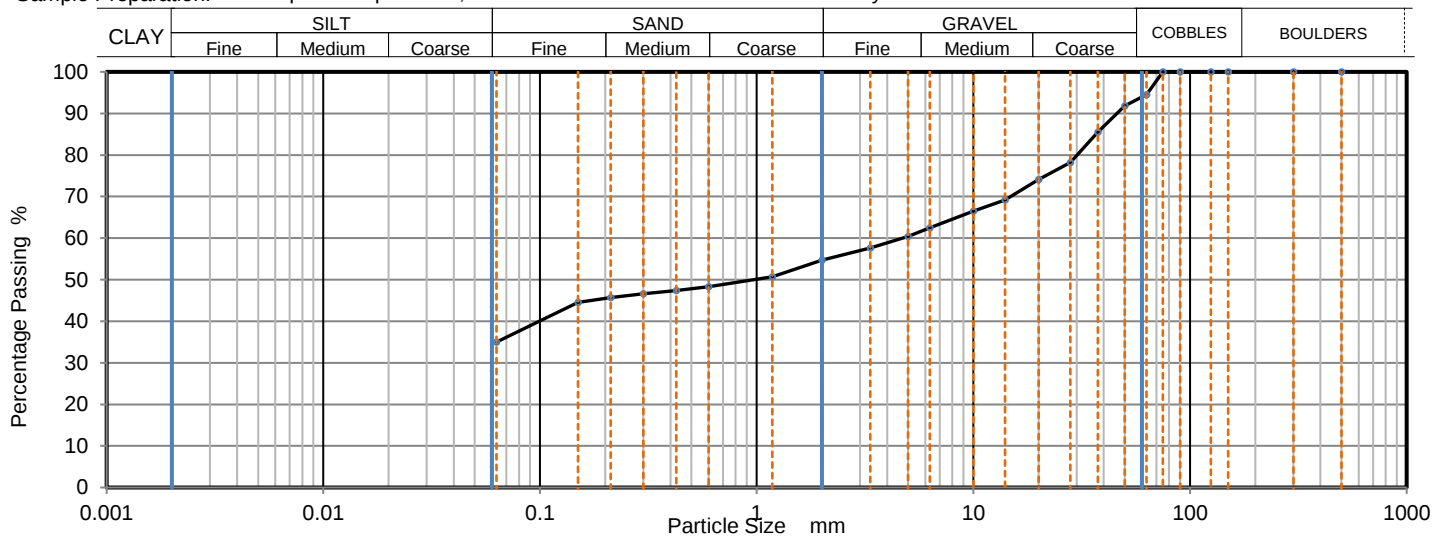
Sample Description: Yellowish brown clayey GRAVEL. Gravel is siltstone

Sample Preparation: Sample was quartered, oven dried at 108.3 °C and broken down by hand.

Depth Top [m]: 1.80

Depth Base [m]: 2.50

Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	95		
50	92		
37.5	86		
28	78		
20	74		
14	69		
10	67		
6.3	63		
5	60		
3.35	58		
2	55		
1.18	51		
0.6	48		
0.425	47		
0.3	47		
0.212	46		
0.15	45		
0.063	35		

Sample Proportions	% dry mass
Very coarse	6
Gravel	40
Sand	20
Fines <0.063mm	35

Grading Analysis	
D100	mm 75
D60	mm 4.71
D30	mm
D10	mm
Uniformity Coefficient	> 75
Curvature Coefficient	

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Client: Enzygo Geoenvironmental Ltd
Client Address: Ducie House, Ducie Street,, M1 2JW

Client Reference: SHF.1888.002

Job Number: 23-51213-1

Date Sampled: 27/07/2023

Date Received: 16/08/2023

Date Tested: 24/08/2023

Sampled By: Not Given

Contact: Reuben Fisher
Site Address: Ossett Lane, Dewsbury

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 2782374

Hole No.: CP01

Sample Reference: B8

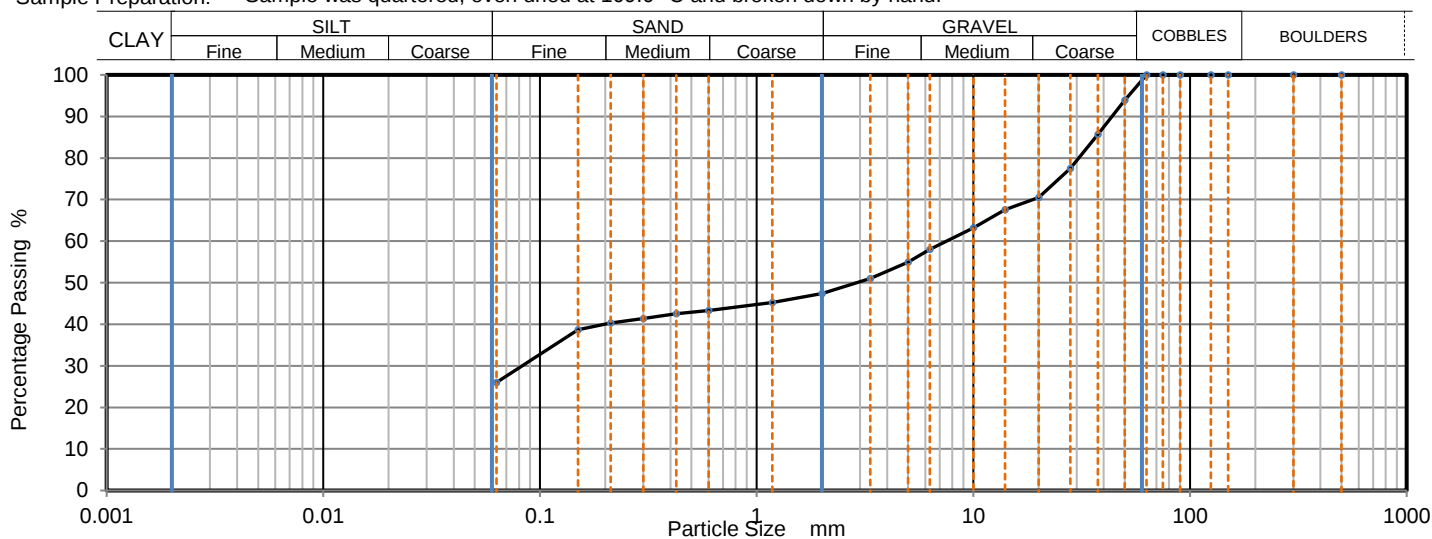
Sample Description: Yellowish brown sandy clayey GRAVEL

Sample Preparation: Sample was quartered, oven dried at 109.0 °C and broken down by hand.

Depth Top [m]: 2.70

Depth Base [m]: 3.50

Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	94		
37.5	86		
28	78		
20	71		
14	68		
10	63		
6.3	58		
5	55		
3.35	51		
2	47		
1.18	45		
0.6	43		
0.425	43		
0.3	41		
0.212	40		
0.15	39		
0.063	26		

Sample Proportions	% dry mass
Very coarse	0
Gravel	53
Sand	21
Fines <0.063mm	26

Grading Analysis	
D100	mm 63
D60	mm 7.53
D30	mm 0.0829
D10	mm
Uniformity Coefficient	> 120
Curvature Coefficient	

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Client: Enzygo Geoenvironmental Ltd
Client Address: Ducie House, Ducie Street., M1 2JW

Contact: Reuben Fisher
Site Address: Ossett Lane, Dewsbury

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference: SHF.1888.002

Job Number: 23-51213-1

Date Sampled: 27/07/2023

Date Received: 16/08/2023

Date Tested: 23/08/2023

Sampled By: Not Given

Test Results:

Laboratory Reference: 2782375

Hole No.: CP01

Sample Reference: B10

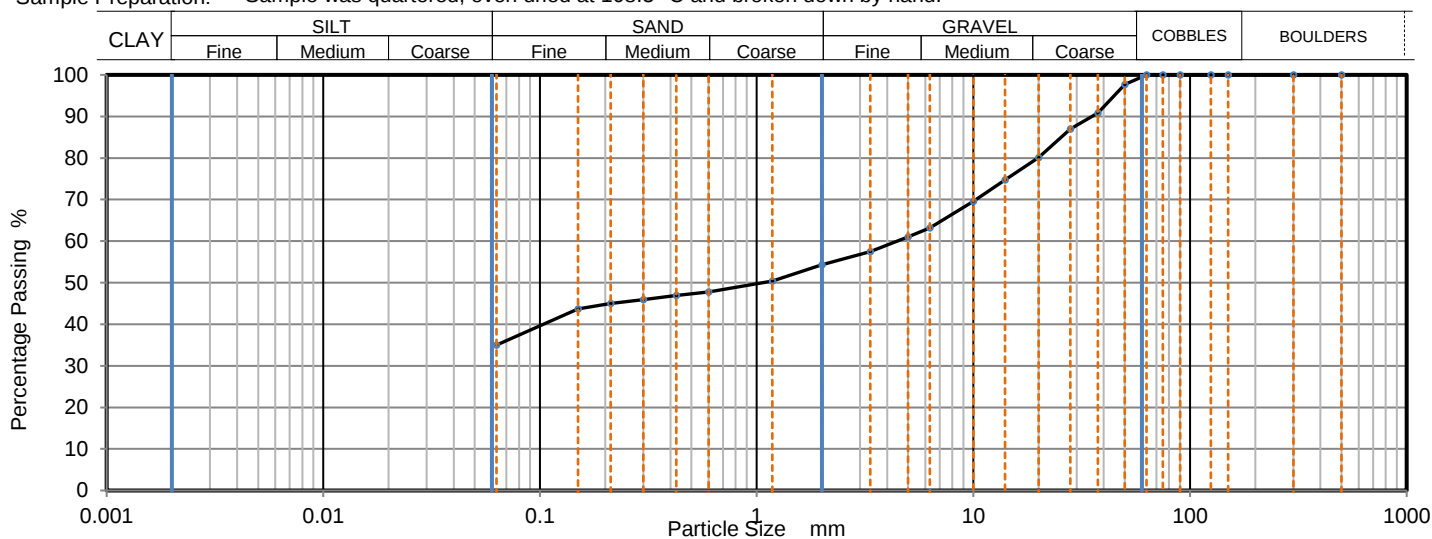
Sample Description: Light brown clayey GRAVEL. Gravel is siltstone

Sample Preparation: Sample was quartered, oven dried at 108.3 °C and broken down by hand.

Depth Top [m]: 4.00

Depth Base [m]: 4.80

Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	98		
37.5	91		
28	87		
20	80		
14	75		
10	70		
6.3	63		
5	61		
3.35	58		
2	54		
1.18	50		
0.6	48		
0.425	47		
0.3	46		
0.212	45		
0.15	44		
0.063	35		

Sample Proportions	% dry mass
Very coarse	0
Gravel	46
Sand	19
Fines <0.063mm	35

Grading Analysis		
D100	mm	63
D60	mm	4.44
D30	mm	
D10	mm	
Uniformity Coefficient		> 70
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Page 1 of 1

Date Reported: 31/08/2023

GF 100.23



TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Client: Enzygo Geoenvironmental Ltd
Client Address: Ducie House, Ducie Street,, M1 2JW

Client Reference: SHF.1888.002

Job Number: 23-51213-1

Date Sampled: 27/07/2023

Date Received: 16/08/2023

Date Tested: 23/08/2023

Sampled By: Not Given

Contact: Reuben Fisher
Site Address: Ossett Lane, Dewsbury

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 2782376

Hole No.: WS1

Sample Reference: B2

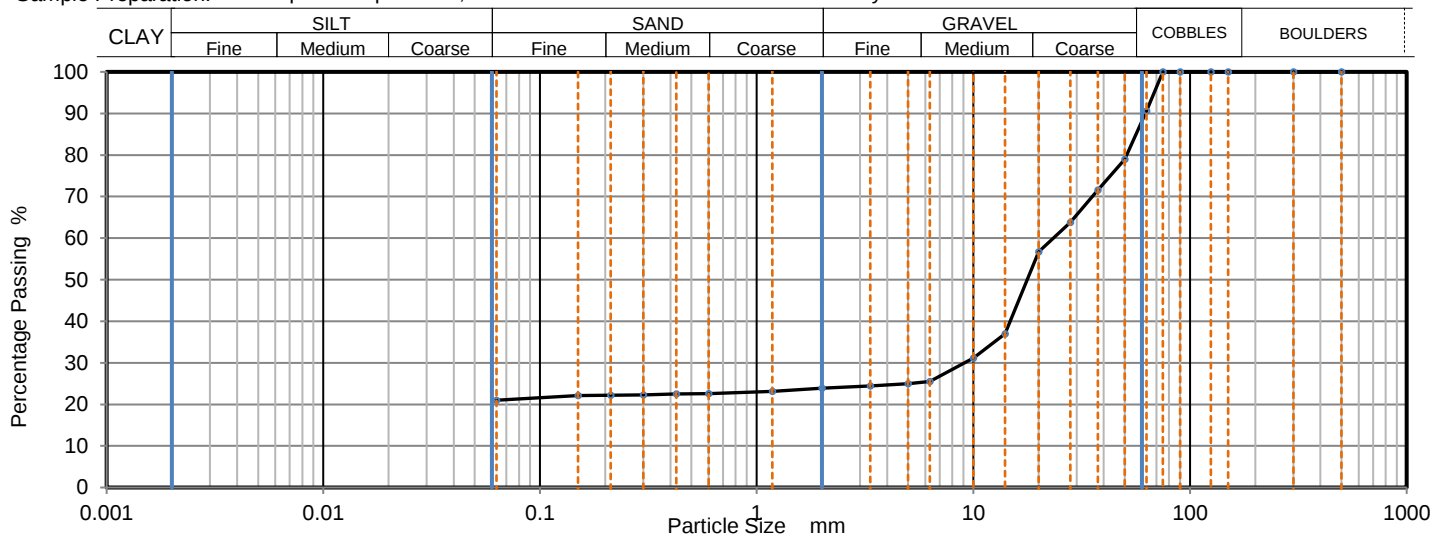
Sample Description: Yellowish brown clayey GRAVEL with fragments of shales

Sample Preparation: Sample was quartered, oven dried at 109.0 °C and broken down by hand.

Depth Top [m]: 1.00

Depth Base [m]: 2.00

Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	91		
50	79		
37.5	72		
28	64		
20	57		
14	37		
10	31		
6.3	26		
5	25		
3.35	24		
2	24		
1.18	23		
0.6	23		
0.425	23		
0.3	22		
0.212	22		
0.15	22		
0.063	21		

Sample Proportions	% dry mass
Very coarse	9
Gravel	67
Sand	3
Fines <0.063mm	21

Grading Analysis	
D100	mm 75
D60	mm 23.4
D30	mm 9.14
D10	mm
Uniformity Coefficient	> 370
Curvature Coefficient	

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

Signed:

Katarzyna Koziel

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Client: Enzygo Geoenvironmental Ltd
Client Address: Ducie House, Ducie Street,, M1 2JW

Client Reference: SHF.1888.002

Job Number: 23-51213-1

Date Sampled: 26/07/2023

Date Received: 16/08/2023

Date Tested: 23/08/2023

Sampled By: Not Given

Contact: Reuben Fisher
Site Address: Ossett Lane, Dewsbury

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 2782377

Hole No.: WS2

Sample Reference: B2

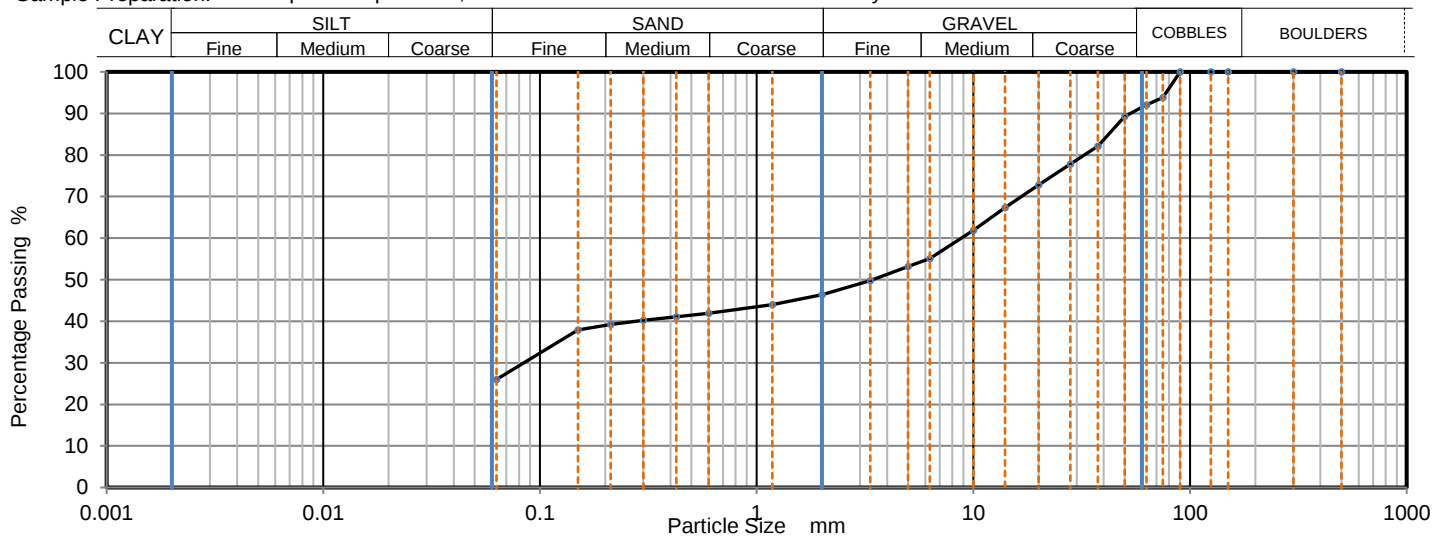
Sample Description: Light brown sandy clayey GRAVEL

Sample Preparation: Sample was quartered, oven dried at 109.0 °C and broken down by hand.

Depth Top [m]: 2.00

Depth Base [m]: 3.00

Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	94		
63	92		
50	89		
37.5	82		
28	78		
20	73		
14	67		
10	62		
6.3	55		
5	53		
3.35	50		
2	46		
1.18	44		
0.6	42		
0.425	41		
0.3	40		
0.212	39		
0.15	38		
0.063	26		

Sample Proportions	% dry mass
Very coarse	8
Gravel	46
Sand	20
Fines <0.063mm	26

Grading Analysis	
D100	mm 90
D60	mm 8.78
D30	mm 0.0843
D10	mm
Uniformity Coefficient	> 140
Curvature Coefficient	

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Katarzyna Koziel

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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4041

TEST CERTIFICATE**DETERMINATION OF PARTICLE SIZE DISTRIBUTION**

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

Client: Enzygo Geoenvironmental Ltd
Client Address: Ducie House, Ducie Street,, M1 2JW

Client Reference: SHF.1888.002
Job Number: 23-51213-1
Date Sampled: 27/07/2023
Date Received: 16/08/2023
Date Tested: 24/08/2023
Sampled By: Not Given

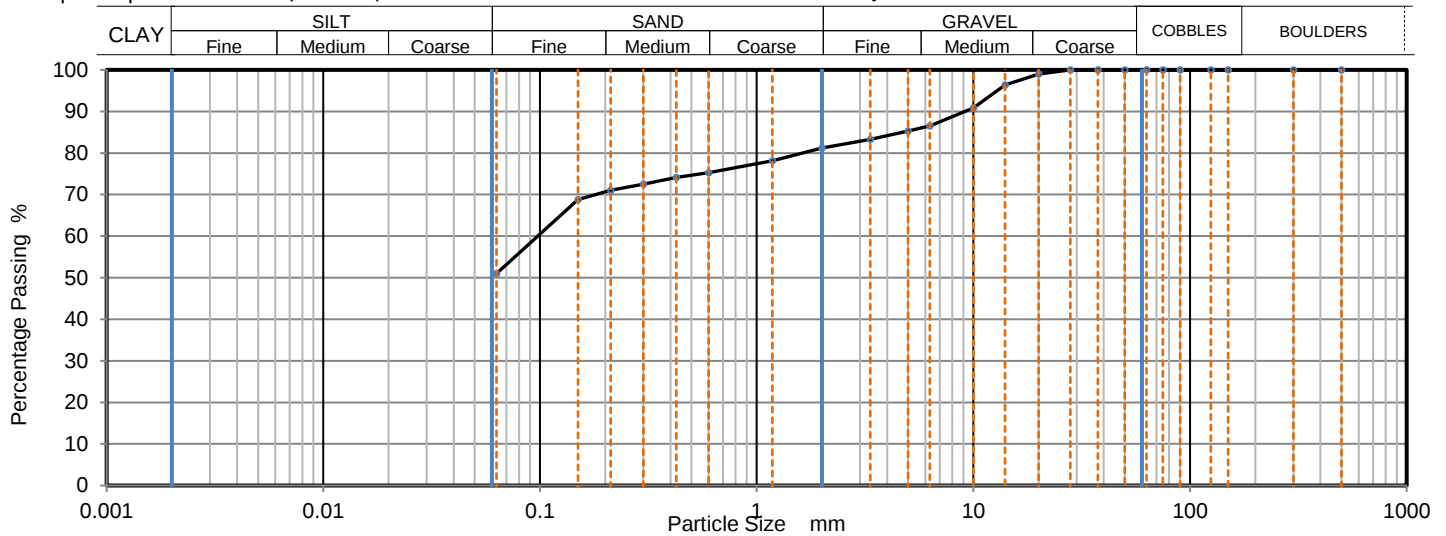
Contact: Reuben Fisher
Site Address: Ossett Lane, Dewsbury

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference: 2782379
Hole No.: WS3
Sample Reference: B3
Sample Description: Yellowish brown sandy CLAY
Sample Preparation: Sample was quartered, oven dried at 109.0 °C and broken down by hand.

Depth Top [m]: 1.00
Depth Base [m]: 2.00
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	99		
14	96		
10	91		
6.3	87		
5	85		
3.35	83		
2	81		
1.18	78		
0.6	75		
0.425	74		
0.3	73		
0.212	71		
0.15	69		
0.063	52		

Sample Proportions	% dry mass
Very coarse	0
Gravel	19
Sand	30
Fines <0.063mm	52

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	> 1.5
Curvature Coefficient	

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:**Signed:**

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Reuben Fisher
Enzygo Geoenvironmental Ltd
Ducie House, Ducie Street,
M1 2JW

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

e: Reuben.Fisher@enzygo.com

Analytical Report Number : 23-51214

Project / Site name:	Ossett Lane, Dewsbury	Samples received on:	16/08/2023
Your job number:	SHF.1888.002	Samples instructed on/ Analysis started on:	16/08/2023
Your order number:	SHF.1888.002	Analysis completed by:	30/08/2023
Report Issue Number:	1	Report issued on:	30/08/2023
Samples Analysed:	8 soil samples		

Izabela Wójcik
Signed:

Izabela Wójcik
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 23-51214
Project / Site name: Ossett Lane, Dewsbury
Your Order No: SHF.1888.002

Lab Sample Number				2782382	2782383	2782384	2782385	2782386
Sample Reference				CP01	CP01	CP01	CP01	WS1
Sample Number				D4	D7	D9	D11	D3
Depth (m)				1.20	2.60	2.80	5.00	3.50
Date Sampled				27/07/2023	27/07/2023	27/07/2023	27/07/2023	26/07/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	8.8	7.1	8.7	10	5.7
Total mass of sample received	kg	0.001	NONE	0.5	0.4	0.5	0.4	0.5

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	6.2	7.3	6.6	4.9	6.7
Total Sulphate as SO ₄	%	0.005	MCERTS	0.212	0.35	0.261**	0.112	0.026
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.844	1.56	1.36**	0.417	0.0752
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	2.1	2.1	1.8	2	2.4
Total Sulphur	%	0.005	MCERTS	0.076	0.154	0.122	0.045	0.01
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	2.2

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	63	43	46	35	13
Magnesium (leachate equivalent)	mg/l	2.5	NONE	31	21	23	18	6.7

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-51214
Project / Site name: Ossett Lane, Dewsbury
Your Order No: SHF.1888.002

Lab Sample Number				2782387	2782388	2782389
Sample Reference				WS2	WS3	WS3
Sample Number				D3	D4	B6
Depth (m)				1.50	1.50	3.50-4.00
Date Sampled				26/07/2023	27/07/2023	27/07/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	13	7.8	10
Total mass of sample received	kg	0.001	NONE	0.4	0.5	0.4

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7	6.3	7
Total Sulphate as SO ₄	%	0.005	MCERTS	0.02	0.024	0.016
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0563	0.0074	0.0737
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	1.6	0.8	3.3
Total Sulphur	%	0.005	MCERTS	0.008	0.014	0.006
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	11	15	70
Magnesium (leachate equivalent)	mg/l	2.5	NONE	5.4	7.7	35

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 23-51214

Project / Site name: Ossett Lane, Dewsbury

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2782382	CP01	D4	1.2	Brown clay and sand with gravel.
2782383	CP01	D7	2.6	Brown clay and sand with gravel.
2782384	CP01	D9	2.8	Brown clay and sand with gravel.
2782385	CP01	D11	5	Brown clay with gravel.
2782386	WS1	D3	3.5	Brown clay and sand with gravel.
2782387	WS2	D3	1.5	Brown clay with gravel.
2782388	WS3	D4	1.5	Brown clay and sand with gravel.
2782389	WS3	B6	3.50-4.00	Brown clay and sand with gravel.

Analytical Report Number : 23-51214
Project / Site name: Ossett Lane, Dewsbury

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

**** Despite repeating Total Sulphate and Water Soluble Sulphate analysis, the results remain contradictory.**

Appendix 5 - Human Health Assessment Reference Values

Determinant	Units	GAC Value Residential					
		With Plant Uptake			Without Plant Uptake		
Arsenic	mg/kg	37			40		
Cadmium	mg/kg	11			85		
Chromium	mg/kg	910			910		
Chromium VI	mg/kg	6			6		
Lead	mg/kg	200			310		
Mercury	mg/kg	40			56		
Nickel	mg/kg	130			180		
Selenium	mg/kg	250			430		
Copper	mg/kg	2400			7100		
Zinc	mg/kg	3700			40000		
Cyanide	mg/kg	791			800		
SOM	%	1	2.5	6	1	2.5	6
Phenol	mg/kg	280	550	1100	750	1300	2300
Napthalene	mg/kg	2.3	5.6	13	2.3	5.6	13
Acenaphtylene	mg/kg	170	420	920	2900	4600	6000
Acenaphthene	mg/kg	210	510	1100	3000	4700	6000
Flourene	mg/kg	170	400	860	2800	3800	4500
Phenanthrene	mg/kg	95	220	440	1300	1500	1500
Anthracene	mg/kg	2400	5400	11000	31000	35000	37000
Fluoranthene	mg/kg	280	560	890	1500	1600	1600
Pyrene	mg/kg	620	1200	2000	3700	3800	3800
Benzo(a)Anthracene	mg/kg	7.2	11	13	11	14	15
Chrysene	mg/kg	15	22	27	30	31	32
Benzo(b)Flouranthene	mg/kg	2.6	3.3	3.7	3.9	4.0	4.0
Benzo(k)Flouranthene	mg/kg	77	93	100	110	110	110
Benzo(a)Pyrene	mg/kg	2.2	2.7	3.0	3.2	3.2	3.2
Indeno(123-cd)Pyrene	mg/kg	27	36	41	45	46	46
Dibenzo(a,h)Anthracene	mg/kg	0.24	0.28	0.3	0.31	0.32	0.32
Benzo(ghi)Perylene	mg/kg	320	340	350	360	360	360
TPH C ₅ -C ₆ Aliphatic	mg/kg	42	78	160	42	78	160
TPH C ₆ -C ₈ Aliphatic	mg/kg	100	230	530	100	230	530
TPH C ₈ -C ₁₀ Aliphatic	mg/kg	27	65	150	27	65	150
TPH C ₁₀ -C ₁₂ Aliphatic	mg/kg	130	330	760	130	330	770
TPH C ₁₂ -C ₁₆ Aliphatic	mg/kg	1100	2400	4300	1100	2400	4400
TPH C ₁₆ -C ₃₅ Aliphatic	mg/kg	65000	92000	110000	65000	92000	110000
TPH C ₃₅ -C ₄₄ Aliphatic	mg/kg	65000	92000	110000	65000	92000	110000
TPH C ₅ -C ₇ Aromatic	mg/kg	70	140	300	370	690	1400
TPH C ₇ -C ₈ Aromatic	mg/kg	130	290	660	860	1800	3900
TPH C ₈ -C ₁₀ Aromatic	mg/kg	34	83	190	47	110	270
TPH C ₁₀ -C ₁₂ Aromatic	mg/kg	74	180	380	250	590	1200
TPH C ₁₂ -C ₁₆ Aromatic	mg/kg	140	330	660	1800	2300	2500
TPH C ₁₆ -C ₂₁ Aromatic	mg/kg	260	540	930	1900	1900	1900
TPH C ₂₁ -C ₃₅ Aromatic	mg/kg	1100	1500	1700	1900	1900	1900
TPH C ₃₅ -C ₄₄ Aromatic	mg/kg	1100	1500	1700	1900	1900	1900
Benzene	mg/kg	0.087	0.17	0.37	0.38	0.70	1.4
Toluene	mg/kg	130	290	660	880	1900	3900
Ethylebenzene	mg/kg	47	110	260	83	190	440
Xylene	mg/kg	56	130	310	79	180	430

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Determinant	Units	GAC Value					
		Residential POS			Commercial		
Arsenic	mg/kg	79			640		
Cadmium	mg/kg	120			190		
Chromium	mg/kg	1500			8600		
Chromium VI	mg/kg	7.7			33		
Lead	mg/kg	630			2330		
Mercury	mg/kg	120			1100		
Nickel	mg/kg	230			980		
Selenium	mg/kg	1100			12000		
Copper	mg/kg	12000			68000		
Zinc	mg/kg	81000			730000		
Cyanide	mg/kg	N/A			16200		
SOM	%	1	2.5	6	1	2.5	6
Phenol	mg/kg	760	1500	3200	760	1500	3200
Napthalene	mg/kg	4900	4900	4900	190	460	1100
Acenaphthylene	mg/kg	15000	15000	15000	83000	97000	100000
Acenaphthene	mg/kg	15000	15000	15000	84000	97000	100000
Flourene	mg/kg	9900	9900	9900	63000	68000	71000
Phenanthrene	mg/kg	3100	3100	3100	22000	22000	23000
Anthracene	mg/kg	74000	74000	74000	520000	540000	540000
Fluoranthene	mg/kg	3100	3100	3100	23000	23000	23000
Pyrene	mg/kg	7400	7400	7400	54000	54000	54000
Benzo(a)Anthracene	mg/kg	29	29	29	170	170	180
Chrysene	mg/kg	57	57	57	350	350	350
Benzo(b)Flouranthene	mg/kg	7.1	7.2	7.2	44	44	45
Benzo(k)Flouranthene	mg/kg	190	190	190	1200	1200	1200
Benzo(a)Pyrene	mg/kg	5.7	5.7	5.7	35	35	36
Indeno(123-cd)Pyrene	mg/kg	82	82	82	500	510	510
Dibenzo(a,h)Anthracene	mg/kg	0.57	0.57	0.58	3.5	3.6	3.6
Benzo(ghi)Perylene	mg/kg	640	640	640	3900	4000	4000
TPH C ₅ -C ₆ Aliphatic	mg/kg	570000	590000	600000	3200	5900	12000
TPH C ₆ -C ₈ Aliphatic	mg/kg	600000	610000	620000	7800	17000	40000
TPH C ₈ -C ₁₀ Aliphatic	mg/kg	13000	13000	13000	2000	4800	11000
TPH C ₁₀ -C ₁₂ Aliphatic	mg/kg	13000	13000	13000	9700	23000	47000
TPH C ₁₂ -C ₁₆ Aliphatic	mg/kg	13000	13000	13000	59000	82000	90000
TPH C ₁₆ -C ₃₅ Aliphatic	mg/kg	250000	250000	250000	1600000	1700000	1800000
TPH C ₃₅ -C ₄₄ Aliphatic	mg/kg	250000	250000	250000	1600000	1700000	1800000
TPH C ₅ -C ₇ Aromatic	mg/kg	56000	56000	56000	26000	46000	86000
TPH C ₇ -C ₈ Aromatic	mg/kg	56000	56000	56000	56000	110000	180000
TPH C ₈ -C ₁₀ Aromatic	mg/kg	5000	5000	5000	3500	8100	17000
TPH C ₁₀ -C ₁₂ Aromatic	mg/kg	5000	5000	5000	16000	28000	34000
TPH C ₁₂ -C ₁₆ Aromatic	mg/kg	5100	5100	5000	36000	37000	38000
TPH C ₁₆ -C ₂₁ Aromatic	mg/kg	3800	3800	3800	28000	28000	28000
TPH C ₂₁ -C ₃₅ Aromatic	mg/kg	3800	3800	3800	28000	28000	28000
TPH C ₃₅ -C ₄₄ Aromatic	mg/kg	3800	3800	3800	28000	28000	28000
Benzene	mg/kg	72	72	73	27	47	90
Toluene	mg/kg	56000	56000	56000	56000	110000	180000
Ethylebenzene	mg/kg	24000	24000	25000	5700	13000	27000
Xylene	mg/kg	41000	42000	43000	5900	14000	30000

Determinant	Units	GAC Value					
		Park POS			Allotments		
Arsenic	mg/kg	170			43		
Cadmium	mg/kg	532			1.9		
Chromium	mg/kg	33000			18000		
Chromium VI	mg/kg	220			1.8		
Lead	mg/kg	1300			80		
Mercury	mg/kg	240			19		
Nickel	mg/kg	800			53		
Selenium	mg/kg	1800			88		
Copper	mg/kg	44000			520		
Zinc	mg/kg	170000			620		
Cyanide	mg/kg						
SOM	%	1	2.5	6	1	2.5	6
Phenol	mg/kg	760	1500	3200	66	140	280
Napthalene	mg/kg	1200	1900	3000	4.1	10	24
Acenaphtylene	mg/kg	29000	30000	30000	28	69	160
Acenaphthene	mg/kg	29000	30000	30000	34	85	200
Flourene	mg/kg	20000	20000	20000	27	67	160
Phenanthrene	mg/kg	6200	6200	6300	15	38	90
Anthracene	mg/kg	150000	150000	150000	380	950	2200
Fluoranthene	mg/kg	6300	6300	6400	52	130	290
Pyrene	mg/kg	15000	15000	15000	110	270	620
Benzo(a)Anthracene	mg/kg	49	56	62	2.9	6.5	13
Chrysene	mg/kg	93	110	120	4.1	9.4	19
Benzo(b)Flouranthene	mg/kg	13	15	16	0.99	2.1	3.9
Benzo(k)Flouranthene	mg/kg	370	410	440	37	75	130
Benzo(a)Pyrene	mg/kg	11	12	13	0.97	2.0	3.5
Indeno(123-cd)Pyrene	mg/kg	150	170	180	9.5	21	39
Dibenzo(a,h)Anthracene	mg/kg	1.1	1.3	1.4	0.14	0.27	0.43
Benzo(ghi)Perylene	mg/kg	1400	1500	1600	290	470	640
TPH C ₅ -C ₆ Aliphatic	mg/kg	95000	130000	180000	730	1700	3900
TPH C ₆ -C ₈ Aliphatic	mg/kg	150000	220000	320000	2300	5600	13000
TPH C ₈ -C ₁₀ Aliphatic	mg/kg	14000	18000	21000	320	770	1700
TPH C ₁₀ -C ₁₂ Aliphatic	mg/kg	21000	23000	24000	2200	4400	7300
TPH C ₁₂ -C ₁₆ Aliphatic	mg/kg	25000	25000	26000	11000	13000	13000
TPH C ₁₆ -C ₃₅ Aliphatic	mg/kg	450000	480000	490000	260000	270000	270000
TPH C ₃₅ -C ₄₄ Aliphatic	mg/kg	450000	480000	490000	260000	270000	270000
TPH C ₅ -C ₇ Aromatic	mg/kg	76000	84000	92000	13	27	57
TPH C ₇ -C ₈ Aromatic	mg/kg	87000	95000	100000	22	51	120
TPH C ₈ -C ₁₀ Aromatic	mg/kg	7200	8500	9300	8.6	21	51
TPH C ₁₀ -C ₁₂ Aromatic	mg/kg	9200	9700	10000	13	31	74
TPH C ₁₂ -C ₁₆ Aromatic	mg/kg	10000	10000	10000	23	57	130
TPH C ₁₆ -C ₂₁ Aromatic	mg/kg	7600	7700	7800	46	110	260
TPH C ₂₁ -C ₃₅ Aromatic	mg/kg	7800	7800	7900	370	820	1600
TPH C ₃₅ -C ₄₄ Aromatic	mg/kg	7800	7800	7900	370	820	1600
Benzene	mg/kg	90	100	110	0.017	0.034	0.075
Toluene	mg/kg	87000	95000	100000	22	51	120
Ethylebenzene	mg/kg	17000	22000	27000	16	39	91
Xylene	mg/kg	17000	23000	31000	28	67	160

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